

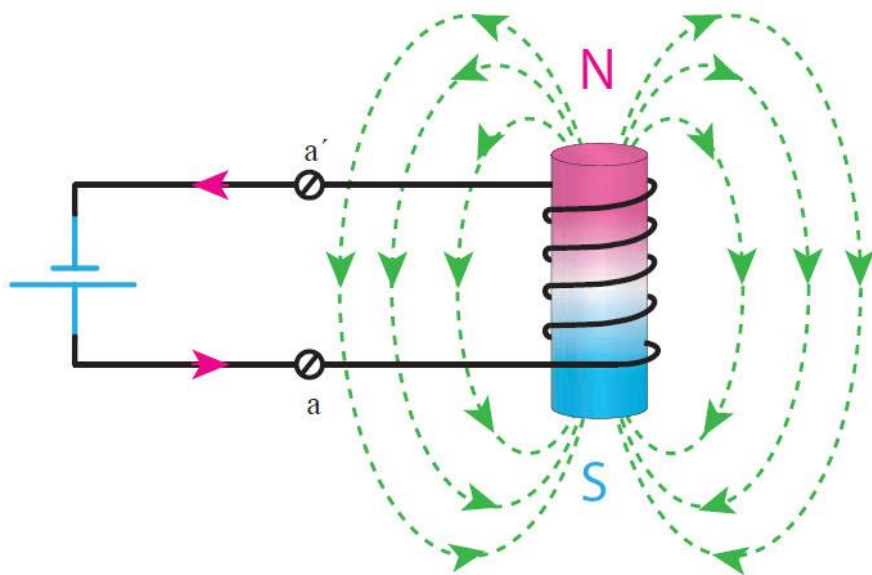
آموزش اینورتر IG5A



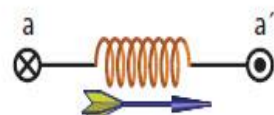
مختصری در خصوص موتورهای آسنکرون



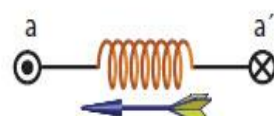
د) شکل واقعی ماشین القایی سیم پیچ متمرکز مدل آزمایشگاهی



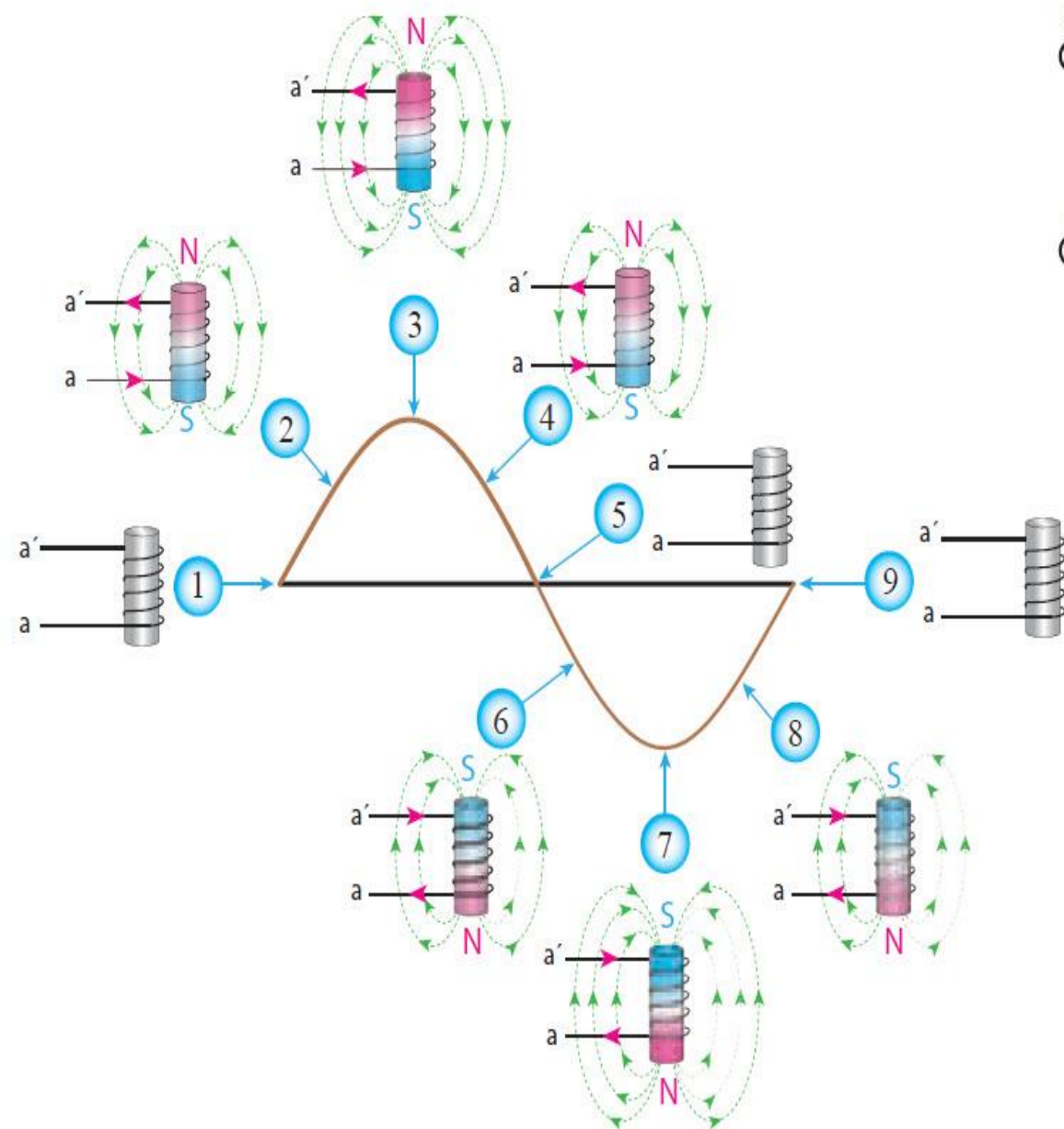
شکل ۱۱- میدان مغناطیسی حاصل از منبع جریان مستقیم

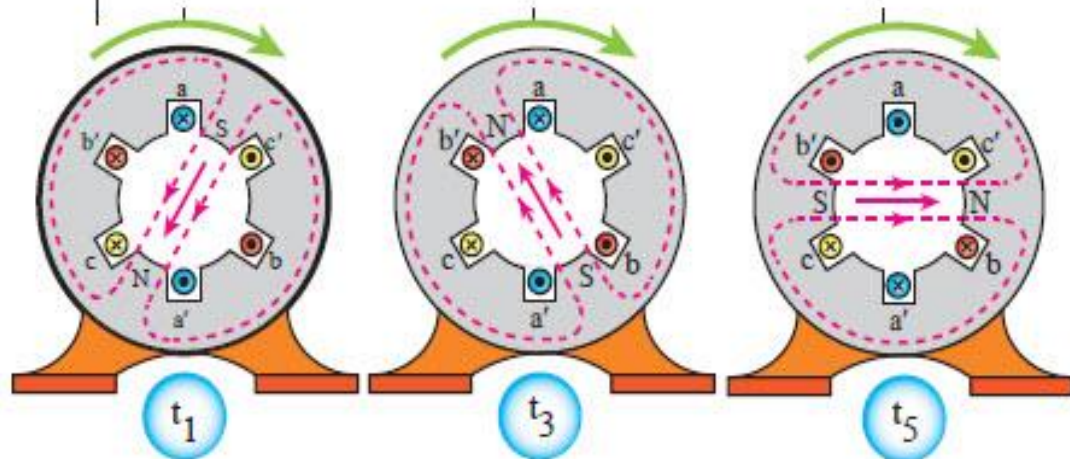
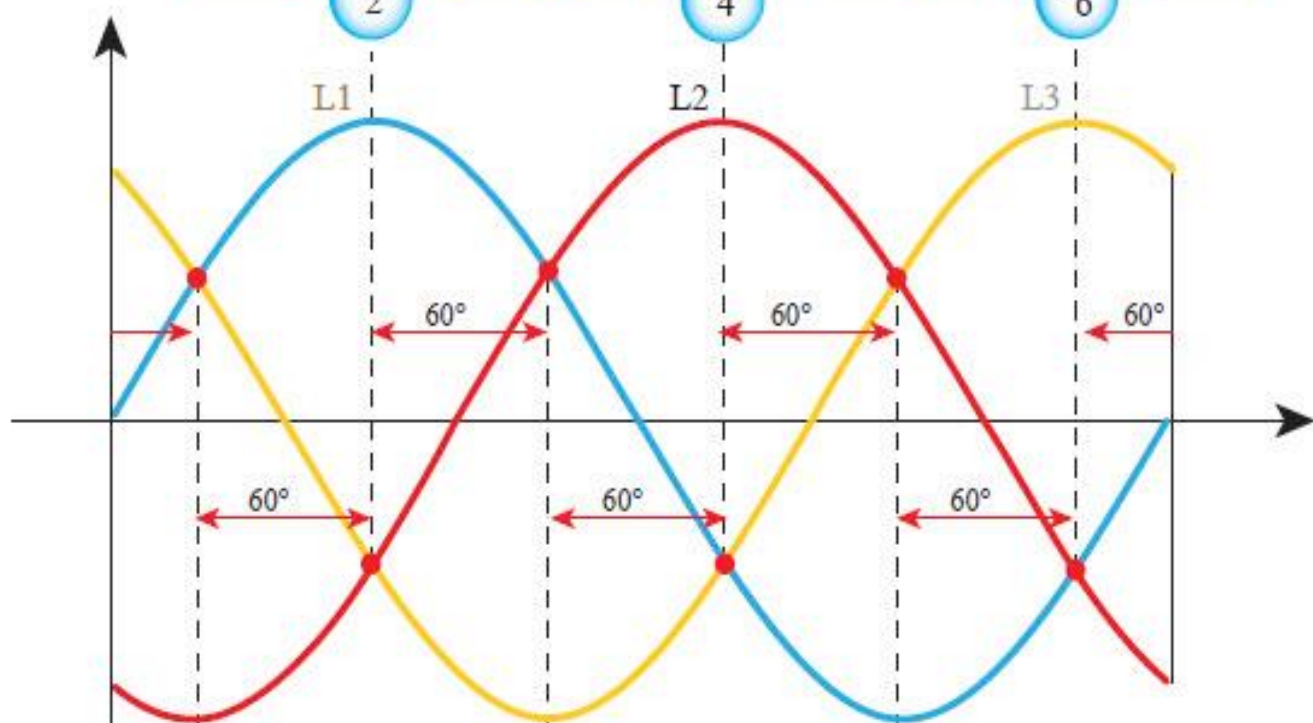
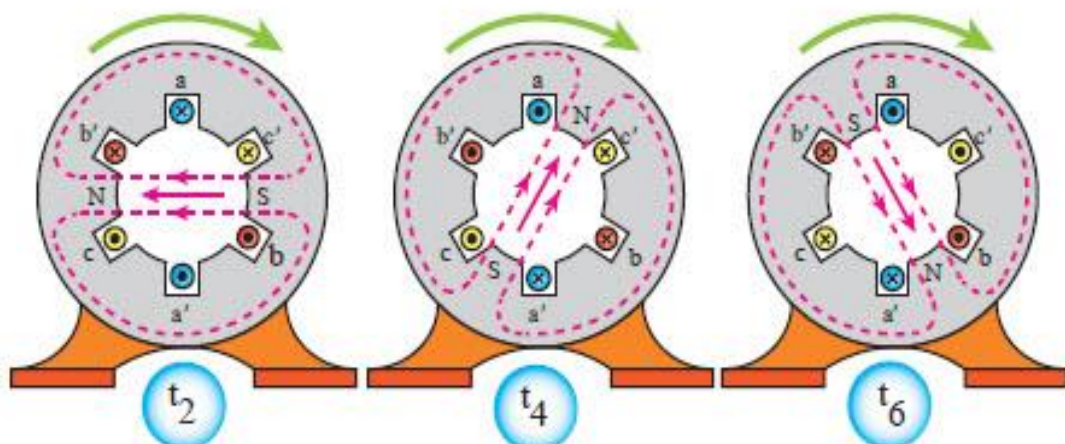


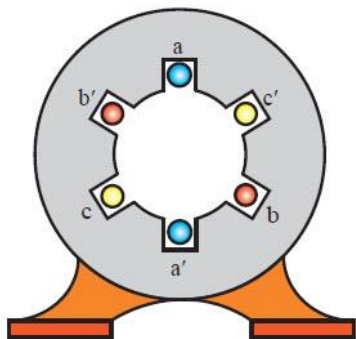
جهت جریان مثبت



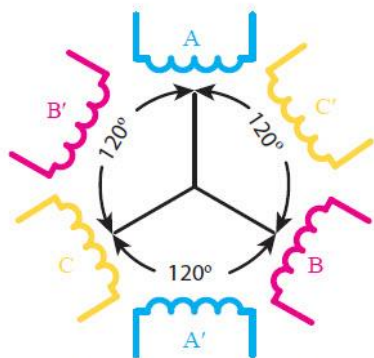
جهت جریان منفی



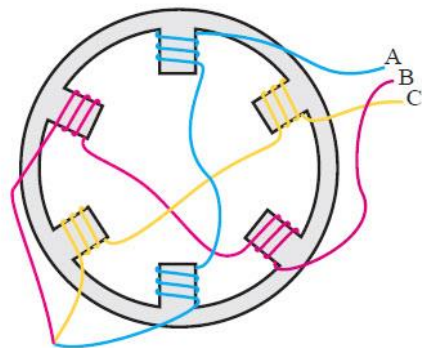




ج) شمای تک حلقه سیم‌بندی ماشین القایی با سیم پیچ گسترده بر اساس موقعیت مکانی



ب) نمایش کلاف‌ها بر اساس موقعیت مکانی



الف) شمای واقعی با ماشین القایی با سیم پیچ متمرکز



د) شکل واقعی ماشین القایی سیم پیچ متمرکز مدل آزمایشگاهی

$$n_s = \frac{120 \times f}{P} \quad (3-2)$$

در رابطه (۳-۲) :

n_s سرعت میدان دوار بر حسب RPM

f فرکانس شبکه برق بر حسب Hz

P تعداد قطب‌های سیم‌بندی ماشین القایی

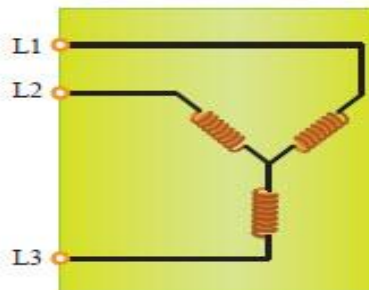
به یاد داشته باشید که فرکانس در شبکه های برق ثابت است در نتیجه حداکثر سرعت میدان دوار در ماشین القایی دو قطبی ایجاد می‌شود.

مثال : سرعت میدان دوار یک ماشین ۲ قطبی در شبکه برق

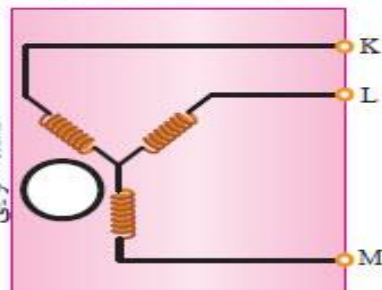
ایران با فرکانس (۵۰ Hz) چقدر است؟

$$n_s = \frac{120 \times f}{P} = \frac{120 \times 50}{2} = 3000 \text{ RPM}$$

شباهت مدار موتور القای به ترانس

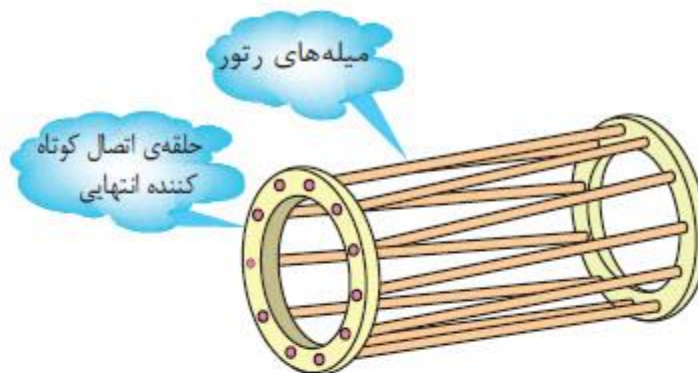


استاتور



رتور

مدار الکتریکی (بایین) و جعبه ترمینال (بالا) موتور القایی با رتور سیم پیچی شده



ساختمان رتور قفسی (سمت راست) رتور کامل با معرفی اجزای آن (سمت چپ)

۸-۳- لغزش در ماشین‌های القایی

در ماشین القایی به اختلاف سرعت رتور (n_r) با سرعت میدان دوار (n_s) سرعت لغزش می‌گویند. و آن را با رابطه (۳-۳) نشان می‌دهند.

$$\Delta n = n_s - n_r \quad (3-3)$$

از آنجا که سرعت رتور متغیر است لذا سرعت لغزش هم به تناسب آن تغییر می‌کند. نسبت سرعت لغزش به سرعت میدان دوار را لغزش می‌گویند و آن را با S نمایش می‌دهند.

$$S = \frac{\Delta n}{n_s} \quad (3-4)$$

$$S = \frac{n_s - n_r}{n_s} \quad (3-5)$$

معمولاً لغزش را در ماشین‌های القایی به صورت درصد نمایش می‌دهند و آن را از رابطه زیر محاسبه می‌کنند.

$$\% S = \frac{n_s - n_r}{n_s} \times 100$$

مثال رتور موتور القایی چهار قطب در فرکانس ۵۰ HZ

با سرعت ۱۴۵۰ RPM می‌چرخد مطلوب است. سرعت لغزش و لغزش این موتور القایی :

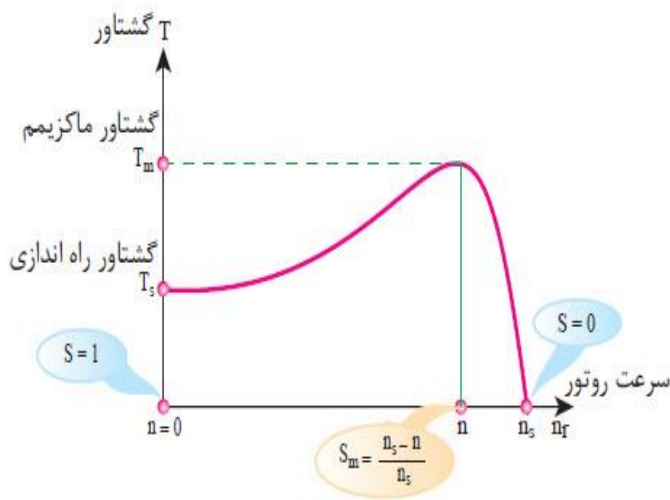
$$n_s = \frac{120 \cdot f}{P} = \frac{120 \times 50}{4} = 1500 \text{ RPM}$$

$$\Delta n = n_s - n_r = 1500 - 1450 = 50 \text{ RPM}$$

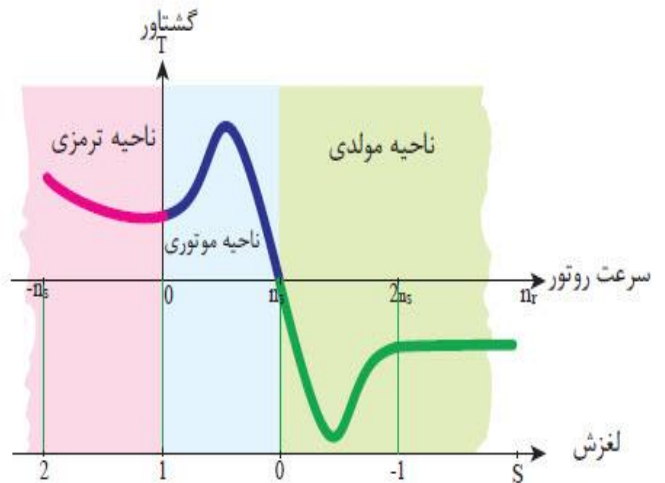
$$S = \frac{\Delta n}{n_s} = \frac{50}{1500} = 0.03$$

$$0.03 \times 100 = 3\%$$

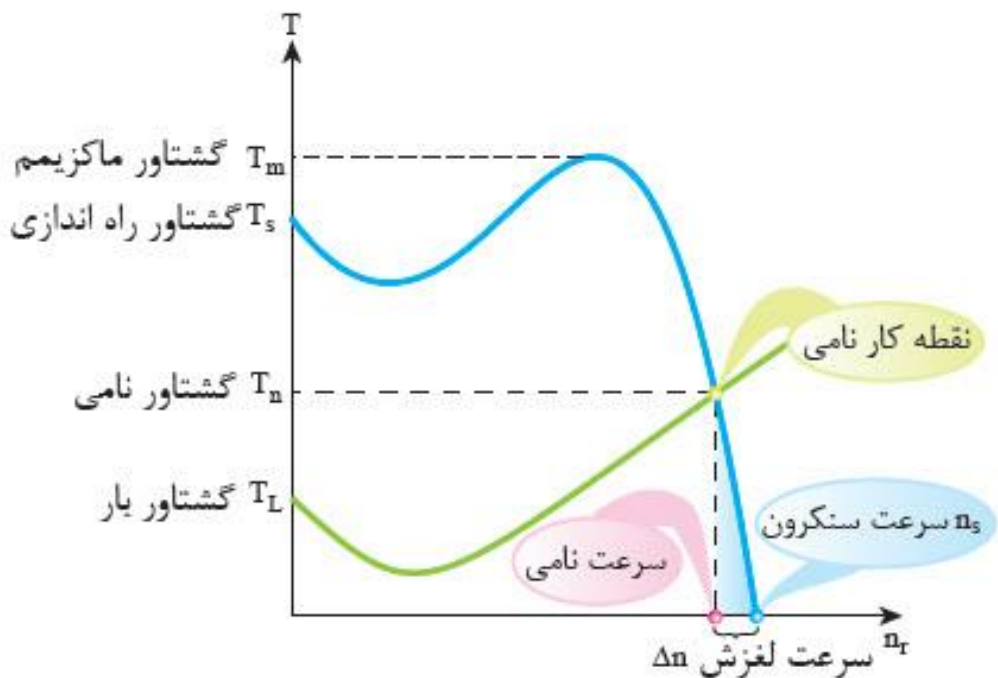
منحنی گشتاور دور موتور آسنکرون



منحنی گشتاور - دور موتور القایی



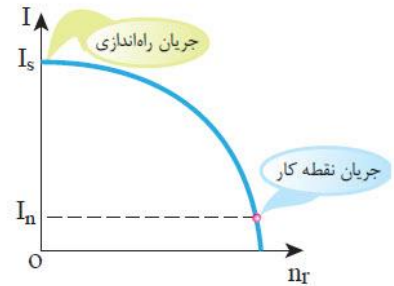
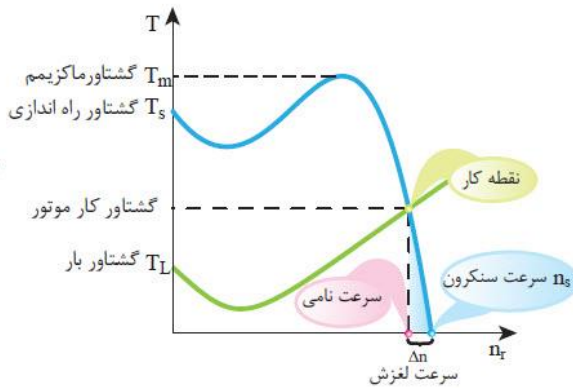
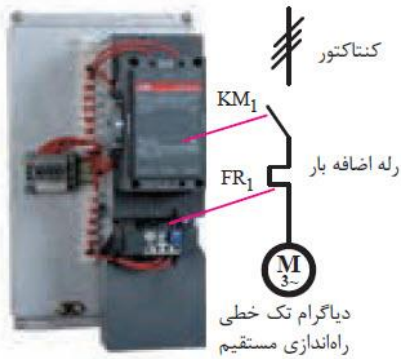
نواحی مختلف ماشین القایی



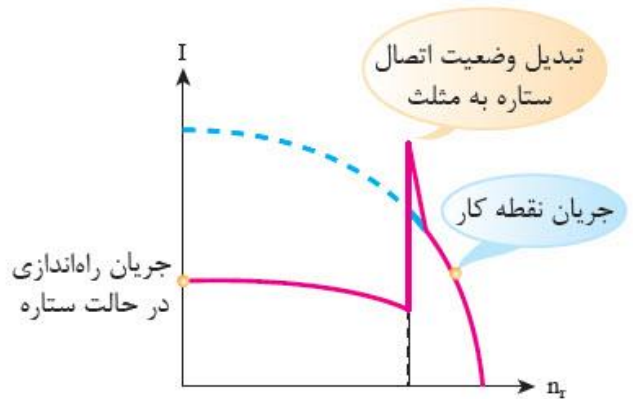
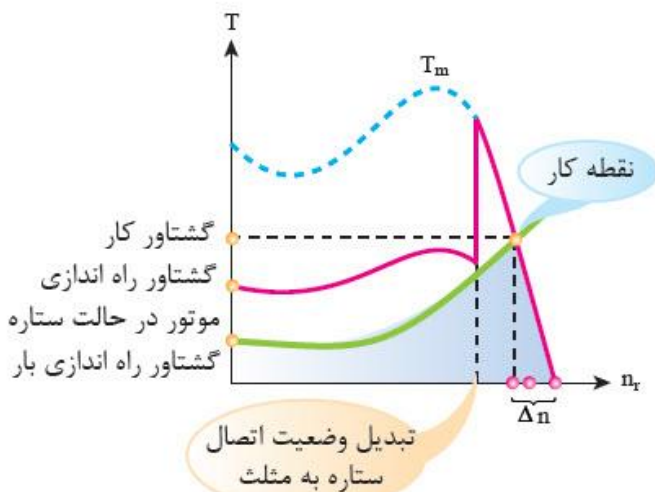
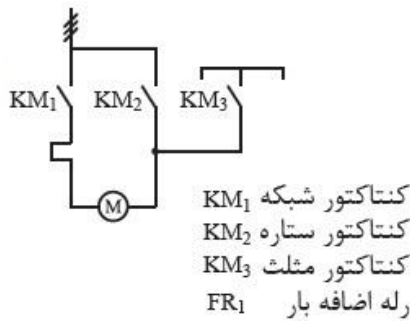
تقابل نمودار گشتاور - دور بار مکانیکی و گشتاور - دور موتور

القایی و تشکیل نقطه کار

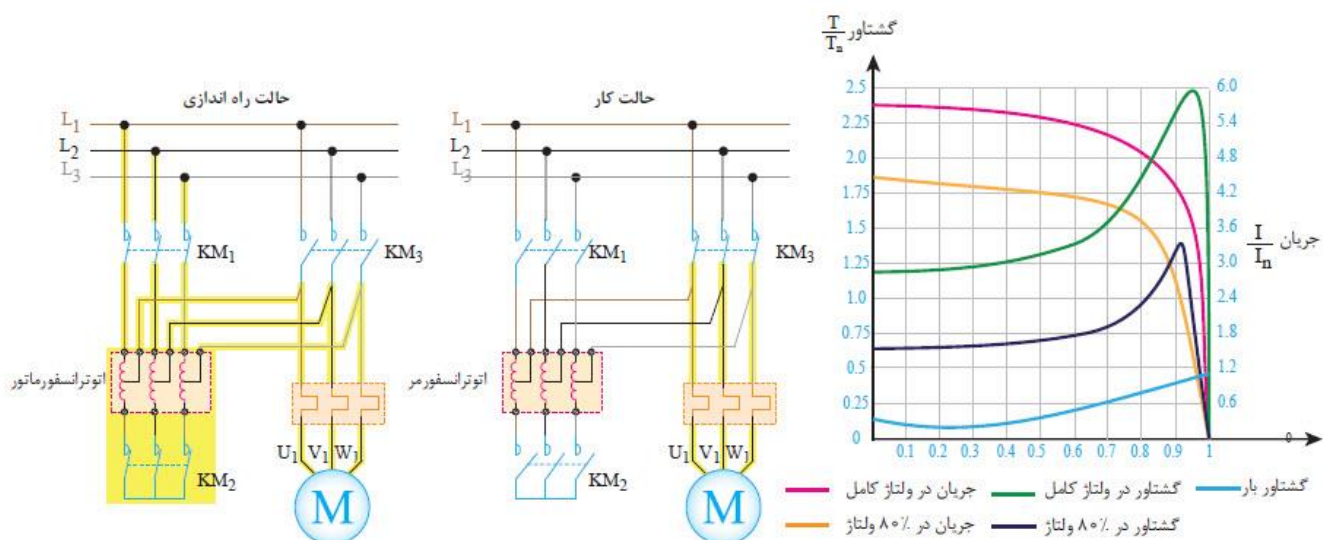
روشهای راه اندازی موتور آسنکرون



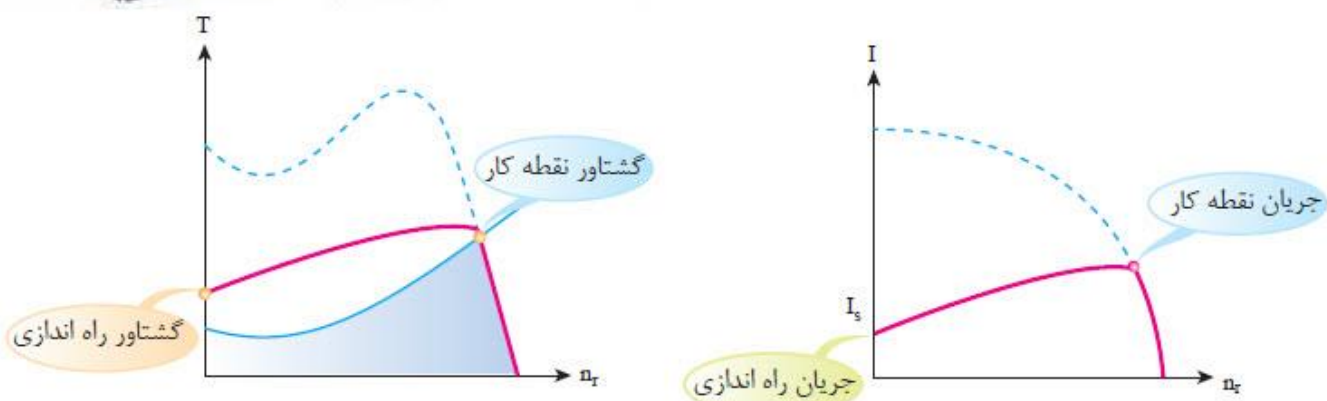
مدار قدرت و نمودارهای مربوط به راه اندازی مستقیم DOL



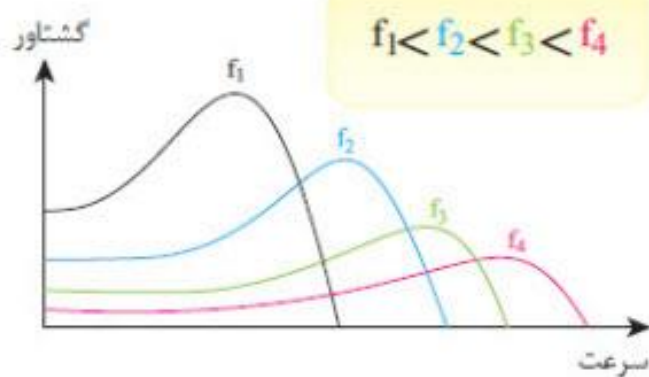
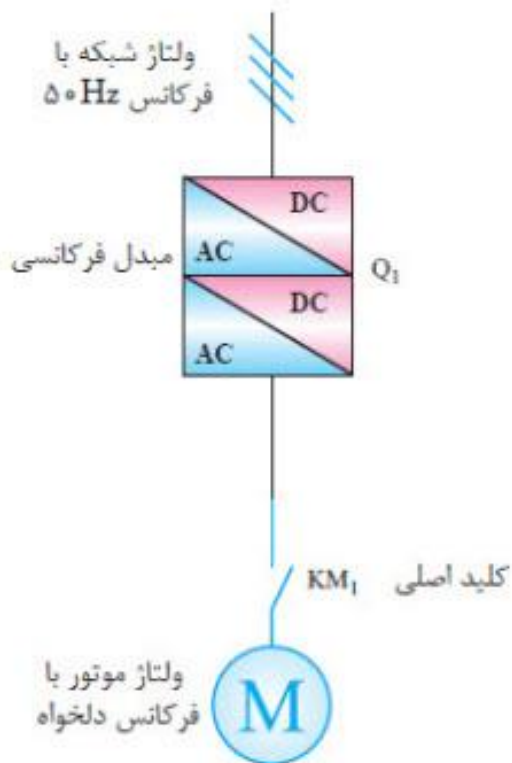
مدار قدرت و نمودارهای مربوط به راه اندازی ستاره - مثلث



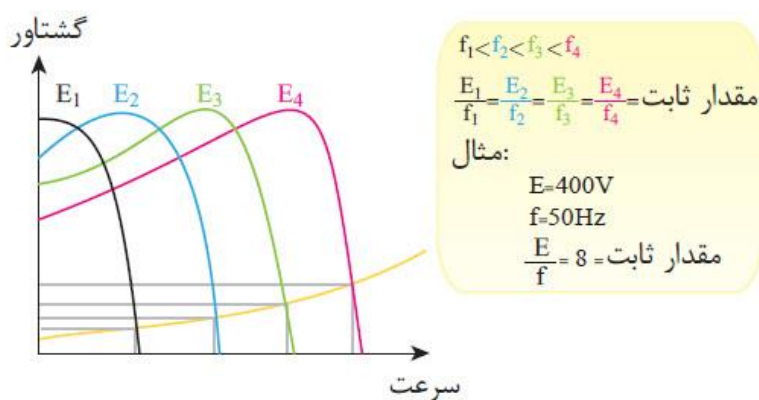
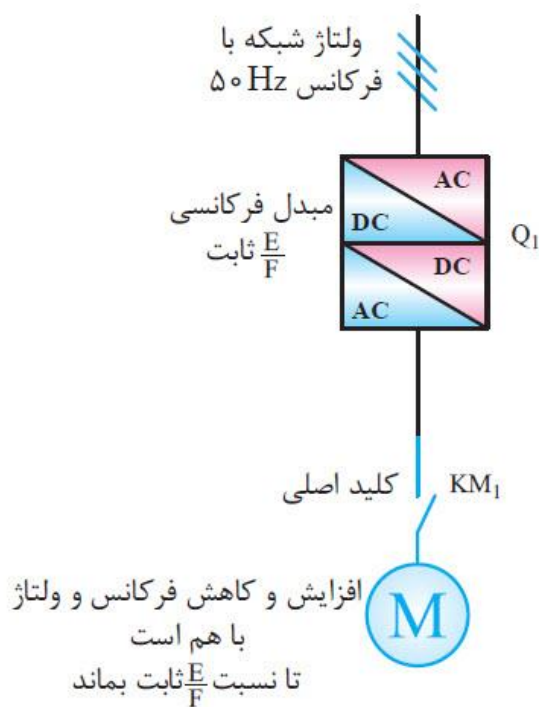
مدار قدرت راه اندازی موتور القایی توسط اتوترانسفورماتور و اثر کاهش جریان راه اندازی با استفاده از اتوترانسفورماتور در منحنی گشتاور-دور (الف) حالت راه اندازی ب) حالت کار



مدار راه اندازی نرم موتورهای القایی (بالا) - نمودار جریان راه اندازی نرم (سمت راست) و گشتاور-دور موتور القایی با راه انداز نرم (سمت چپ)



نمای تک خطی اتصال مبدل فرکانسی به موتور القایی (شکل سمت چپ) اثر تغییر فرکانس بر گشتاور و سرعت (شکل سمت راست)



نمای تک خطی اتصال مبدل فرکانسی / ولتاژ به موتور القایی (شکل سمت چپ) اثر تغییر فرکانس و ولتاژ همزمان بر منحنی گشتاور - دور (شکل سمت راست)



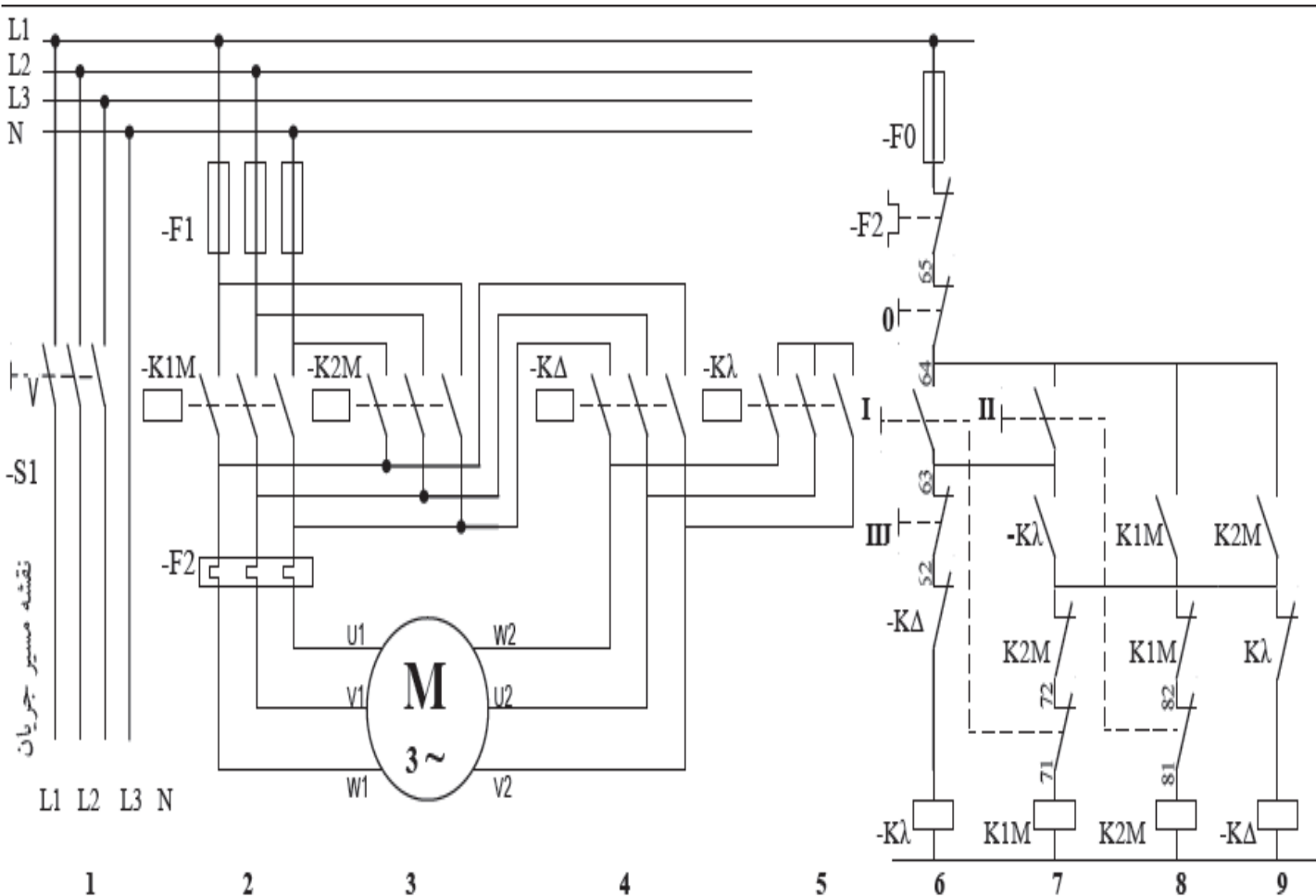
اینورتر چیست و چه کاربردی دارد؟

اینورتر (Inverter) یا مبدل برق دستگاه الکترونیکی است که جریان مستقیم (DC) را به جریان متناوب (AC) تبدیل می کند. جریان تبدیل شده می تواند بر اساس نیاز در هر ولتاژ و فرکانسی باشد

مزایای استفاده از اینورتر

- راه اندازی نرم و کاهش اساسی جریان راه اندازی به میزان ۷۰٪
- عدم تحمیل شوک الکتریکی به شبکه برق کارخانه در لحظه راه اندازی
- روشن و خاموش نمودن موتور بدون نیاز به قطع و وصل برق اصلی
- کاهش اساسی هزینه های تعمیر و نگهداری
- کاهش اساسی ارتعاشات و ضربه های مکانیکی
- حفاظت هوشمند الکتروموتور در مقابل قطعی فاز، اضافه بار و ...
- امکان انتخاب اقسام الکتریکی نظیر کلیدها و فیوزها در رنجهای پایین تر
- تغیر دهنده جهت دور به راحتی و بدون نیاز به کنتاکتور
- حفاظت موتور در مقابل افزایش ولتاژ و جلوگیری از آسیب دیدن موتور
- کاهش تعداد المانهای الکتریکی و سادگی مدار

مدار چپگرد راستگرد / ستاره مثلث



امکان کنترل و مانیتورینگ چندین اینورتر با یک HMI



RS-485

بررسی اینورتر از لحاظ صرفه جویی انرژی

فن ها و پمپ ها عمده ترین بارهاي موتورهاي الكتريكي هستند. اين ها از ادواتي نظير دمپر ها و يا شيرهاي خفه كن براي تنظيم دبي استفاده ميکنند. اما اين روش ها انرژي را تلف مي کنند



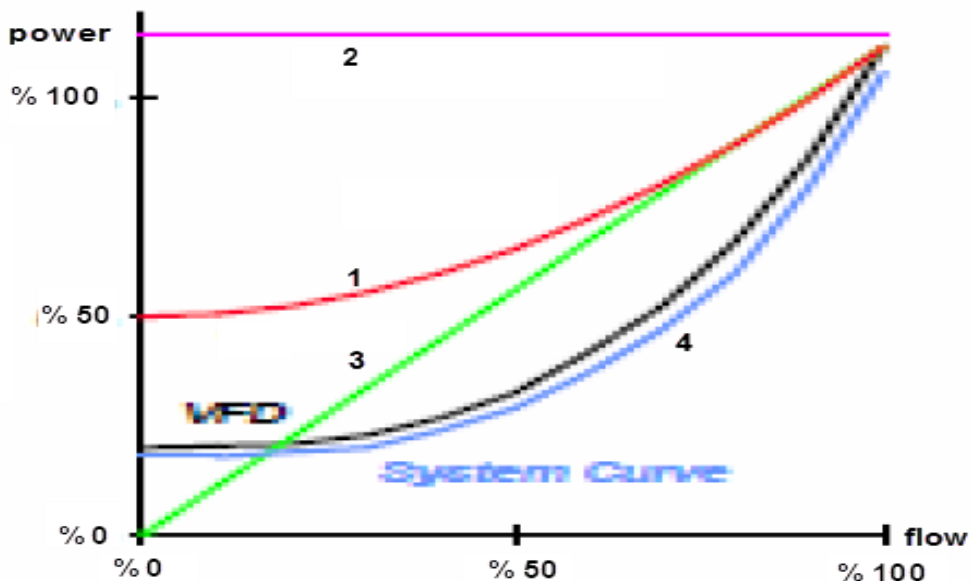
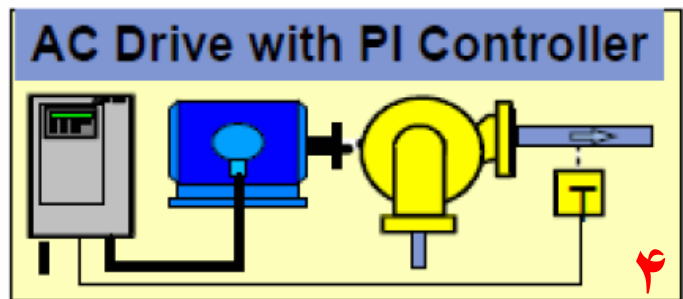
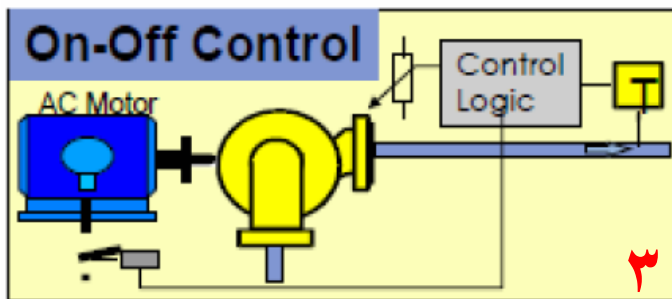
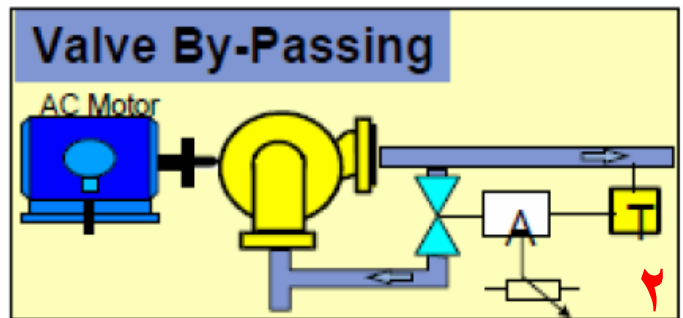
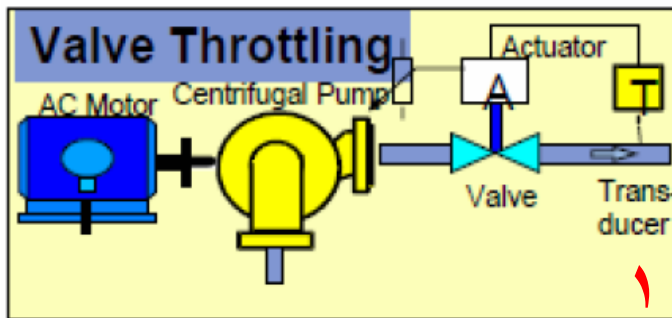
عملکرد اين تجهيزات را مي توان به راننده اتومبيلي تشبيه نمود که براي کاهش سرعت، در حالي که پدال گاز را تا آخر فشرده است، از پدال ترمز استفاده مي کند

انواع روش های کنترل جریان فلو در پمپ ها

ابتدا انواع روش های کنترلی در پمپ ها و فن های سانتریفوژ را مورد بررسی قرار میدهیم سپس برتری کنترل کننده الکترونیکی را نسبت دیگر کنترل کننده های مکانیکی مورد ارزیابی قرار میگیرد

انواع روش های کنترل جریان فلو در پمپ های سانتریفوژ

- ۱- کنترل با شیر دستی
- ۲- کنترل بایپاس
- ۳- کنترل روشن و خاموش
- ۴- کنترل کننده دور الکترونیکی



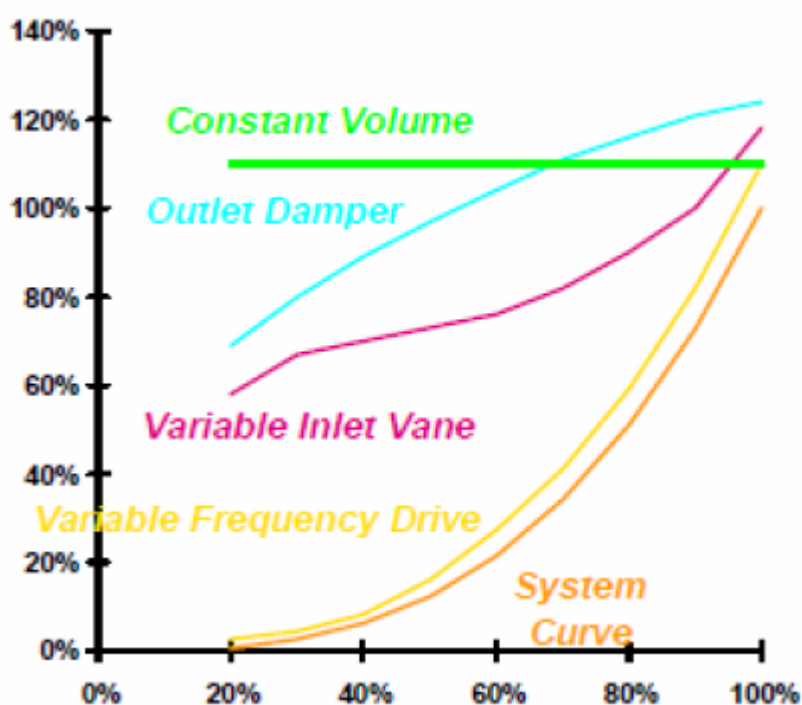
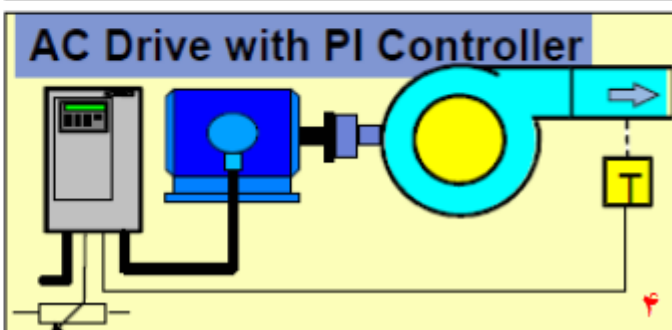
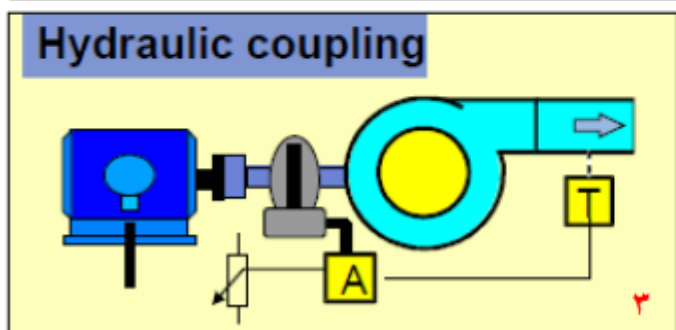
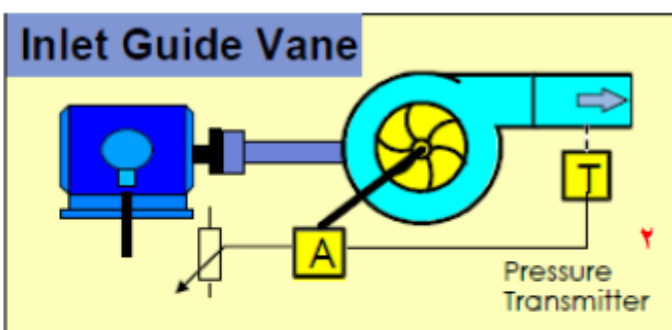
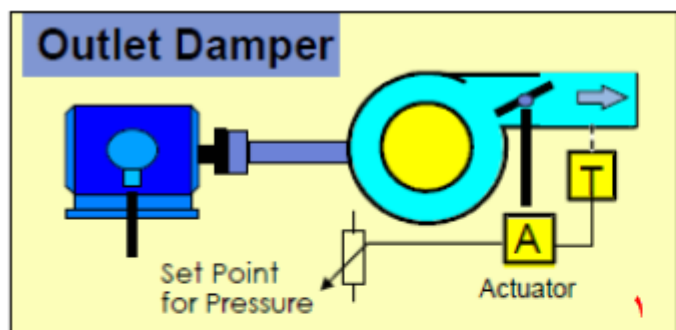
انواع روش هاي كنترل جريان هوا در فن هاي سانترفوژ

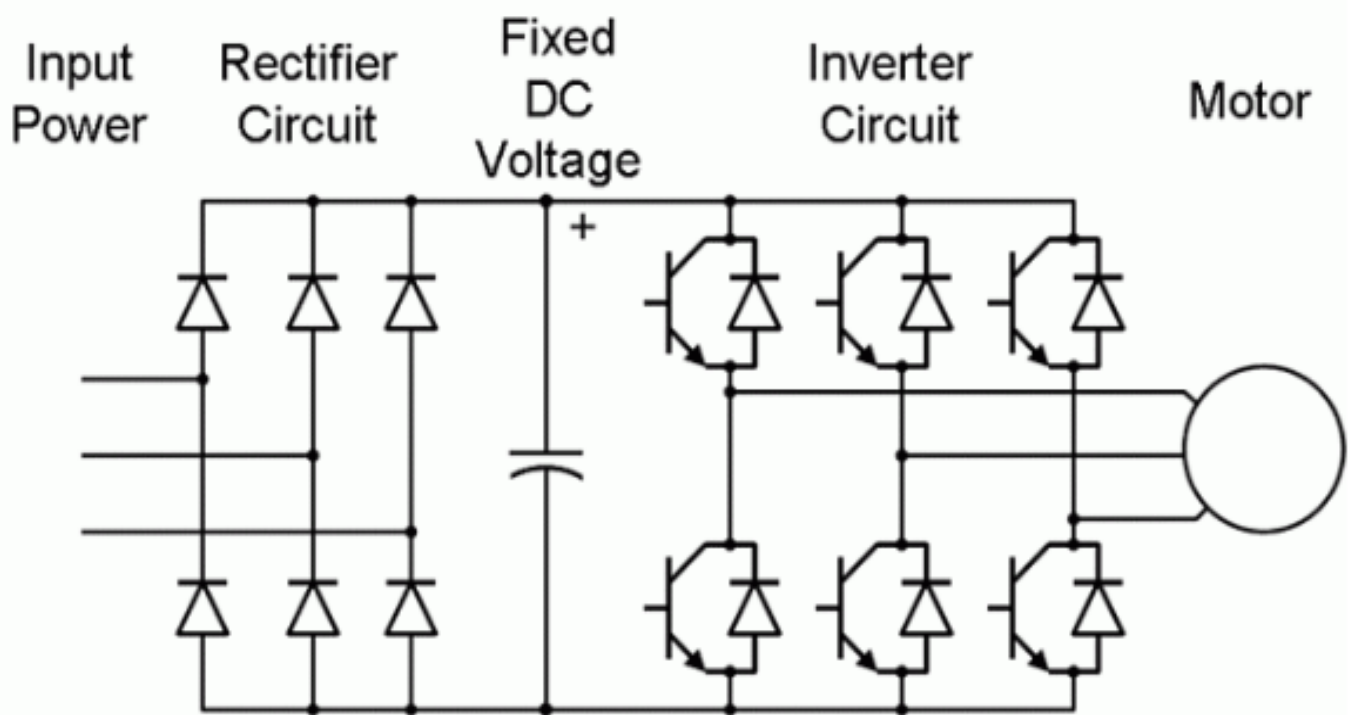
۱- كنترل دمپر خروجي

۲- كنترل پروانه فن

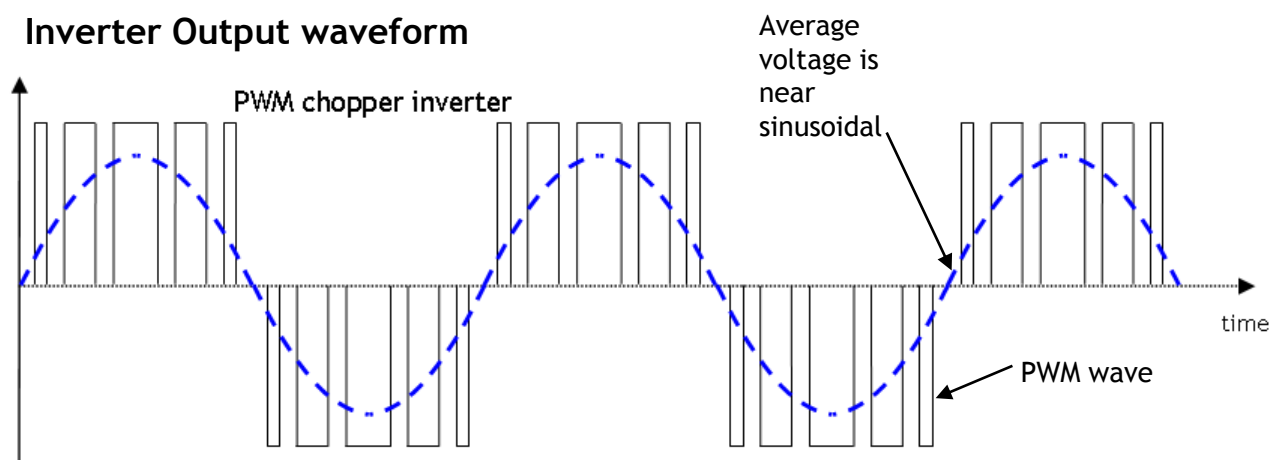
۳- كنترل هيدرو ليكي

۴- كنترل الكترونيكي





Inverter Output waveform



PWM = Pulse Width Modulation

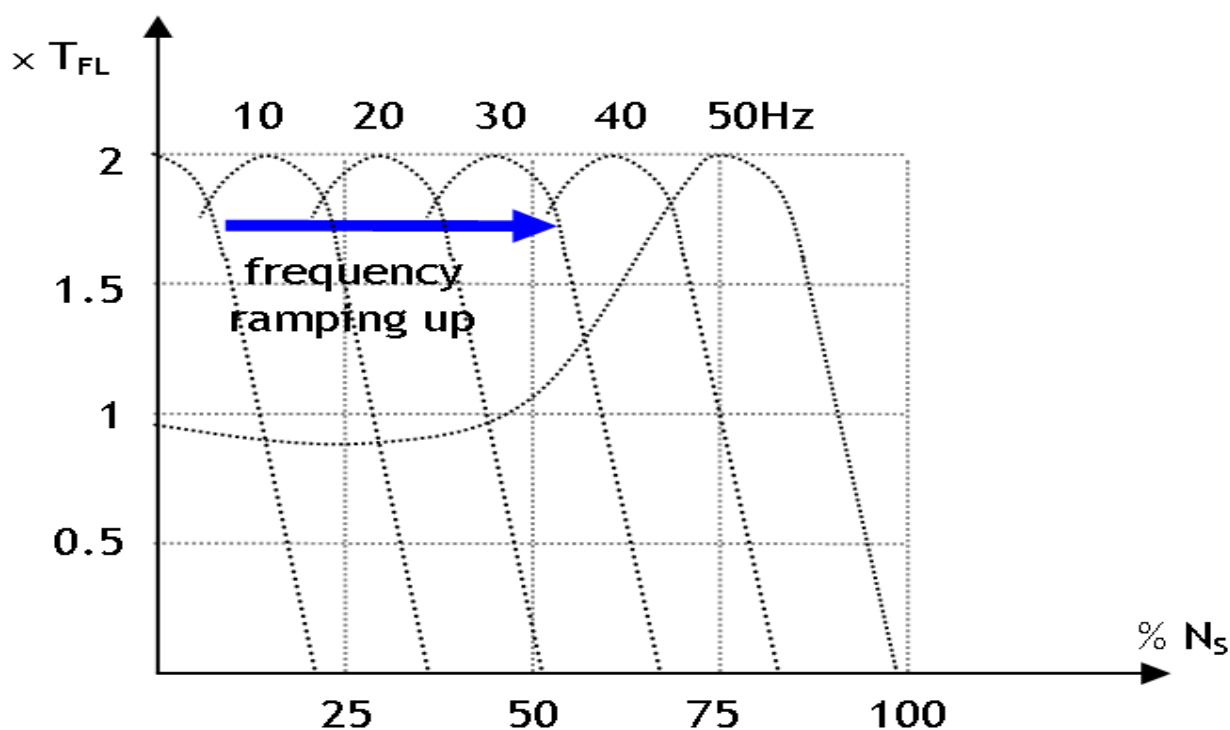
Average voltage is sinusoidal

Filter is needed to remove harmonics due to chopping

از اینورترها در سه ناحیه استفاده می گردد :

- ۱- فعالیتهای گشتاور ثابت مثل میکسرها , اکسترودرها , نوارهای نقاله و . . .
 - ۲- فعالیتهای توان ثابت مثل کشش و دستگاههای ماشینی.
 - ۳- فعالیتهای گشتاور متغیر مثل فن و پمپ.
- در پمپها و فنها میزان دبی با سرعت موتور متناسب است. اما توان مصرفی با مکعب سرعت متناسب دارد. مثلاً اگر دور موتور به میزان ۵۰٪ کاهش یابد آنگاه توان مصرفی لازم ۱۲,۵٪ خواهد بود و این به مفهوم ۸۷,۵٪ صرفه جویی در انرژی است.

منحنی گشتاور / دور برای فرکانسهای مختلف :



راهنمای اینورتر

IG5A



توضیح کد و لیبل روی اینورتر

intact.



- ←..... Inverter Type
- ←..... Input power rating
- ←..... Output Power Rating
- ←..... Rated output current, frequency
- ←..... Inverter Capacity (kVA)
- ←..... Bar Code and Serial Number

SV		075		iG5A		-		2		(N)	
LS Inverter	Motor rating		Series Name				Input power		Keypad		
	004	0.4 [kW]	iG5A		1		Single Phase 200~230[V]		NON loader I/O Products		
	008	0.75 [kW]									
	015	1.5 [kW]									
	022	2.2 [kW]			2		Three Phase 200~230[V]				
	037	3.7 [kW]									
	040	4.0 [kW]									
	055	5.5 [kW]									
	075	7.5 [kW]									
	110	11.0[kW]			4		Three Phase 380~480[V]				
	150	15.0[kW]									
	185	18.5[kW]									
	220	22.0[kW]									

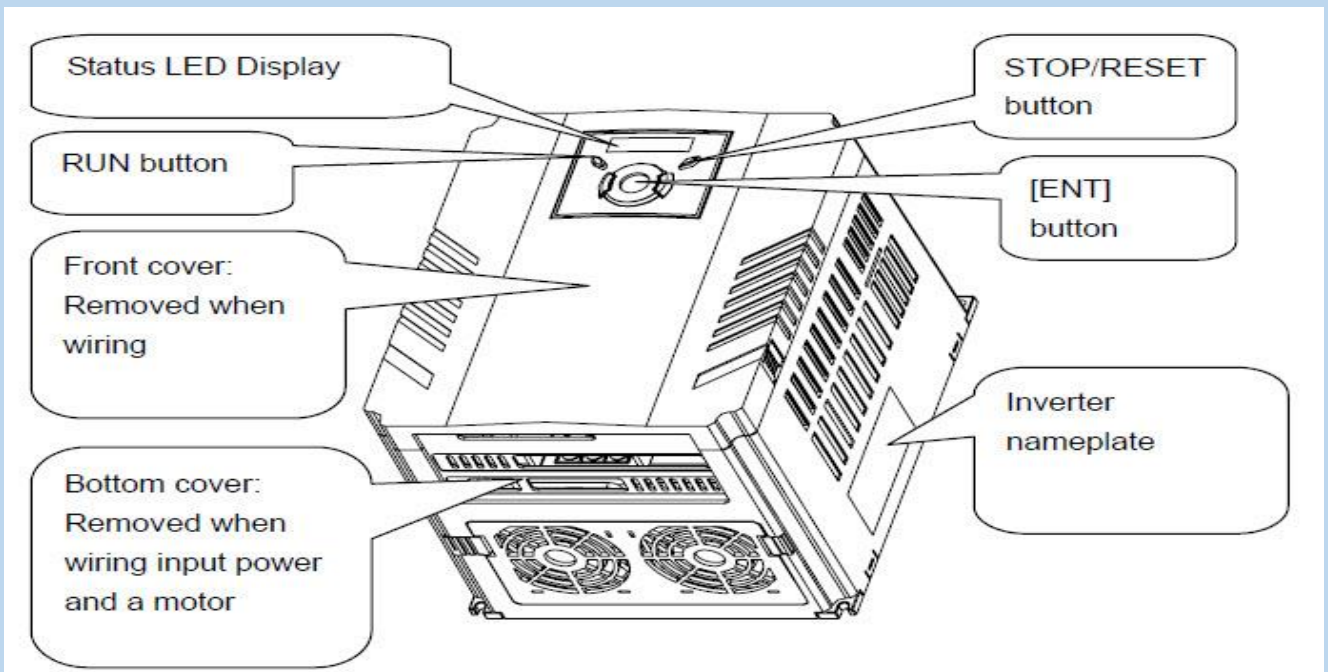
اجزا اینورتر IG5A

کی پد

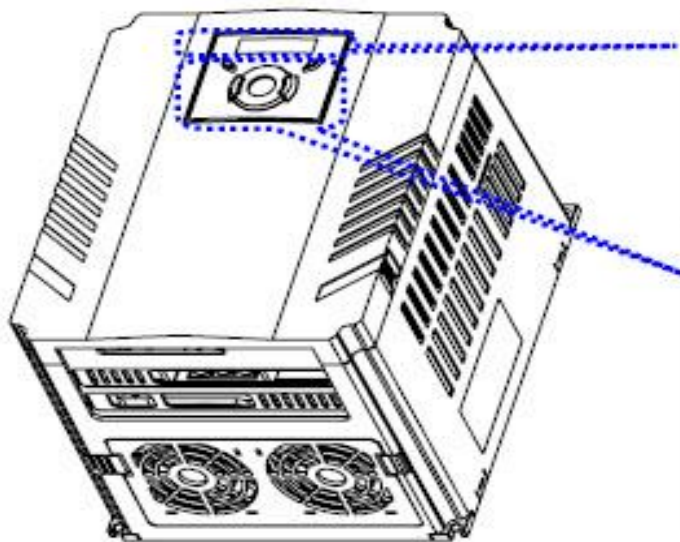


ترمینالهای قدرت

ترمینالهای فرمان



کی پٹ :



Display

- SET/RUN LED
- FWD/REV LED
- 7 Segment LED

Key

- RUN
- STOP/RESET
- Up/Down
- Left/Right
- Enter [ENT]

Display

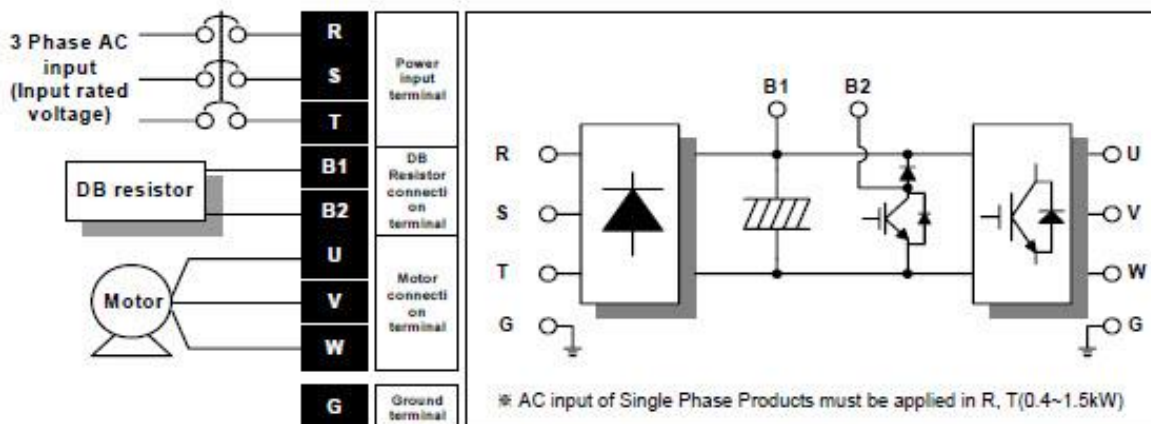
FWD	Lit during forward run	Blinks when a fault occurs
REV	Lit during reverse run	
RUN	Lit during Operation	
SET	Lit during parameter setting	
7 segment	Displays operation status and parameter information	

Keys

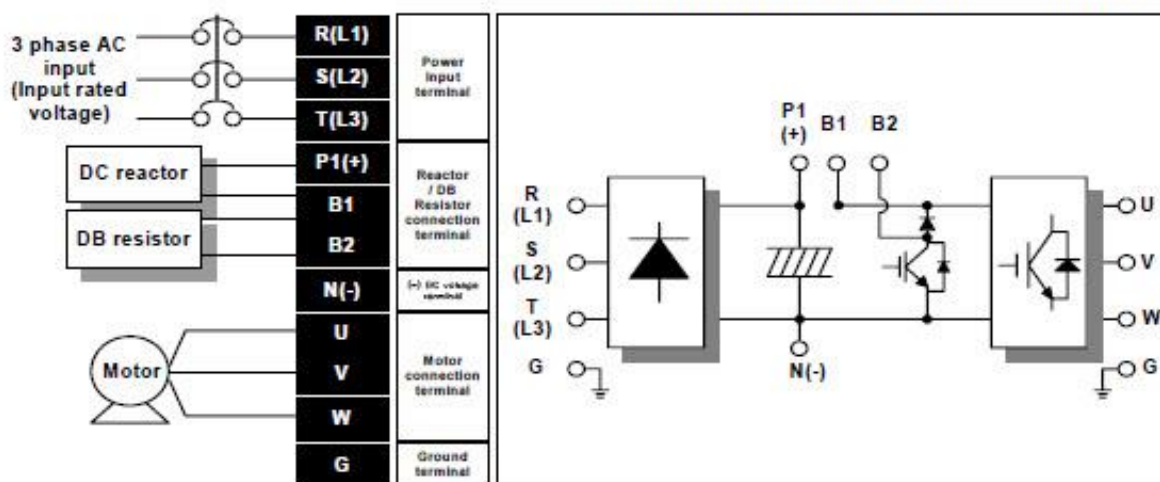
RUN	Run command	
STOP/RESET	STOP: Stop command during operation, RESET: Reset command when fault occurs.	
▲	UP	Used to scroll through codes or increase parameter value
▼	Down	Used to scroll through codes or decrease parameter value
◀	Left	Used to jump to other parameter groups or move a cursor to the left to change the parameter value
▶	Right	Used to jump to other parameter groups or move cursor to the right to change the parameter value
●	ENT	Used to set the parameter value or save the changed parameter value

ترمینالهای قدرت :

* Power terminal wiring (0.4 ~ 7.5kW)



* Power terminal wiring (11.0 ~ 22.0kW)

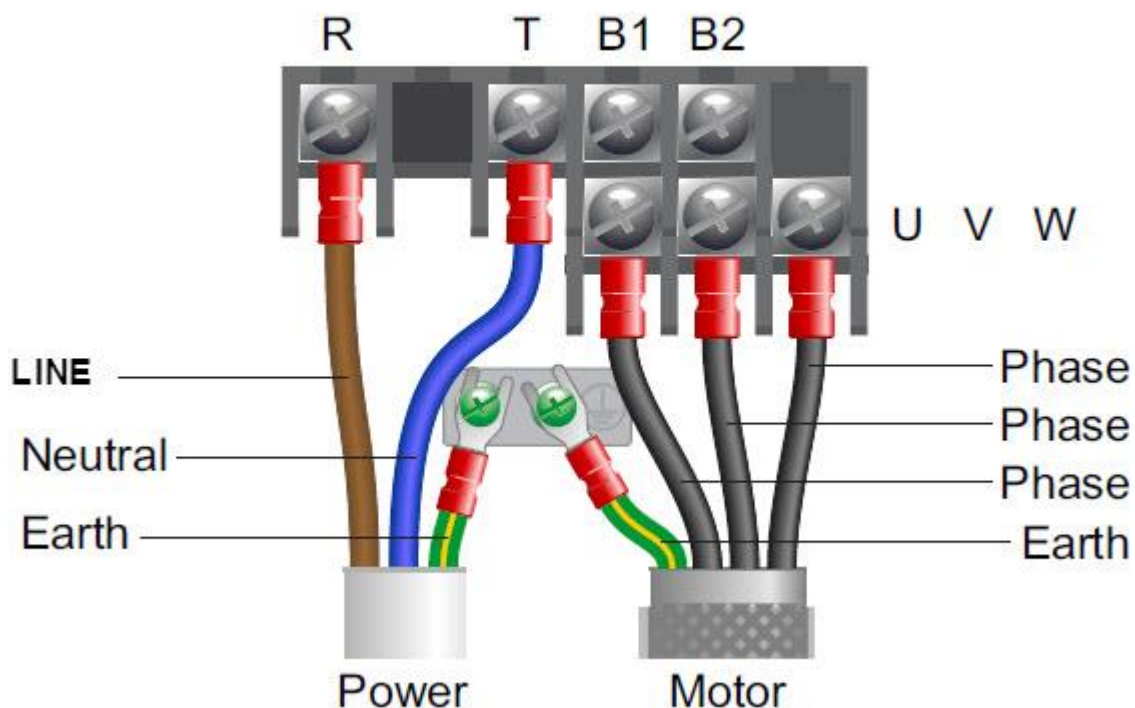


Specifications for power terminal block wiring

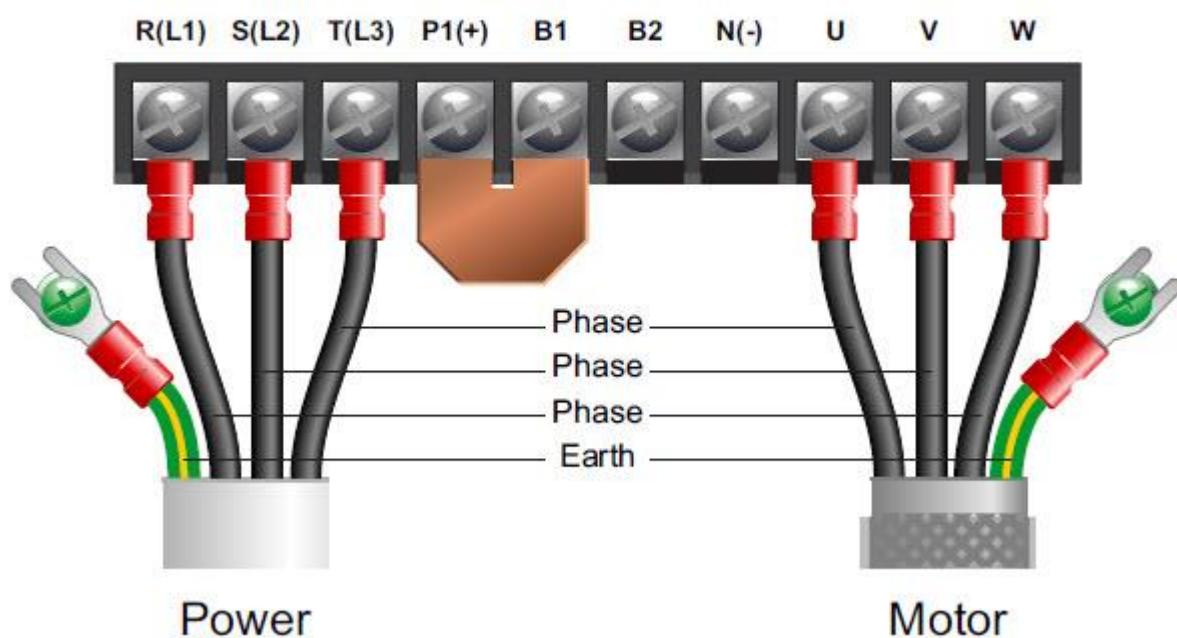
0.4 ~ 0.75kW(Single Phase)	0.4 ~ 1.5kW(Three Phase)	1.5kW(Single Phase)
R S T B1 B2 U V W	R S T B1 B2 U V W	R T B1 B2 U V W
		2.2 ~ 4.0kW(Three Phase)
		R S T B1 B2 U V W
5.5 ~ 7.5kW(Three Phase)	11.0 ~ 22.0kW(Three Phase)	
B1 B2 U V W R S T	R(L1) S(L2) T(L3) P1(+) B1 B2 N(-) U V W	

ترمینالهای قدرت :

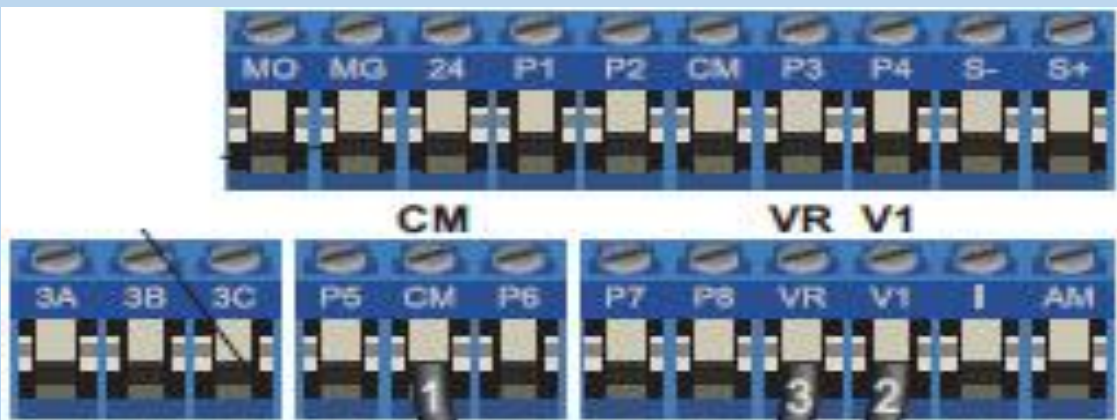
Power and Motor Connections (Single Phase)



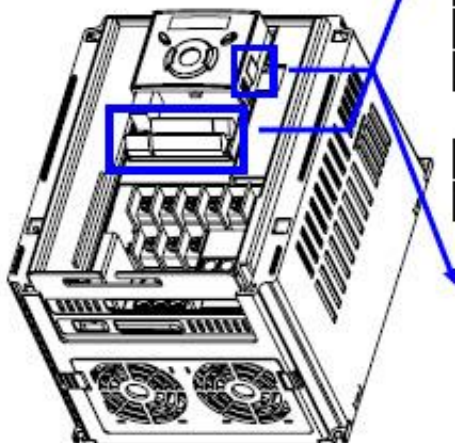
Power and Motor Connections (Three Phase)



ترمینالهای کنترل :



T/M	Description	
MO	Multi-function open collector output	
MG	MO Common	
24	24V output	
P1	MF input terminal (factory setting)	FX: Forward run
P2		RX: Reverse run
CM	Input signal common	
P3	MF input terminal (factory setting)	BX: Emergency stop
P4		RST: Trip reset
P5		JOG: Jog operation
CM	Input signal common	
P6	MF input terminal (factory setting)	Multi-step freq.-Low
P7		Multi-step freq.-Middle
P8		Multi-step freq.-High
VR	10V power supply for potentiometer	
V1	Freq. Setting Voltage signal input: 0~10V	
I	Freq. Setting Current signal input: 0~20mA	
AM	Multi-function analog output signal: 0~10V	
3A	Multi-function relay output terminal	A contact output
3B		B contact output
3C		A/B contact common
S+	RS485 communication terminal	
S-		



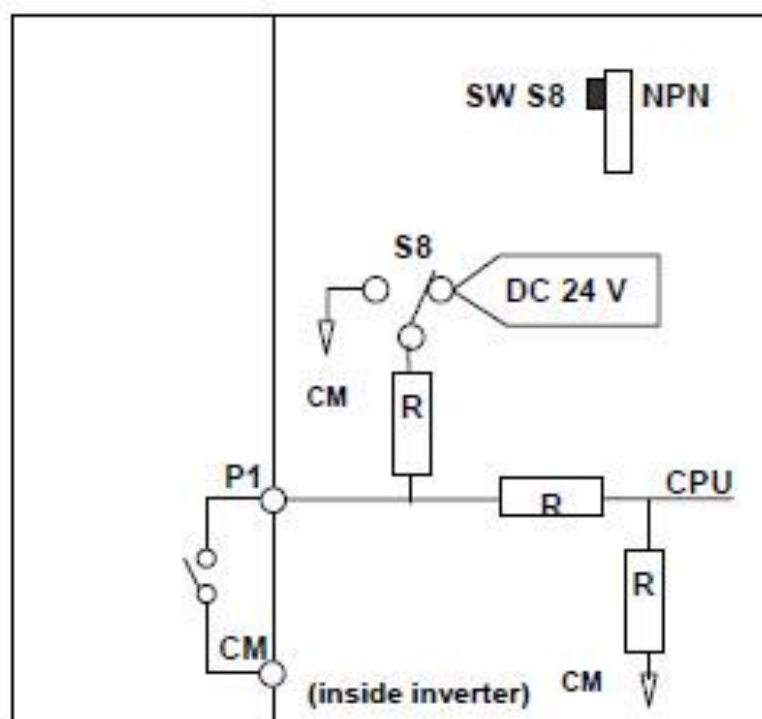
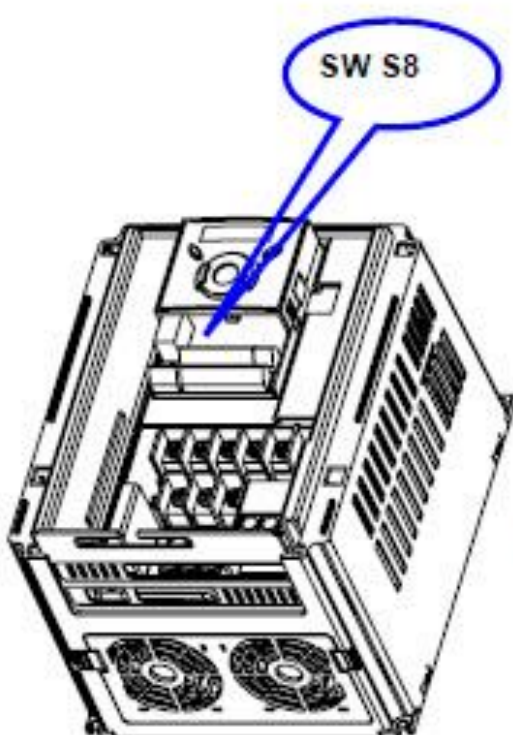
※ For connection to Remote Option or
parameter copying

ترمینالهای کنترل :

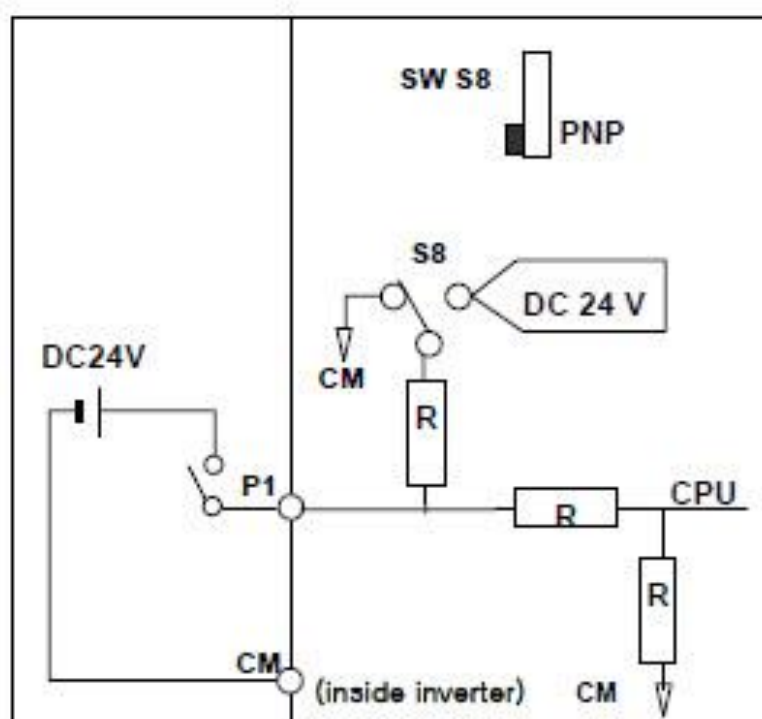
T/M	Terminal Description	Wire size[mm ²]		Screw size	Torque [Nm]	Specification
		single wire	Stranded			
P1~P8	Multi-function input T/M 1-8	1.0	1.5	M2.6	0.4	
CM	Common Terminal	1.0	1.5	M2.6	0.4	
VR	Power supply for external potentiometer	1.0	1.5	M2.6	0.4	Output voltage: 12V Max output current: 10mA Potentiometer: 1 ~ 5kohm
V1	Input terminal for Voltage operation	1.0	1.5	M2.6	0.4	Max input voltage: -12V ~ +12V input
I	Input terminal for Current operation	1.0	1.5	M2.6	0.4	0 ~ 20mA input Internal resistor: 250 ohm
AM	Multi-function analog output terminal	1.0	1.5	M2.6	0.4	Max output voltage: 11[V] Max output current: 10mA
MO	Multi-function terminal for open collector	1.0	1.5	M2.6	0.4	Below DC 26V, 100mA
MG	Ground terminal for external power supply	1.0	1.5	M2.6	0.4	
24	24V External Power Supply	1.0	1.5	M2.6	0.4	Max output current: 100mA
3A	Multi-function relay output A contact	1.0	1.5	M2.6	0.4	Below AC 250V, 1A
3B	Multi-function relay output B contact	1.0	1.5	M2.6	0.4	Below DC 30V, 1A
3C	Common for Multi-function relays	1.0	1.5	M2.6	0.4	

PNP/NPN selection and connector for communication option

1. When using DC 24V inside inverter [NPN]



2. When using external DC 24V [PNP]



3.1 Connection of peripheral devices to the inverter

The following devices are required to operate the inverter. Proper peripheral devices must be selected and correct connections made to ensure proper operation. An incorrectly applied or installed inverter can result in system malfunction or reduction in product life as well as component damage. You must read and understand this manual thoroughly before proceeding.

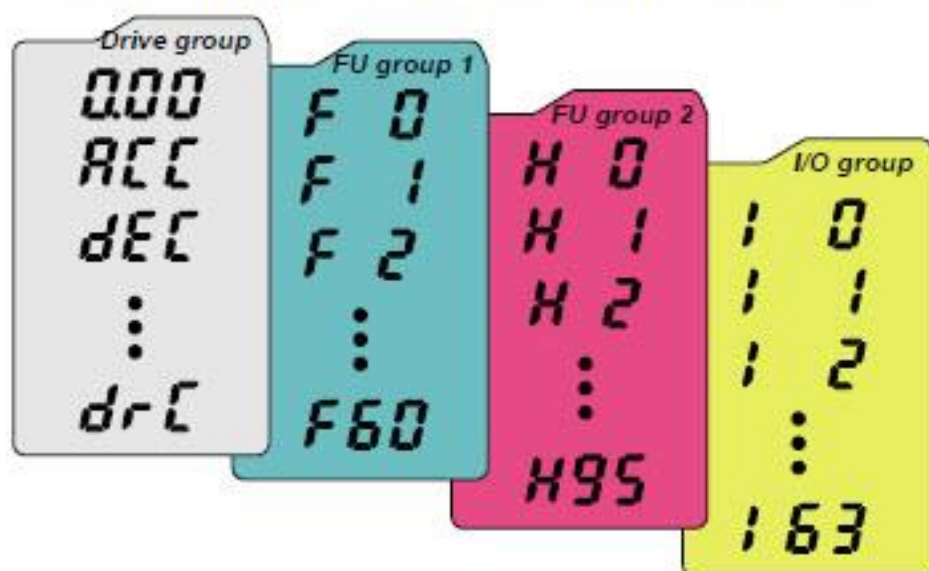
	→	AC Source Supply	Use the power supply within the permissible range of inverter input power rating (Refer to Page 13-1).
	→	MCCB or Earth leakage circuit breaker (ELB)	Select circuit breakers with care. A large inrush current may flow in the inverter at power on.
	→	Magnetic Contactor	Install it if necessary. When installed, do not use it for the purpose of starting or stopping. Otherwise, it could lead to reduction in product life.
	→	AC and DC Reactors ^{notice1}	The AC reactors must be used when the power factor is to be improved or the inverter is installed near a large power supply system (more than 10 times of inverter capacity and wiring distance within 10m).
	→	Installation and wiring	To operate the inverter with high performance for a long time, install the inverter in a proper place in the correct direction and with proper clearances. Incorrect terminal wiring could result in the equipment damage.
	→	To motor	Do not connect a power factor capacitor, surge suppressor or radio noise filter to the output side of the inverter.

Notice1) Terminal block for DC reactor is composed in the more than 11kw capacity

تنظیم پارامترهای اینورتر:

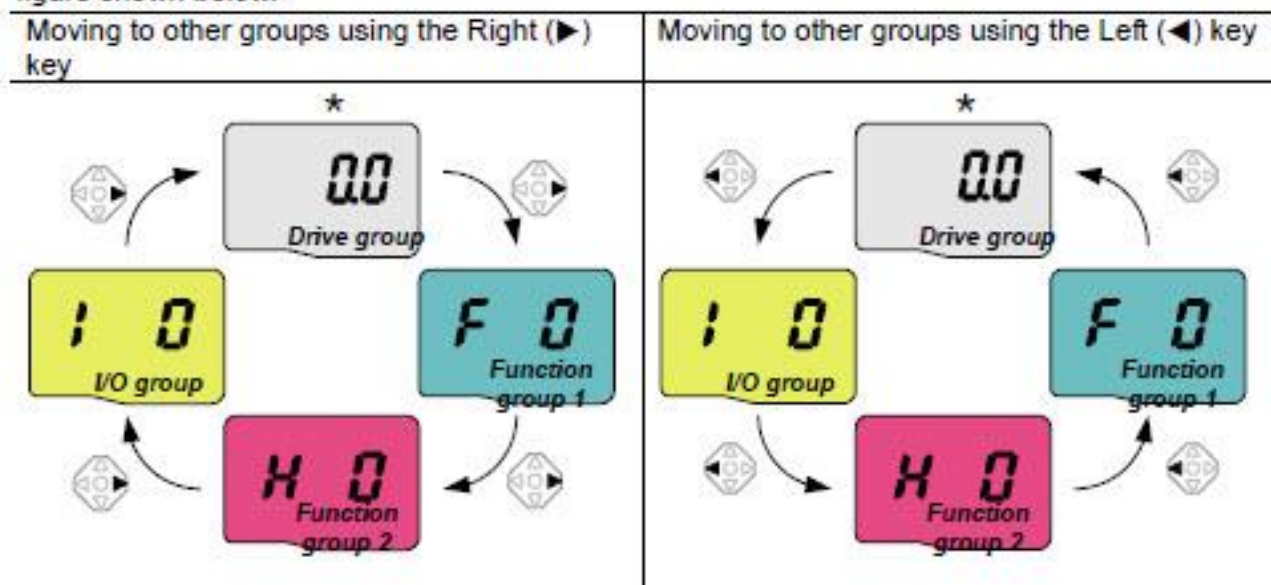
4.3 Moving to other groups

- There are 4 different parameter groups in SV- iG5A series as shown below.



Drive group	Basic parameters necessary for the inverter to run. Parameters such as Target frequency, Accel/Decel time settable.
Function group 1	Basic function parameters to adjust output frequency and voltage.
Function group 2	Advanced function parameters to set parameters for such as PID Operation and second motor operation.
I/O (Input/Output) group	Parameters necessary to make up a sequence using Multi-function input/output terminal.

- Moving to other parameter groups is only available in the first code of each group as the figure shown below.



تنظیم پارامترهای اینورتر:

How to change the codes in a group

• Code change in Drive group

	1		- In the 1 st code in Drive group "0.00", press the Up (▲) key once.
	2		- The 2 nd code in Drive group "ACC" is displayed. - Press the Up (▲) key once.
	3		- The 3 rd code "dEC" in Drive group is displayed. - Keep pressing the Up (▲) key until the last code appears.
	4		- The last code in Drive group "drC" is displayed. - Press the Up (▲) key again.
	5		- Return to the first code of Drive group.
♣ Use Down (▼) key for the opposite order.			

• Code jump

When moving from the "F 0" to the "F 15" directly

	1		- Press the Ent (●) key in "F 0".
	2		- 1 (the code number of F1) is displayed. Use the Up (▲) key to set to 5.
	3		- "05" is displayed by pressing the Left (◀) key once to move the cursor to the left. The numeral having a cursor is displayed brighter. In this case, 0 is active. - Use the Up (▲) key to set to 1.
	4		- 15 is set. - Press the Ent (●) key once.
	5		- Moving to F 15 has been complete.

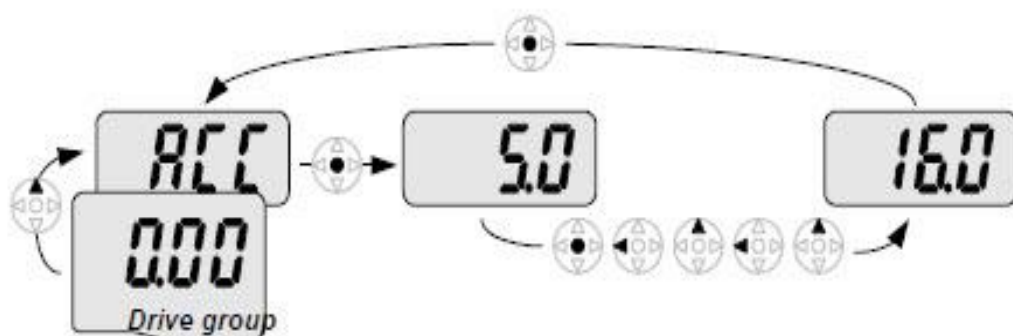
♣ Function group 2 and I/O group are settable with the same setting.

تنظیم پارامترهای اینورتر:

Parameter setting

● Changing parameter values in Drive Group

When changing ACC time from 5.0 sec to 16.0 sec



1		- In the first code "0.00", press the Up (▲) key once to go to the second code.
2		- ACC [Accel time] is displayed. - Press the Ent key (●) once.
3		- Preset value is 5.0, and the cursor is in the digit 0. - Press the Left (◀) key once to move the cursor to the left.
4		- The digit 5 in 5.0 is active. Then press the Up (▲) key once.
5		- The value is increased to 6.0 - Press the Left (◀) key to move the cursor to the left.
6		- 0.60 is displayed. The first 0 in 0.60 is active. - Press the Up (▲) key once.
7		- 16.0 is set. - Press the Ent (●) key once. - 16.0 is blinking. - Press the Ent (●) key once again to return to the parameter name.
8		- ACC is displayed. Accel time is changed from 5.0 to 16.0 sec.

♣ In step 7, pressing the Left (◀) or Right (▶) key while 16.0 is blinking will disable the setting.

13. How to reset the Inverter to Factory Defaults



13.1 Use the navigation pad to navigate to parameter H93.

Press the right navigation key to cycle through the parameter groups until the screen displays "H0".

Press the down arrow repeatedly until "H93" is displayed.



13.2 Press "ENT" to change the value of parameter H93.

Once the display shows "H93", press "ENT" to select the parameter and edit its value.

The display will show the default value of "0".



13.3 Press the up arrow on the navigation pad to change the value from 0 to 1.

Press the up arrow on the navigation pad to change the value of H93 from 0 to 1.

Press "ENT" to save the changes. The display will flash to indicate that the change needs to be confirmed.

Press "ENT" again to confirm the change. The display will return to H93.

All parameters have now been reset to factory defaults.

تنظیم پارامترهای موتور روی اینورتر:

● Function group 2

LED display	Address for communication	Parameter name	Min/Max range	Description		Factory defaults
H30	A31E	[Motor type select]	0.2~ 22.0	0.2	0.2kW	7.5 ¹⁾
				~	~	
				22.0	22.0kW	
H31	A31F	[Number of motor poles]	2 ~ 12	This setting is displayed via rpm in drive group.		4
H33	A321	[Motor rated current]	0.5~150 [A]	Enter motor rated current on the nameplate.		26.3
H34	A322	[No Load Motor Current]	0.1~ 50 [A]	Enter the current value detected when the motor is rotating in rated rpm after the load connected to the motor shaft is removed. Enter the 50% of the rated current value when it is difficult to measure H34 – [No Load Motor Current].		11
H36	A324	[Motor efficiency]	50~100 [%]	Enter the motor efficiency (see motor nameplate).		87

تنظیم پارامتر فرکانس به روشهای مختلف:

الف – از روی کی پد روی اینورتر

● Keypad Frequency setting 1

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	0.00	[Frequency Command]	-	0 ~ 400	0.00	Hz
	Frq	[Frequency mode]	0	0 ~ 8	0	

- Set Frq – [Frequency mode] to 0 {Frequency setting via Keypad 1}.
- Set the desired frequency in 0.00 and press the Prog/Ent (●) key to enter the value into memory.
- The value is settable less than F21 – [Max frequency].

Frq	A104	[Frequency setting method]	0 ~ 7	0	Digital	Keypad setting 1	0
				1		Keypad setting 2	
				2	Analog	V1 1: -10 ~ +10 [V]	
				3		V1 2: 0 ~ +10 [V]	
				4		Terminal I: 0 ~ 20 [mA]	
				5		Terminal V1 setting 1 + Terminal I	
				6		Terminal V1 setting 2+ Terminal I	
				7	RS485 communication		
				8	Digital Volume		

ب - از روی کی پد دوم

- ▶ When remote keypad is connected, keypad keys on the body are deactivated.

● Keypad Frequency setting 2

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	0.00	[Frequency Command]	-	0 ~ 400	0.00	Hz
	Frq	[Frequency mode]	1	0 ~ 8	0	

- Set **Frq** – [Frequency mode] to 1{Frequency setting via Keypad 2}.
- In **0.00**, frequency is changed upon pressing the Up (▲)/Down (▼) key. In this case, UP/Down keys serve as a potentiometer.
- The value is settable less than **F21** – [Max frequency].

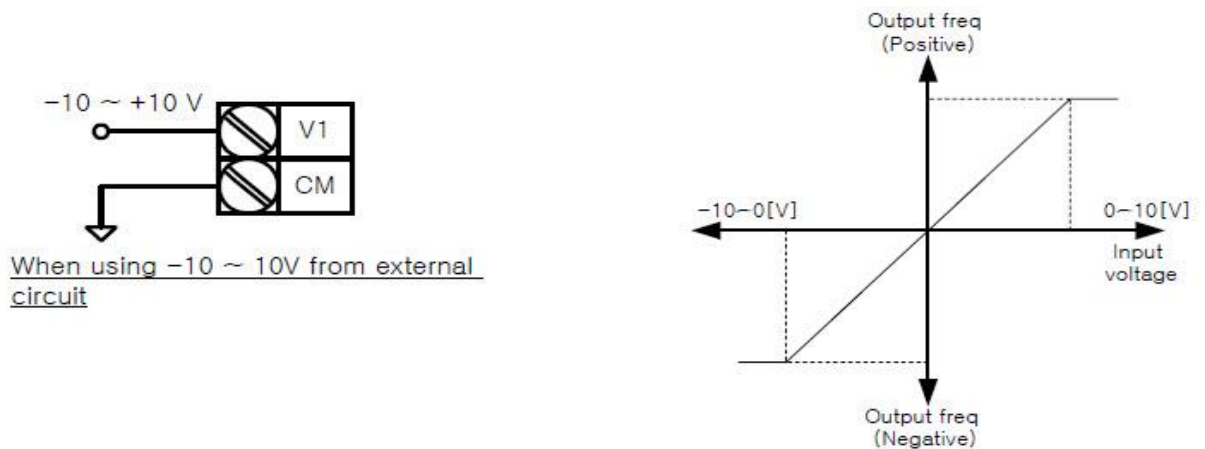
ج - از طریق ورودی آنالوگ ۱۰/- ۱۰+

● Frequency setting via -10 ~ +10[V] input

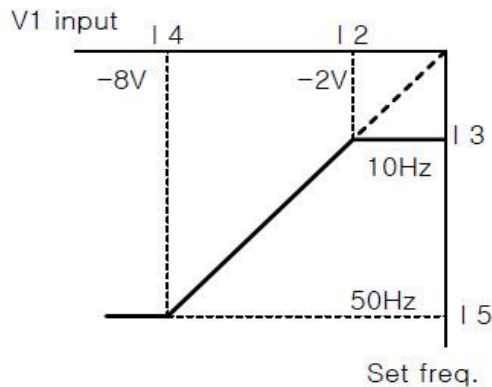
Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	0.00	[Frequency Command]	-	0 ~ 400	0.00	Hz
	Frq	[Frequency Mode]	2	0 ~ 8	0	
I/O group	I 2	[NV input minimum voltage]	-	0 ~ -10	0.0	V
	I 3	[Frequency corresponding to I2]	-	0 ~ 400	0.00	Hz
	I 4	[NV input max voltage]	-	0 ~ 10	10.00	V
	I 5	[Frequency corresponding to I4]	-	0 ~ 400	60.00	Hz
	I6 ~ I10	[V1 input]				

	FWD RUN Command	REV RUN Command
0 ~ +10 [V]	FWD RUN	REV RUN
-10 ~ 0 [V]	REV RUN	FWD RUN

- ▶ Apply $-10\text{V} \sim +10\text{V}$ signal between V1 and CM terminal.
- ▶ Output frequency corresponding to $-10\text{V} \sim +10\text{V}$ input voltage to V1 terminal

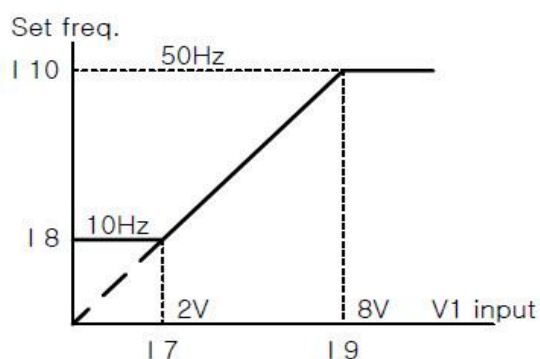


- ▶ I 2 ~ I 5: Setting input range and corresponding frequency to $-10\text{V} \sim 0\text{V}$ V1 input voltage
Ex) when minimum (-) input voltage is -2V with corresponding frequency 10Hz and Max voltage is -8V with run freq. 50Hz .



- ▶ I 6 ~ I 10: Setting input range and corresponding frequency to $0 \sim +10\text{V}$ V1 input voltage

Ex) when minimum (+) input voltage is 2V with corresponding frequency 10Hz and Max voltage is 8V with run freq.

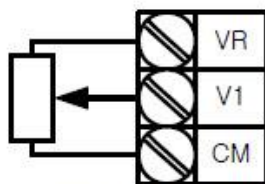


● Frequency setting via 0 ~ 10 [V] input or Terminal Potentiometer

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	0.00	[Frequency Command]	-	0 ~ 400	0.00	Hz
	Frq	[Frequency Mode]	3	0 ~ 8	0	
I/O group	I 6	[Filter time constant for V1 input]	10	0 ~ 9999	10	
	I 7	[V1 input Min voltage]	-	0 ~ 10	0	V
	I 8	[Frequency corresponding to I 7]	-	0 ~ 400	0.00	Hz
	I 9	[V1 input max voltage]	-	0 ~ 10	10	V
	I10	[Frequency corresponding to I 9]	-	0 ~ 400	60.00	Hz

- Select 3 in Frq code of Drive group.
- 0-10V can be directly applied from an external controller or a potentiometer connected on terminals VR, V1 and CM.

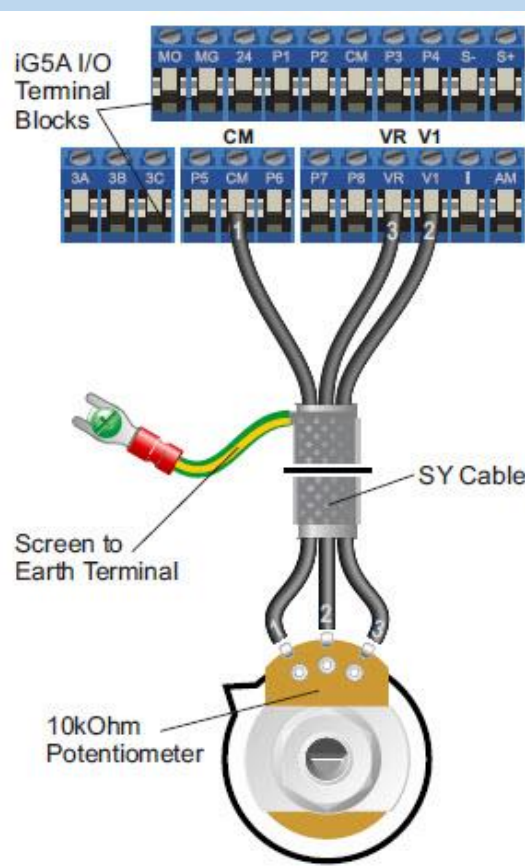
► Wire the terminals as shown below and refer to I 6 ~ I 10.



Wiring of potentiometer



0 ~ 10V input via external controller



● Frequency setting via 0 ~ 20 [mA] input

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	0.00	[Frequency Command]	-	0 ~ 400	0.00	Hz
	Frq	[Frequency Mode]	4	0 ~ 8	0	
I/O group	I11	[Filter time constant for I input]	10	0 ~ 9999	10	
	I12	[I input minimum current]	-	0 ~ 20	4	mA
	I13	[Frequency corresponding to I12]	-	0 ~ 400	0.00	Hz
	I14	[I input max current]	-	0 ~ 20	20	mA
	I15	[Frequency corresponding to I14]	-	0 ~ 400	60.00	Hz

- Select 4 in Frq code of Drive group.
- Frequency is set via 0~20mA input between I and CM terminal.

ه - از طریق ورودی آنالوگ ma ۲۰ تا ۴ و ۱۰- تا ۱۰+ بطور همزمان

● Frequency setting via -10 ~ +10[V] voltage input + 0 ~ 20[mA] input

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	0.00	[Frequency Command]	-	0 ~ 400	0.00	Hz
	Frq	[Frequency Mode]	5	0 ~ 8	0	

- Select 5 in Frq code of Drive group.
- Override function available using Main/Auxiliary speed adjustment
- Related code: I 2 ~ I 5, I 6 ~ I10, I11 ~ I15

در این مد مقدار ست شده در پارامترهای I2 الی I15 با همدیگر جمع شده و نتیجه حاصل فرکانس خروجی خواهد بود. برای مثال در مثال ذیل به ارای ولتاژ ۵ ولت ما فرکانس ۲,۵ را در خروجی خواهیم داشت و به ازای جریان ۱۲ میلی آمپر فرکانس ۳۰ هرتز را خواهیم داشت که مجموع ای دو ۳۲,۵ هرتز خواهد بود

Group	Code	Parameter Name	Setting	Unit
I/O group	I 2	[NV input Min voltage]	0	V
	I 3	[Frequency corresponding to I 2]	0.00	Hz
	I 4	[NV input Max voltage]	10.00	V
	I 5	[Frequency corresponding to I 4]	5.00	Hz
	I7	[V1 input Min voltage]	0	V
	I 8	[Frequency corresponding to I 7]	0.00	Hz
	I 9	[V1 input max voltage]	10	V
	I10	[Frequency corresponding to I 9]	5.00	Hz
	I12	[I input minimum current]	4	mA
	I13	[Frequency corresponding to I 12]	0.00	Hz
	I14	[I input max current]	20	mA
	I15	[Frequency corresponding to I 14]	60.00	Hz

- After the above setting is made, if 5V is applied to V1 with 12mA given to terminal I, output frequency would be 32.5Hz. If -5V is applied to V1 terminal with 12mA given to terminal I, output frequency would be 27.5Hz.

و - از طریق ورودی آنالوگ ma ۲۰ تا ۴ و ۰ تا ۱۰+ بطور همزمان

این حالت نیز شبیه به حالت قبل میباشد

● Frequency setting via 0 ~ 10[V] + 0 ~ 20[mA] input

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	0.00	[Frequency Command]	-	0 ~400	0.00	Hz
	Frq	[Frequency Mode]	6	0 ~ 8	0	

- Select 6 in Frq code of Drive group.
- Related code: I 6 ~ I 10, I 11 ~ I 15
- Refer to Frequency setting via -10 ~ +10V voltage input + 0 ~ 20mA input.

ز - از طریق ورودی شبکه RS485

● Frequency setting via RS 485 communication

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	0.0	[Frequency Command]	-	0 ~400	0.00	Hz
	Frq	[Frequency Mode]	7	0 ~ 8	0	

- Select 7 in Frq code of Drive group.
- Related code: I 59, I 60, I 61
- Refer to Chapter 13. RS485 communication.

ح - از طریق ولوم دیجیتال

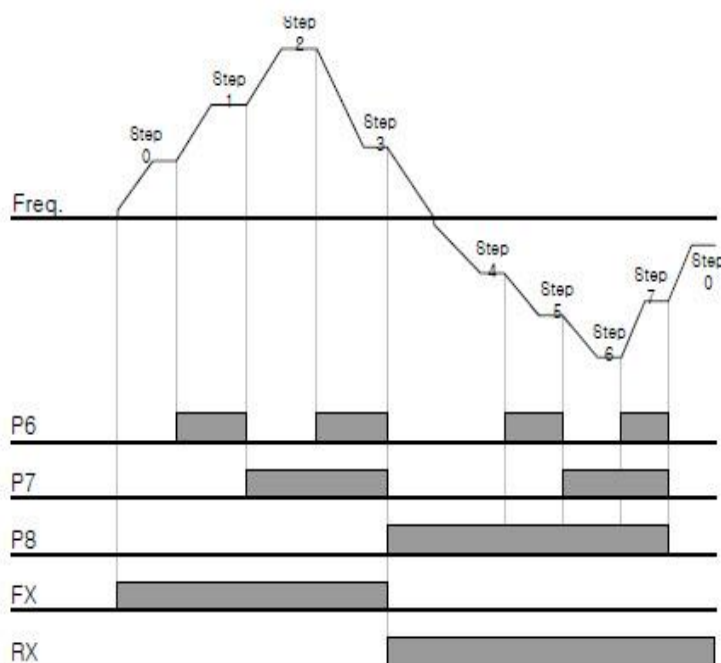
● Frequency setting via Digital Volume (up-down)

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	0.0	[Frequency Command]	-	0 ~400	0.00	Hz
	Frq	[Frequency Mode]	8	0 ~ 8	0	

- Select 7 in Frq code of Drive group.
- Related code: I 59, I 60, I 61
- Refer to Chapter 13. RS485 communication.

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	0.0	[Frequency Command]	5.0	0 ~ 400	0.00	Hz
	Frq	[Frequency Mode]	0	0 ~ 8	0	-
	St1	[Multi-Step frequency 1]	-	0 ~ 400	10.00	Hz
	St2	[Multi-Step frequency 2]	-		20.00	
	St3	[Multi-Step frequency 3]	-		30.00	
I/O group	I22	[Multi-function input terminal P6 define]	5	0 ~ 24	5	-
	I23	[Multi-function input terminal P7 define]	6		6	-
	I24	[Multi-function input terminal P8 define]	7		7	-
	I30	[Multi-Step frequency 4]	-	0 ~ 400	30.00	Hz
	I31	[Multi-Step frequency 5]	-		25.00	
	I32	[Multi-Step frequency 6]	-		20.00	
	I33	[Multi-Step frequency 7]	-		15.00	

- Select a terminal to give Multi-step frequency command among P1-P8 terminals.
- If terminals P6-P8 are selected, set I22-I24 to 5-7 to give Multi-step frequency command.
- Multi-step frequency 0 is settable in **Frq** – [Frequency mode] and **0.00** – [Frequency command].
- Multi-step frequency 1-3 are set at St1-St3 in Drive group, while Step frequency 4-7 are set at I30-I33 in I/O group.



Step freq.	FX or RX	P8	P7	P6
0	✓	-	-	-
1	✓	-	-	✓
2	✓	-	✓	-
3	✓	-	✓	✓
4	✓	✓	-	-
5	✓	✓	-	✓
6	✓	✓	✓	-
7	✓	✓	✓	✓

St1	A105	[Multi-Step frequency 1]	0 ~ 400 [Hz]	Sets Multi-Step frequency 1 during Multi-step operation.	10.00
St2	A106	[Multi-Step frequency 2]		Sets Multi-Step frequency 2 during Multi-step operation.	20.00
St3	A107	[Multi-Step frequency 3]		Sets Multi-Step frequency 3 during Multi-step operation.	30.00

LED display	Address for communication	Parameter name	Min/Max range	Description		Factory defaults
I17	A411	[Multi-function input terminal P1 define]	0 ~ 27	0	Forward run command	0
				1	Reverse run command	
I18	A412	[Multi-function input terminal P2 define]		2	Emergency Stop Trip	1
				3	Reset when a fault occurs {RST}	
I19	A413	[Multi-function input terminal P3 define]		4	Jog operation command	2
				5	Multi-Step freq – Low	
I20	A414	[Multi-function input terminal P4 define]		6	Multi-Step freq – Mid	3
				7	Multi-Step freq – High	
I21	A415	[Multi-function input terminal P5 define]		8	Multi Accel/Decel – Low	4
				9	Multi Accel/Decel – Mid	
I22	A416	[Multi-function input terminal P6 define]		10	Multi Accel/Decel – High	5
				11	DC brake during stop	
I23	A417	[Multi-function input terminal P7 define]		12	2nd motor select	6
				13	-Reserved-	

I24	A418	[Multi-function input terminal P8 define]		14	-Reserved-		7
				15	Up-down	Frequency increase (UP) command	
				16		Frequency decrease command (DOWN)	
				17	3-wire operation		
				18	External trip: A Contact (EtA)		
				19	External trip: B Contact (EtB)		
				20	Self-diagnostic function		
				21	Change from PID operation to V/F operation		
				22	2 nd Source		
				23	Analog Hold		
				24	Accel/Decel Disable		
				25	Up/Down Save Freq. Initialization		
				26	JOG-FX		
				27	JOG-RX		

الف - از روی کی پد و توسط کلیدهای RUN , STOP



drv	A103	[Drive mode]	0 ~ 3	0	Run/Stop via Run/Stop key on the keypad		1	X	7-8
				1	Terminal operation	FX: Motor forward run RX: Motor reverse run			7-8
				2		FX: Run/Stop enable RX: Reverse rotation select			
				3	RS485 communication				7-9

drC	A10D	[Direction of motor rotation select]	F, r	Sets the direction of motor rotation when drv - [Drive mode] is set to either 0 or 1.		F	O	7-8
				F	Forward			
				r	Reverse			

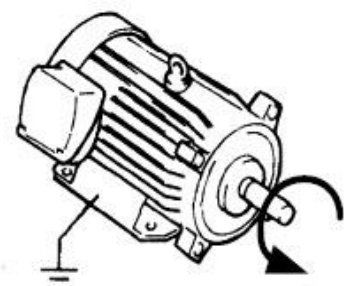
● Operation via keypad RUN key and STOP/RST key

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	drv	[Drive mode]	0	0 ~ 3	1	
	drC	[Direction of motor rotation select]	-	F, r	F	

- Set **drv** – [Drive mode] to 0.
- Acceleration is started upon pressing the Run key while operating frequency is set. Motor decelerates to stop by pressing the STOP/RST key.
- Selecting rotation direction is available at drC - [Direction of motor rotation select] when operating command is issued via keypad.

drC	[Direction of motor rotation select]	F	Forward
		r	Reverse

- When remote keypad is connected, body-embedded keypad is deactivated.



Forward :
Counter-clockwise

ب – راه اندازی بصورت سه سیمه چپگرد و راستگرد از طریق ترمینالهای کنترلی

I17	A411	[Multi-function input terminal P1 define]	0 ~ 27	0	Forward run command	0
				1	Reverse run command	
I18	A412	[Multi-function input terminal P2 define]		2	Emergency Stop Trip	1
				3	Reset when a fault occurs {RST}	

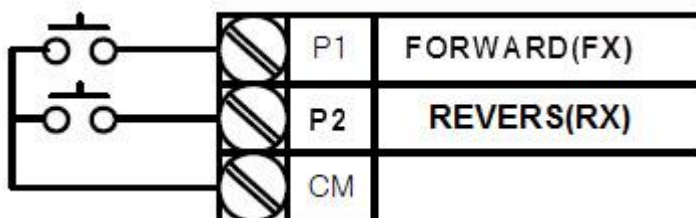
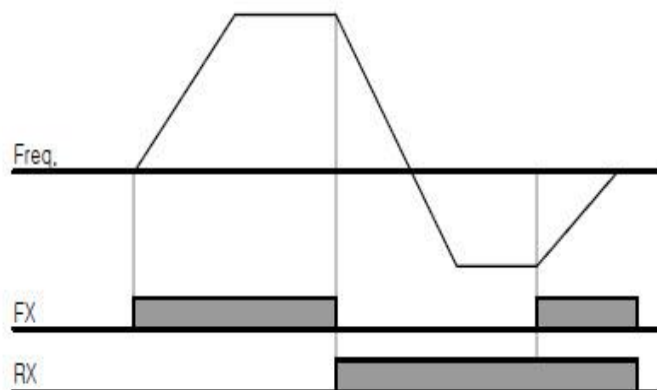
drv	A103	[Drive mode]	0 ~ 3	0	Run/Stop via Run/Stop key on the keypad		1	X	7-8
				1	Terminal operation	FX: Motor forward run RX: Motor reverse run			7-8
						2			
				3	RS485 communication				7-9

● Operating command via FX, RX terminal 1

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	drv	[Drive mode]	1	0 ~ 3	1	
I/O group	I17	[Multi-function input terminal P1 define]	0	0 ~ 27	0	
	I18	[Multi-function input terminal P2 define]	1	0 ~ 27	1	

- Set **drv** – [Drive mode] to 1.
- Set I17 and I18 to 0 and 1 to use P1 and P2 as FX and RX terminals.
- “FX” is Forward run command and “RX” Reverse run.

- Motor is stopped when FX/RX terminal is ON/OFF at the same time.

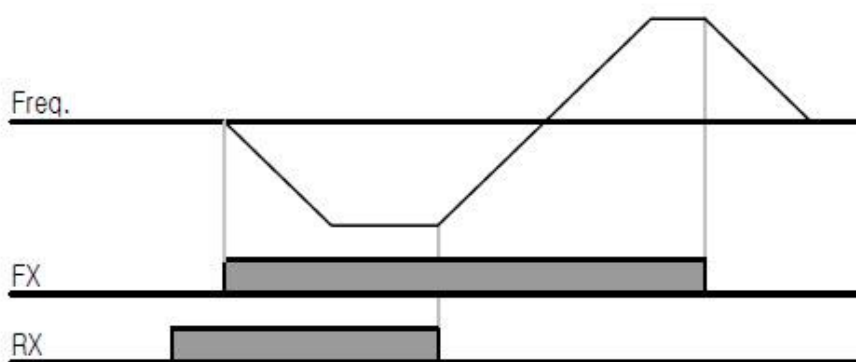


ج - راه اندازی بصورت چپگرد و راستگرد از طریق یک کلید و روشن خاموش کردن از طریق کلید دیگر سه سیمه

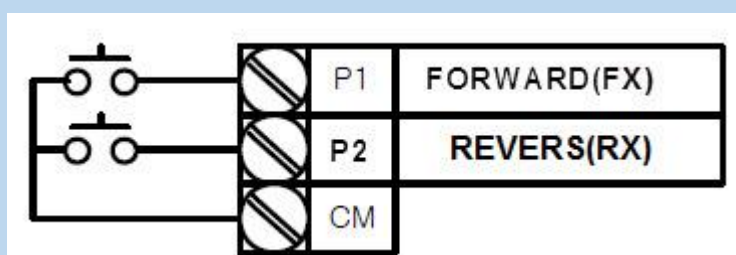
در این حالت کلید FX باعث روشن خاموش شدن موتور و کلید RX باعث چپگرد و راستگرد شدن موتور خواهد شد

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	drv	[Drive mode]	2	0 ~ 3	1	
I/O group	I17	[Multi-function input terminal P1 define]	0	0 ~ 27	0	
	I18	[Multi-function input terminal P2 define]	1	0 ~ 27	1	

- Set the **drv** to 2.
- Set I17 and I18 to 0 and 1 to use P1 and P2 as FX and RX terminals.
- FX: Operating command setting. Motor runs in forward direction when RX terminal (P2) is OFF.
- RX: Direction of motor rotation select. Motor runs in reverse direction when RX terminal (P2) is ON.



drv	A103	[Drive mode]	0 ~ 3	0	Run/Stop via Run/Stop key on the keypad		1	X	7-8
				1	Terminal operation	FX: Motor forward run RX: Motor reverse run			7-8
				2		FX: Run/Stop enable RX: Reverse rotation select			
				3	RS485 communication				7-9



● Operating command via RS485 communication

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	drv	[Drive mode]	3	0 ~ 3	1	
I/O group	I59	[Communication protocol select]	-	0 ~ 1	0	
	I60	[Inverter number]	-	1 ~ 250	1	
	I61	[Baud rate]	-	0 ~ 4	3	

- Set the **drv** to 3.
- Set I59, I60 and I61 correctly.
- Inverter operation is performed via RS485 communication.
- Refer to Chapter. 13, RS485 communication.

I59	A43B	[Communication protocol select]	0 ~ 1	Set communication protocol.	0	X	11-2
				0 Modbus RTU			
				1 LS BUS			
I60	A43C	[Inverter number]	1 ~ 250	Set for RS485 communication	1	O	11-2
I61	A43D	[Baud rate]	0 ~ 4	Select the Baud rate of the RS485.	3	O	11-2
				0 1200 [bps]			
				1 2400 [bps]			
				2 4800 [bps]			
				3 9600 [bps]			
				4 19200 [bps]			

غیر فعال کردن جهت چرخش موتور

● FX/RX Run Disable

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	drC	[Direction of motor rotation select]	-	F, r	F	
Function group 1	F 1	[Forward/Reverse run disable]	-	0 ~ 2	0	

- Select the direction of motor rotation.
- 0: Forward and Reverse run enable
- 1: Forward run disable
- 2: Reverse run disable

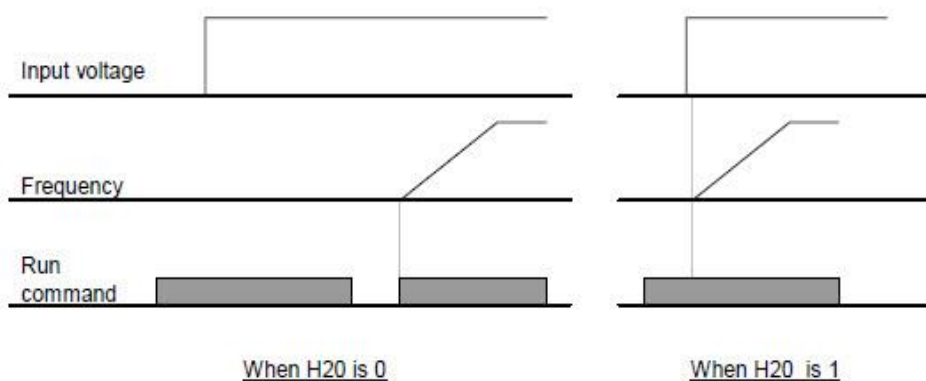
تنظیم نحوه روشن شدن موتور به محض وصل شدن برق ورودی اینورتر

این بدین معنی میباشد که قبل از اتصال برق ورودی اینورتر دستور روشن شدن اینورتر به یکی از روشهای گفته شده فراهم باشد

● Power On Start select

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	drv	[Drive mode]	1, 2	0 ~ 3	1	
Function group 2	H20	[Power On Start select]	1	0 ~ 1	0	

- Set H20 to 1.
- When AC input power is applied to the inverter with drv set to 1 or 2 {Run via control terminal} ON, motor starts acceleration.
- This parameter is inactive when **drv** is set to 0 {Run via keypad} or 3 {RS485 communication}.

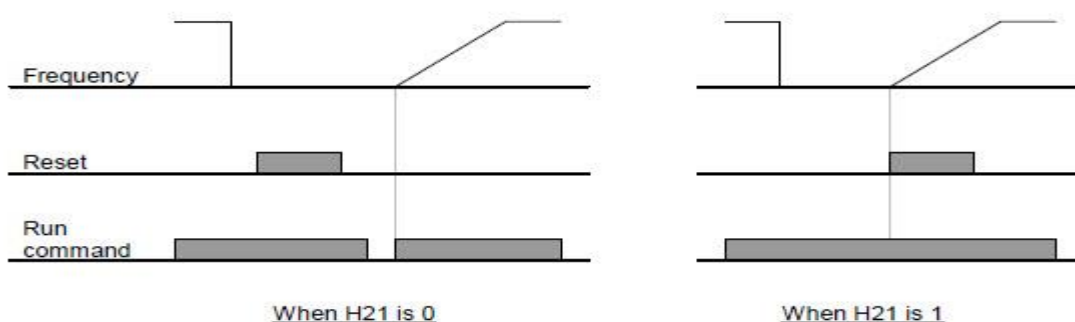


تنظیم ریستارت شدن موتور بعد از اتفاق افتادن FAULT

● Restart after fault reset

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	drv	[Drive mode]	1, 2	0 ~ 3	1	
Function group 2	H21	[Restart after fault reset selection]	1	0 ~ 1	0	

- Set H21 to 1.
- Motor starts acceleration if **drv** is set to 1 or 2 and the selected terminal is ON when a fault is cleared.
- This parameter is inactive when **drv** is set to 0 {Run via keypad} or 3 {RS485 communication}.



Accel/Decel time and pattern setting

● Accel/Decel time setting based on Max frequency

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	ACC	[Accel time]	-	0 ~ 6000	5.0	Sec
	dEC	[Decel time]	-	0 ~ 6000	10.0	Sec
Function group1	F21	[Max Frequency]	-	40 ~ 400	60.00	Hz
Function group2	H70	[Frequency Reference for Accel/Decel]	0	0 ~ 1	0	
	H71	[Accel/Decel time scale]	-	0 ~ 2	1	

- Set the desired Accel/Decel time at ACC/dEC in Drive group.
- If H70 is set to 0 {Max frequency}, Accel/Decel time is the time that takes to reach the max freq from 0 Hz.
- Desired Accel/Decel time unit is settable at the H71.

- Accel/Decel time is set based on F21 – [Max frequency]. For instance, if F21 is set to 60Hz, Accel/Decel time 5 sec, and run frequency 30Hz, time to reach 30Hz would be 2.5 sec.



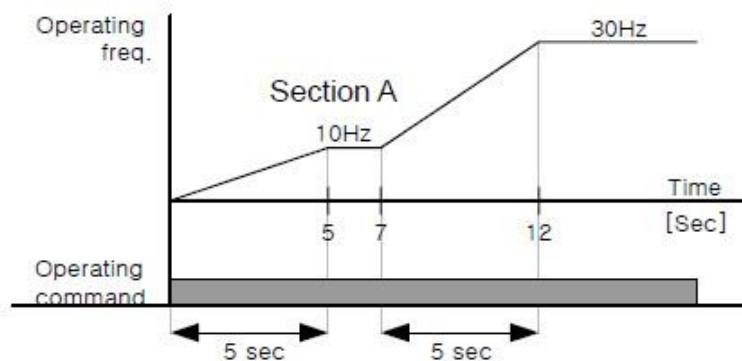
LED display	Address for communication	Parameter name	Min/Max range	Description		Factory defaults
H70	A346	[Frequency Reference for Accel/Decel]	0 ~ 1	0	Based on Max freq (F21)	0
				1	Based on Delta freq.	
H71	A347	[Accel/Decel time scale]	0 ~ 2	0	Settable unit: 0.01 second.	1
				1	Settable unit: 0.1 second.	
				2	Settable unit: 1 second.	

● Accel/Decel time setting based on Operating Frequency

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Drive group	ACC	[Accel time]	-	0 ~ 6000	5.0	Sec
	dEC	[Decel time]	-	0 ~ 6000	10.0	Sec
Function group 2	H70	[Frequency Reference for Accel/Decel]	1	0 ~ 1	0	

- Accel/Decel time is set at the **ACC/dEC**.
- If you set H70 to 1 {Delta frequency}, Accel/Decel time is the time that takes to reach a target freq from constant run freq (Current operating freq.).

- ▶ When H70 and Accel time are set to 1 {Delta frequency} and 5 sec, respectively,
- ▶ The below graph in Section A shows the change in operating frequency when target frequency is set to 10Hz at first and then changed to 30Hz.



LED display	Address for communication	Parameter name	Min/Max range	Description		Factory defaults
H70	A346	[Frequency Reference for Accel/Decel]	0 ~ 1	0	Based on Max freq (F21)	0
				1	Based on Delta freq.	
H71	A347	[Accel/Decel time scale]	0 ~ 2	0	Settable unit: 0.01 second.	1
				1	Settable unit: 0.1 second.	
				2	Settable unit: 1 second.	

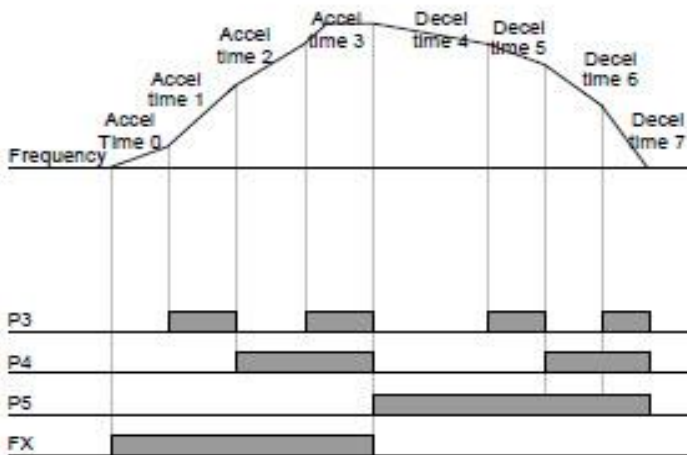
تنظیم ACCEL/DECEL TIME AND PATTERN زمان و نحوه شتابگیری و خاموشی موتور

ج - بصورت چند مرحله ای

● Multi-Accel/Decel time setting via Multi-function terminals

Group	Code	Parameter Name	Set	Range	Initial	Unit
Drive group	ACC	[Accel time]	-	0 ~ 6000	5.0	Sec
	dEC	[Decel time]	-	0 ~ 6000	10.0	Sec
I/O group	I17	[Multi-function input terminal P1 define]	0	0 ~ 27	0	
	I18	[Multi-function input terminal P12 define]	1		1	
	I19	[Multi-function input terminal P3 define]	8		2	
	I20	[Multi-function input terminal P4 define]	9		3	
	I21	[Multi-function input terminal P5 define]	10		4	
	I34	[Multi-Accel time 1]	-	0 ~ 6000	3.0	Sec
	~	~				
	I47	[Multi-Decel time 7]	-		9.0	

- Set I19, I20, I21 to 8, 9, 10 if you want to set Multi - Accel/Decel time via P3-P5 terminals.
- Multi-Accel/Decel time 0 is settable at ACC and dEC.
- Multi-Accel/Decel time 1-7 is settable at I34-I47.



Accel/Decel time	P5	P4	P3
0	-	-	-
1	-	-	✓
2	-	✓	-
3	-	✓	✓
4	✓	-	-
5	✓	-	✓
6	✓	✓	-
7	✓	✓	✓

I17	A411	[Multi-function input terminal P1 define]	0 ~ 27	0	Forward run command	0
				1	Reverse run command	
I18	A412	[Multi-function input terminal P2 define]		2	Emergency Stop Trip	1
				3	Reset when a fault occurs {RST}	

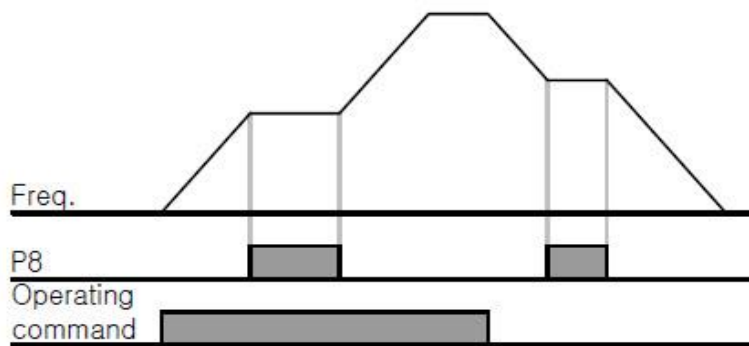
I19	A413	[Multi-function input terminal P3 define]		4	Jog operation command	2
				5	Multi-Step freq – Low	
I20	A414	[Multi-function input terminal P4 define]		6	Multi-Step freq – Mid	3
				7	Multi-Step freq – High	
I21	A415	[Multi-function input terminal P5 define]		8	Multi Accel/Decel – Low	4
				9	Multi Accel/Decel – Mid	
I22	A416	[Multi-function input terminal P6 define]		10	Multi Accel/Decel – High	5
				11	DC brake during stop	

جلوگیری از شتاب گرفتن موتور حین شتاب گیری

● Accel/Decel Disable

Group	Code	Parameter Name	Setting	Range	Initial	Unit
I/O group	I17	[Multi-function input terminal P1 define]	-	0 ~27	0	
	~	~				
	I24	[Multi-function input terminal P8 define]	24		7	

- Select one terminal among Multi-function input terminals 1-8 to define Accel/Decel disable.
- If P8 is selected, set I24 to 24 to activate this function.



I24	A418	[Multi-function input terminal P8 define]		14	-Reserved-	7	O	-
				15	Up-down			8-4
				16	Frequency increase (UP) command			
					Frequency decrease command (DOWN)			
				17	3-wire operation			8-7
				18	External trip: A Contact (EtA)			10-5
				19	External trip: B Contact (EtB)			
				20	Self-diagnostic function			8-22
				21	Change from PID operation to V/F operation			8-10
				22	2 nd Source			8-24
				23	Analog Hold			7-6
				24	Accel/Decel Disable			7-16
				25	Up/Down Save Freq. Initialization			8-4
				26	JOG-FX			8-3
				27	JOG-RX			

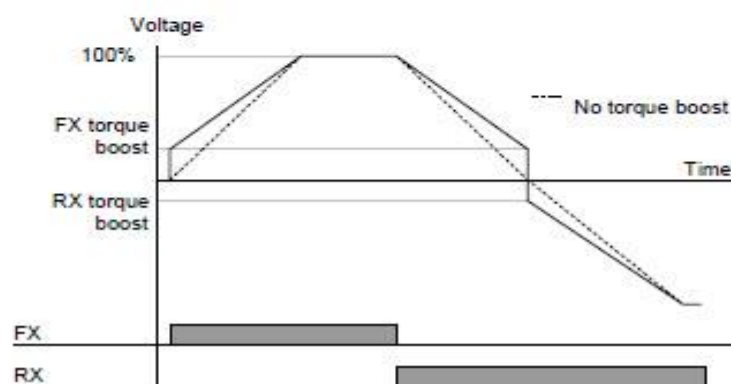
● Manual torque boost

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Function group 1	F27	[Torque Boost select]	0	0 ~ 1	0	
	F28	[Torque boost in forward direction]	-	0 ~ 15	2	%
	F29	[Torque boost in reverse direction]				

- Set F27 to 0 {Manual torque boost}.
- The values of [Torque boost in forward/reverse direction] are set separately in F28 and F29.

**CAUTION**

- If the boost value is set much higher than required, it may cause motor overheating due to over-energizing.



F27	A21B	[Torque Boost select]	0 ~ 1	0	Manual torque boost	0
				1	Auto torque boost	
F28	A21C	[Torque boost in forward direction]	0 ~ 15 [%]	This parameter sets the amount of torque boost applied to a motor during forward run. It is set in percent of Max output voltage.		2
F29	A21D	[Torque boost in reverse direction]		This parameter sets the amount of torque boost applied to a motor during reverse run. It is set as a percent of Max output voltage		2

● Auto torque boost

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Function group 1	F27	[Torque Boost select]	1	0 ~ 1	0	
Function group 2	H34	[No load motor Current]	-	0.1 ~ 20	-	A
	H41	[Auto tuning]	0	0 ~ 1	0	
	H42	[Stator resistance (Rs)]	-	0 ~ 14	-	Ω

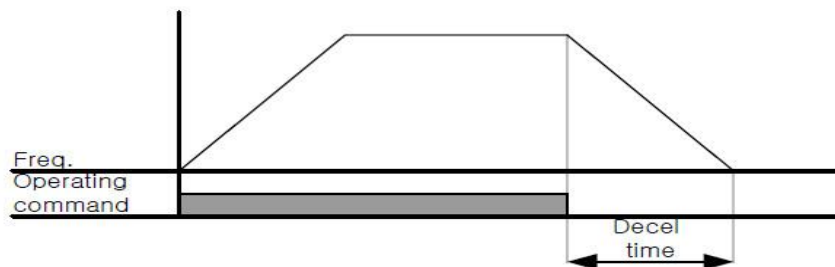
- Before Auto Torque Boost setting, H34 and H42 should be set correctly (See page 10-6, 10-10).
- Select 1{Auto torque boost} in F27.
- Inverter automatically calculates torque boost value using motor parameters and outputs the corresponding voltage.

F 4	A204	[Stop mode select]	0 ~ 3	0	Decelerate to stop	0
				1	DC brake to stop	
				2	Free run to stop	
				3	Power Braking stop	

● Decel to stop

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Function group 1	F4	[Stop mode select]	0	0 ~ 3	0	

- Select 0 {decel to stop} in F4 code.
- Motor decelerates to 0 Hz and stops during the setting time.



ب - بصورت تزریق جریان ترمزی به موتور

● DC braking to stop

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Function group 1	F4	[Stop mode select]	1	0 ~ 3	0	

- Select 1 {DC brake to stop} in F4 code.

ج - بصورت خلاص کردن موتور بطوری که خودش بایستد

● Free run stop

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Function group 1	F4	[Stop mode select]	2	0 ~ 3	0	

محدود کردن فرکانس

الف - محدود کردن فرکانس ماکزیمم و فرکانس شروع بکار موتور

● Frequency limit using Max Frequency and Start Frequency

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Function group 1	F21	[Max frequency]	-	0 ~ 400	60.00	Hz
	F23	[Start frequency]	-	0.1 ~ 10	0.50	Hz

- Max Frequency: Frequency highest limit. Any frequency cannot be set above [Max frequency] except for F22 [Base frequency].
- Start Frequency: Frequency lowest limit. If a frequency is set lower than this, 0.00 is automatically set.

F21 ¹⁾	A215	[Max frequency]	40 ~ 400 [Hz]	This parameter sets the highest frequency the inverter can output. It is frequency reference for Accel/Decel (See H70)	60.00
 Caution					
Any frequency cannot be set above Max frequency except Base frequency					
F22	A216	[Base frequency]	30 ~ 400 [Hz]	The inverter outputs its rated voltage to the motor at this frequency (see motor nameplate).	60.00
F23	A217	[Start frequency]	0.1 ~ 10 [Hz]	The inverter starts to output its voltage at this frequency. It is the frequency low limit.	0.50
F24	A218	[Frequency high/low limit select]	0 ~ 1	This parameter sets high and low limit of run frequency.	0
F25 ²⁾	A219	[Frequency high limit]	0 ~ 400 [Hz]	This parameter sets high limit of the run frequency. It cannot be set above F21 – [Max frequency].	60.00
F26	A21A	[Frequency low limit]	0.1 ~ 400 [Hz]	This parameter sets low limit of the run frequency. It cannot be set above F25 - [Frequency high limit] and below F23 – [Start frequency].	0.50

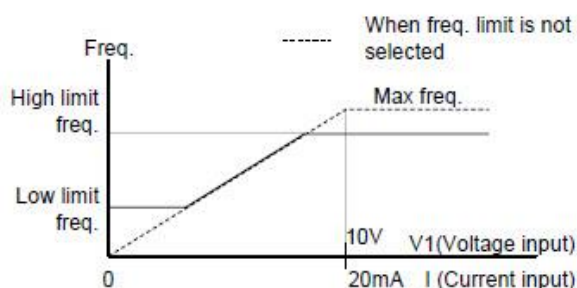
ج – محدود کردن فرکانس کاری

● Frequency command limit using High/Low limit

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Function group 1	F24	[Frequency high/low limit select]	1	0 ~ 1	0	
	F25	[Frequency high limit]	-	0 ~ 400	60.00	Hz
	F26	[Frequency low limit]	-	0 ~ 400	0.50	Hz

- Set F24 to 1.
- Active run frequency can be set within the range of F25 and F26.

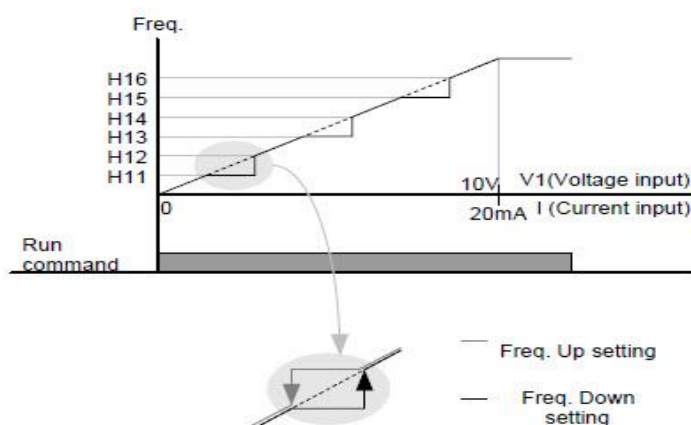
- ▶ When frequency setting is done via Analog input (voltage or current input), the inverter operates within the range of high and low limit frequency as shown below.
- ▶ This setting is also valid when frequency setting is done via keypad.



● Skip frequency

Group	Code	Parameter Name	Setting	Range	Initial	Unit
Function group 2	H10	[Skip frequency select]	1	0 ~ 1	0	
	H11	[Skip frequency low limit 1]	-	0.1 ~ 400	10.00	Hz
	~	~				
	H16	[Skip frequency low limit 3]	-	0.1 ~ 400	35.00	Hz

- Set H10 to 1.
- Run frequency setting is not available within the skip frequency range of H11-H16.
- Skip frequency is settable within the range of F21 – [Max frequency] and F23 – [Start frequency].



H10	A30A	[Skip frequency select]	0 ~ 1	Sets the frequency range to skip to prevent undesirable resonance and vibration on the structure of the machine.	0
H11¹⁾	A30B	[Skip frequency low limit 1]	0.1~400 [Hz]	Run frequency cannot be set within the range of H11 thru H16. The frequency values of the low numbered parameters cannot be set above those of the high numbered ones. Settable within the range of F21 and F23.	10.00
H12	A30C	[Skip frequency high limit 1]			15.00
H13	A30D	[Skip frequency low limit 2]			20.00
H14	A30E	[Skip frequency high limit 2]			25.00
H15	A30F	[Skip frequency low limit 3]			30.00
H16	A310	[Skip frequency high limit 3]			35.00

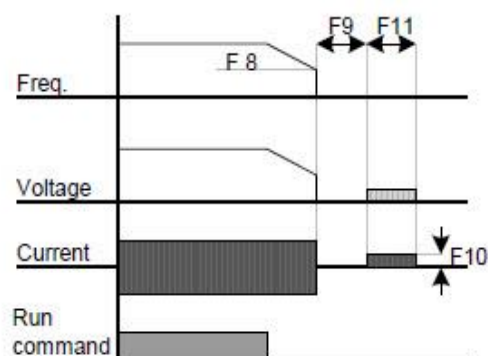
DC brake

● Stopping motor by DC brake

Group	Display	Parameter Name	Setting	Range	Default	Unit
Function group 1	F 4	[Stop mode select]	1	0 ~ 3	0	
	F 8	[DC Brake start frequency]	-	0.1 ~ 60	5.00	Hz
	F 9	[DC Brake wait time]	-	0 ~ 60	0.1	sec
	F10	[DC Brake voltage]	-	0 ~ 200	50	%
	F11	[DC Brake time]	-	0 ~ 60	1.0	sec

- Set F4 - [Stop mode select] to 1.
- F 8: The frequency at which the DC brake will become active.
- F 9: Inverter output will hold for this time after F8 - [DC Brake start frequency] before applying F10 - [DC Brake voltage].
- F10: Set this value as a percent of H33 – [Motor rated current].
- F11: It sets the time for F10 - [DC Brake voltage] to be applied to the motor after F 9 - [DC Brake wait time].

- ▶ Setting F10 or F11 to 0 will disable DC brake.
- ▶ F 9 – [DC Brake Wait time]: When load inertia is large or F 8 – [DC Brake Start Frequency] is high, over current trip may occur. It can be prevented using F9.



- ▶ In case of DC brake at high load inertia and frequency, change the DC brake controller gain according to H37 set value.

H37	Load inertia ratio	0	Less than 10 times motor inertia
		1	10 times motor inertia
		2	Greater than 10 times motor inertia

در حالت فوق ابتدا در فرکانس تنظیم شده F8 خروجی اینورتر بلافاصله قطع میگردد سپس بعد از گذشت زمان F9 جریان DC با ولتاژ F10 و به مدت F11 به موتور تزریق میگردد.

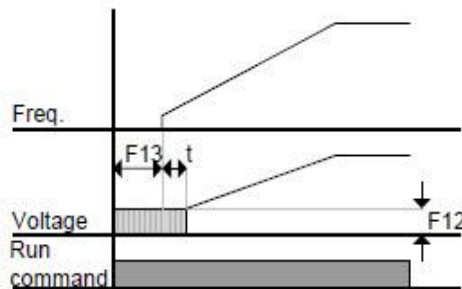
● Starting DC brake

Group	Display	Parameter Name	Setting	Range	Default	Unit
Function group 1	F12	[DC Brake start voltage]	-	0 ~ 200	50	%
	F13	[DC Brake start time]	-	0 ~ 60	0	sec

- F12: It sets the level as a percent of H33 – [Motor rated current].
- F13: Motor accelerates after DC voltage is applied for the set time.

⚠ CAUTION

If excessive DC Brake voltage is set or DC Brake time is set too long, it may cause motor overheating and damage to the motor.



- ▶ Setting F12 or F13 to 0 will disable Starting DC brake.
- ▶ t: After F13 - [DC Brake start time], the frequency is increasing after DC voltage is applied until the time t.