FUJI ELECTRIC

GE Fuji Drives USA

The AF-300 Mini™

Adjustable Frequency Drive

With the AF-300 Mini, you get performance, compact size, quality, flexibility, and simple programming.

AF-300 Mini Series Features

GE Fuji brings you a new drive from the world's leading manufacturer of general-purpose drives up to 5 hp*. The new AF-300 Mini™ drive provides you with advanced design experience, industry-leading technology and proven quality.

The AF-300 Mini features a full range of functions, compact enclosures, simplified operation, broad range of models and global compatibility. This new drive meets your needs in applications such as conveyors, fans, pumps, centrifugal separators and food processing equipment. In addition, it offers new opportunities for system integration, energy savings, reduced labor and installed space for an overall cost reduction.

- Optimal performance for a variety of applications
- Compact design
- Simple operation
- Broad product family
- Options available for added flexibility
- Global standards

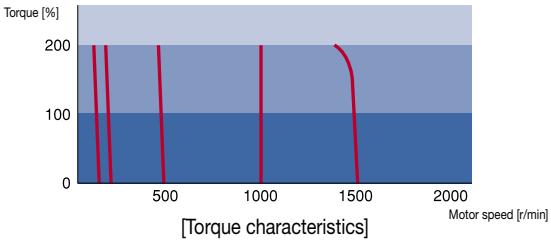
ACTUAL SIZE

*ARC USA: "Low Power AC Drives Worldwide, Outlook (2001)"

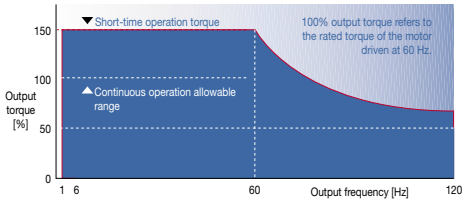
Optimum performance for material handling

High starting torque – 150% or greater

Equipped with GE Fuji's original simplified torque-vector control system and the automatic torque boost function, the AF-300 Mini drive provides consistent high torque (at 5 Hz or above with automatic torque boost and slip compensation enabled).



[Torque characteristics]



Output torque characteristic data

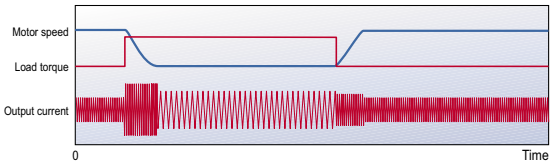
The above graph shows an example of torque characteristics obtained when AF-300 Mini is combined one-to-one with a standard 3-phase 4 pole motor.

Dynamic braking

With a built-in braking transistor, an optional braking resistor can be connected to increase regenerative braking in applications such as conveyors and material handling equipment that require braking capacity. For drives 2 hp or above, standard models with a field installable braking resistor kit are available.

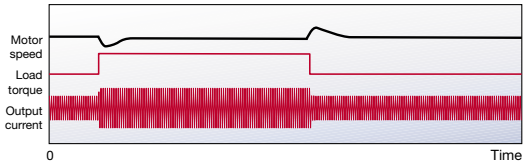
Trip-free operation

The improved current limiting function (stall prevention) allows trip-free operation even under intermittent high load conditions.



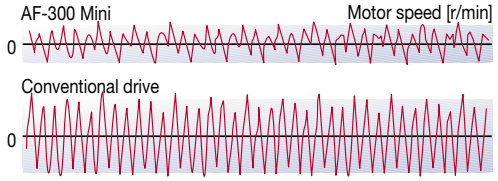
Stable operation with varying loads

The slip compensation function provides speed stability even with varying loads on the motor.



Improved motor stability at low speed

GE Fuji's unique voltage control system improves performance and motor stability at low speed by at least a factor of two (at 1 Hz) compared with conventional drives.



Instability characteristics

Energy savings for fans and pumps

Automatic energy savings as standard

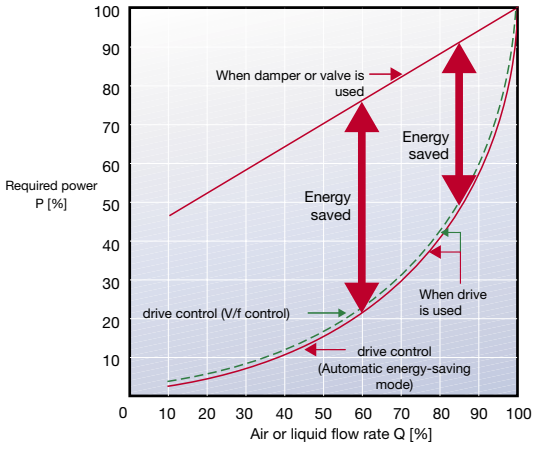
The AF-300 Mini drive's standard automatic energy-saving function minimizes motor losses and saves additional electricity when driving fans or pumps. (Energy savings vary depending on motor characteristics.)

PID control function

Allows control of temperature, pressure or flow rate through motor regulation without the need for additional controllers.

Cooling fan ON/OFF control function

For noise reduction and energy savings, the drive cooling fan can be set to automatically turn off while the driven fan or pump is stopped based on actual internal drive temperature.



Energy savings

Energy savings rate varies with the motor characteristics.

Other features available with the AF-300 Mini

A wide range of available frequency reference settings

Operating frequency can be set either from the keypad, built-in potentiometer or remotely. The remote frequency reference input can be 4 to 20 mA, 0 to 10V, 8 preset speeds or optional RS485 communication.

Transistor and fault relay outputs

Programmable transistor output and fault relay are included as standard equipment. The transistor output can be programmed for early overload warning, at speed, predictive maintenance alarm, etc.

High 400 Hz output frequency

The drive can be used in applications such as centrifugal separators and wood finishing machines that require high motor speed.

Two point non-linear V/Hz configuration

An additional set point (two in total) allows adjusting the V/Hz configuration to match the application.

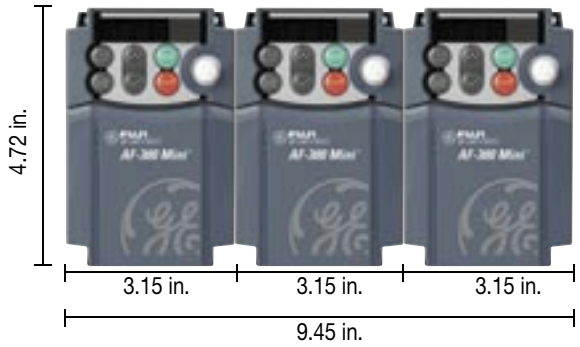
Soft Switching IGBTs

GE Fuji Drives' soft-switching technology reduces voltage spikes and their associated stress on motor insulation. This eliminates costly filters, reactors, and special motors in most applications.

Compact Size

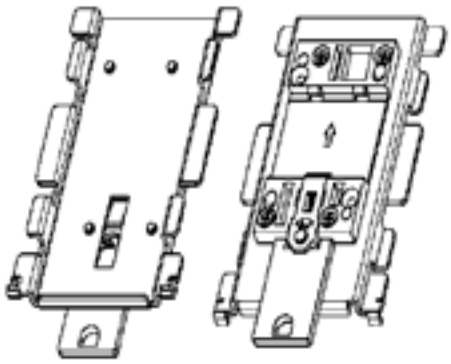
Side-by-side mounting

Multiple drive units can be mounted side-by-side with zero clearance inside a panel. This feature helps to minimize the space used for installation. (Ambient temperature 40˚C or less.)



Optional DIN rail mounting

The optional DIN rail mounting kit allows for quick and easy mounting on 35mm DIN rail.

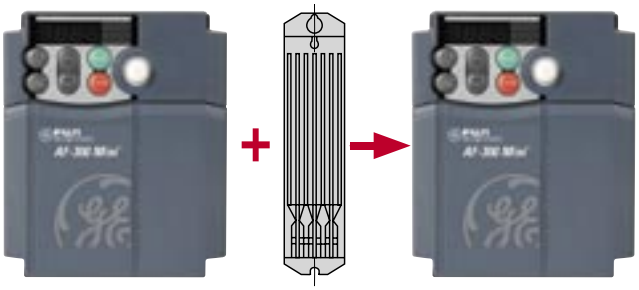


Same size as GE Fuji AF-300 C11 series

The AF-300 Mini drive can easily be interchanged with the AF-300 C11 drive.

Available model with built–in braking resistor

For ratings of 2 hp or above, a built-in braking resistor can be specified. This resistor option can be mounted directly on the drive and requires no additional mounting space.

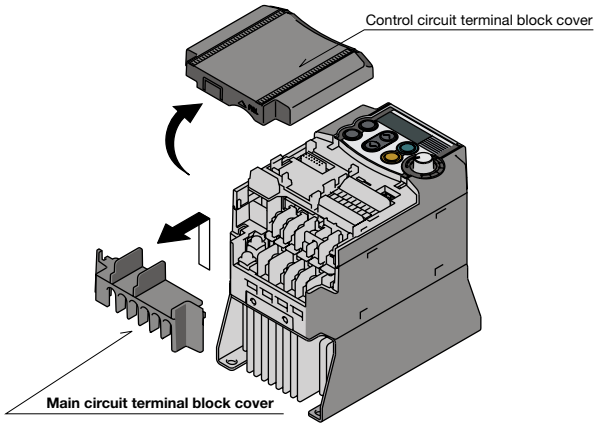


Simple operation and wiring

Standard potentiometer

Speed can easily be adjusted with the built-in potentiometer.

Main and control circuit terminal block covers are easily removable.



Variety of data available on keypad display

The keypad display is capable of providing output frequency, set frequency, load shaft speed, output current, output voltage, alarm history and input power.

Keypad menu mode

Menu items include the function menu for checking or changing function codes, operation monitor, I/O check, maintenance info and alarm info. See the AF-300 Mini User's Manual for details.

Maintenance

DC bus capacitor life expectancy

The capacitor's life expectancy is estimated by comparing its present parameters with stored initial values. The drive will display estimated capacitor life.

Long-life cooling fan

A long-life cooling fan (average design life: 7 years at ambient temperature of 40˚C) improves uptime and reduces maintenance.

Total run time stored and displayed

The drive stores and can display the total cumulative run time for the drive, the printed circuit board (PCB) and the cooling fan.

Stored alarm history

Detailed information such as load current, drive temp, I/O status, etc. can be displayed for the last 4 alarm occurrences.

Predictive service alarm

The drive provides a signal when the dc bus circuit capacitors, the electrolytic capacitors on the PCB or the cooling fans are nearing the end of their estimated service life.

I/O status

Detailed I/O status for all analog and discrete I/O can be accessed via keypad or software.

Peripheral device interface and protective functions

All models are equipped with pre-charge resistor and control circuit

Eliminates potential nuisance tripping of upstream devices due to inrush current while reducing the required current ratings of fuses and/or circuit breakers.

Standard DC reactor (DCR) connection terminal

A terminal is provided for the addition of an optional dc reactor. The dc reactor suppresses harmonics while protecting the drive.

Input/Output phase loss protection

Output phase loss is detected at all times during start and run.

Switchable sink/source

The input/output mode (sink/source) for the digital input terminals can be switched via an internal jumper switch.

Positive temperature coefficient (PTC) thermistor motor protection

In addition to the electronic thermal relay protection, a motor PTC thermistor input is also provided.

Available Options

Function code copy function

The optional remote keypad includes a built-in copy function, which allows drive programming to be uploaded and copied to other drives.

Drive configuration software is available

The free configuration software allows programming, monitoring and trouble-shooting of drives with a Windows®-based PC.

DIN rail mounting

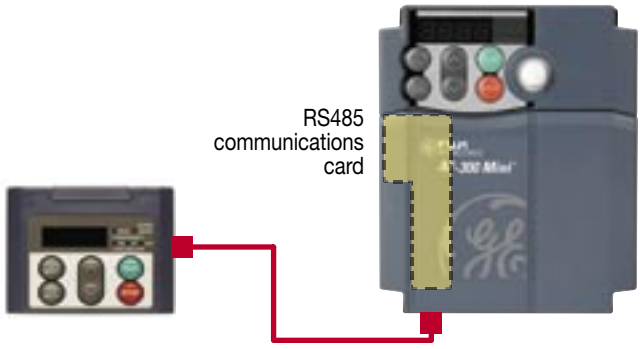
Using the optional mounting base, the drive can be easily mounted on a standard 35mm DIN rail.

NEMA 1 Kit

A NEMA 1 kit is available for standalone applications. The kit includes a top and bottom cover. The bottom cover contains metal conduit adaptors for easy wiring.

Remote operation

The drive can easily be remotely operated using the optional RS485 communications card, remote keypad and remote operation extension cable.



Global standards

All standard models comply with the EC Directive (CE marking), UL standards and Canadian standards (cUL certification).

All standard AF-300 Mini drives comply with European and North American/Canadian standards, enabling specification standardization for machines and equipment for domestic or export.

Models with built-in EMC filters conform to the European EMC Directive.

Drive Selection

Hp Rating	1-phase 115V series	1-phase 230V series	3-phase 230V series	3-phase 460V series
Stock Models - IP20 Protected Enclosure				
1/8	6KXC111F12X9**	6KXC121F12X9**	6KXC123F12X9**	
1/4	6KXC111F25X9**	6KXC121F25X9**	6KXC123F25X9**	
1/2	6KXC111F50X9**	6KXC121F50X9**	6KXC123F50X9**	6KXC143F50X9**
1	6KXC111001X9**	6KXC121001X9**	6KXC123001X9**	6KXC143001X9**
2		6KXC121002X9**	6KXC123002X9**	6KXC143002X9**
3		6KXC121003X9**	6KXC123003X9**	6KXC143003X9**
5			6KXC123005X9**	6KXC143005X9**
Built-to-Order Model				
IP20 Protected Enclosure with Internal CE Filter				
1/8		6KXC121F12E9**	6KXC123F12E9**	
1/4		6KXC121F25E9**	6KXC123F25E9**	
1/2		6KXC121F50E9**	6KXC123F50E9**	6KXC143F50E9**
1		6KXC121001E9**	6KXC123001E9**	6KXC143001E9**
2		6KXC121002E9**	6KXC123002E9**	6KXC143002E9**
3		6KXC121003E9**	6KXC123003E9**	6KXC143OO3E9**
5			6KXC123005E9**	6KXC143005E9**

How to Read the Model Number

6K XC1 N N (X/N)NN X N X N

Code	
6K	GE Product Code

Code	
XC1	AF-300 Drive Family

Code	Input Voltage
1	115 Vac
2	230 Vac
4	460 Vac

Code	Input Phase
1	1-phase
3	3-phase

Code	Horsepower
F50	1/2 hp
001	1 hp

Code	Minor Product Revision
1	1st Minor Revision
2	2nd Minor Revision

Code	Product Revision
A	1st Revision
B	2nd Revision

Code	Enclosure Type
9	IP20

Code	Factory Installed Options
X	Keypad
E	CE Filter
R	DB Resistor

1) 3-phase 230V/460V series

Item				Specifications												
Input power source				3-phase 230V class							3-phase 460V class					
Type 6KXC123___X9 * *: 230V class 6KXC143___X9 * *: 460V class				F12	F25	F50	001	002	003	005	F50	001	002	003	005
Nominal applied motor *1			[hp]	1/8	1/4	1/2	1	2	3	5	1/2	1	2	3	5
			[kW]	0.1	0.2	0.4	0.75	1.5	2.2	3.7	0.4	0.75	1.5	2.2	3.7
Output ratings	Rated capacity *2		[kVA]	0.31	0.59	1.1	1.9	3.1	4.3	6.7	1.1	1.9	2.9	4.3	7.1
	Rated voltage *3		[V]	3-phase 200V/50 Hz, 200, 220, 230V/60 Hz							3-phase 380,400, 415V/50 Hz, 380, 400, 440, 460V/60 Hz				
	Rated current	[A]	High carrier (4-15 kHz)	0.7	1.4	2.5	4.2	7.0	10.0	16.5	1.5	2.5	3.7	5.5	9.0
			Low carrier (-3 kHz)	0.8	1.5	3.0	5.0	8.0	11.0	17.0					
	Overload capability			150% of rated current for 1 min, 200% of rated current for 0.5 s											
	Rated frequency			50, 60 Hz											
Input ratings	Phase, voltage, frequency			3-phase, 200 to 240V, 50/60 Hz							3-phase, 380 to 480V, 50/60 Hz				
	Voltage/frequency variations			Voltage: +10 to -15% (Voltage unbalance *8: 2% or less) Frequency: +5 to -5%											
	Momentary voltage dip capability *4			As long as input voltage is 165V or above the drive continues operation. If it drops below 165V, the drive operates for 15 ms.							As long as input voltage is 300V or more, the drive continues operation. If it drops below 300V, the drive operates for 15 ms.				
	Rated current		(with DCR)	0.57	0.93	1.6	3.0	5.7	8.3	14.0	0.85	1.6	3.0	4.4	7.3
	*9	[A]	(without DCR)	1.1	1.8	3.1	5.3	9.5	13.2	22.2	1.7	3.1	5.9	8.2	13.0
	Required power supply Capacity *5		[kVA]	0.3	0.4	0.6	1.1	2.0	3.0	4.9	0.6	1.1	2.0	2.9	4.9
Braking	Torque *6		[%]	150		100		50	30		100		50	30	
	Torque *7		[%]	-		150					150				
	DC injection braking			Starting frequency: 0.0 to 60.0 Hz, braking time: 0.0 to 30.0 s, braking level: 5 to 100% of rated current											
Conformity to safety standards				UL508C, C22.2No.14, EN50178:1997											
Enclosure (IEC60529)				IP20											
Cooling method				Natural cooling			Fan cooling				Natural cooling		Fan cooling		
Weight			[lbs]	1.3	1.3	1.3	1.5	3.7	3.7	5.1	2.4	2.6	3.7	3.7	5.1

2) 1-phase 230V series

Item				Specifications					
Input power source				1-phase 230V class					
Type 6KXC121___X9 * *				F12	F25	F50	001	002	003
Nominal applied motor *1			[hp]	1/8	1/4	1/2	1	2	3
			[kW]	0.1	0.2	0.4	0.75	1.5	2.2
Output ratings	Rated capacity *2 [kVA]			0.31	0.59	1.1	1.9	3.1	4.3
	Rated voltage *3 [V]			3-phase, 200V/50 Hz, 200, 220, 230V/60 Hz					
	Rated current	[A]	High carrier (4-15 kHz)	0.7	1.4	2.5	4.2	7.0	10.0
			Low carrier (-3 kHz)	0.8	1.5	3.0	5.0	8.0	11.0
	Overload capability			150% of rated current for 1 min, 200% of rated current for 0.5 s					
	Rated frequency			50, 60 Hz					
Input ratings	Phase, voltage, frequency			1-phase, 200 to 240V, 50/60 Hz					
	Voltage/frequency variations			Voltage: +10 to -10% Frequency: +5 to -5%					
	Momentary voltage dip capability *4			When the input voltage is 165V or more, the drive continues operation. If it drops below 165V, the drive operates for 15 ms.					
	Rated current *9 [A]		(with DCR)	1.1	2.0	3.5	6.4	11.6	17.5
			(without DCR)	1.8	3.3	5.4	9.7	16.4	24.8
	Required power supply Capacity *5		[kVA]	0.3	0.5	0.8	1.3	2.4	3.6
Braking	Torque *6		[%]	150		100		50	30
	Torque *7		[%]	-		150			
	DC injection braking			Starting frequency: 0.0 to 60.0 Hz, braking time: 0.0 to 30.0 s, braking current: 5 to 100% of rated current					
Conformity to safety standards				UL508C, C22.2No.14, EN50178:1997					
Enclosure (IEC60529)				IP20					
Cooling method				Natural cooling				Fan cooling	
Weight			[lbs]	1.3	1.3	1.3	1.8	3.7	5.1

*1) GE 4-pole standard motor
*2) Drive output capacity (kVA) at 230V/460V
*3) Output voltage cannot exceed the power supply voltage.
*4) Tested under standard conditions with 85% nominal motor load.
*5) Obtained with a dc reactor.
*6) Average braking torque with AVR control OFF (varies with motor efficiency.)
*7) Average braking torque using external braking resistor (optional)
No braking resistor is available for 1/8 hp, 1/4 hp.
*8) Voltage unbalance [%] = Max voltage [V] - Min voltage [V]/3=phase average voltage [V] x 67 (IEC61800-3 (5.2.3)) If this value is 2 to 3%, use ac reactor (option).
*9) Calculated under GE Fuji specified conditions.

Common Specifications

Item			Explanation	
Output frequency	Setting range	Maximum frequency	25 to 400 Hz	
		Base frequency	25 to 400 Hz	
		Starting frequency	0.1 to 60.0 Hz	
		Carrier frequency	0.75 to 15k Hz (Frequency may drop automatically to protect the drive running at 7kHz or higher.)	
	Accuracy (Stability)		Analog setting: ±2% of max freq. (at 25°C), temperature drift: ±0.2% of max freq. (at 25±10°C) Keypad setting: ±0.01% of max freq. (at 25°C), temperature drift: ±0.01% of max freq. (at -10 to +50°C)	
	Setting resolution		Analog setting: 1/1000 of max freq. Keypad setting: 0.01 Hz (99.99 Hz or less), 0.1 Hz (100.0 to 400.0 Hz) Link setting: Selectable from 2 types 1/20000 of max freq. (ex. 0.003 Hz at 60 Hz, 0.006 Hz at 120 Hz, 0.02 Hz at 400 Hz) 0.01 Hz (fixed)	
Control	Control method		V/Hz control (Simplified torque-vector control)	
	Voltage/freq. characteristic	200V 100V class	Output voltage between 80 and 240V can be set at base frequency and at maximum. AVR control can be turned ON or OFF.	
			Desired 1 point on non-linear V/Hz curve: 0 to 240V, 0 to 400 Hz can be set.	
		400V class	Output voltage between 160 and 500V at base frequency and at maximum output frequency (common spec). AVR control can be turned ON or OFF.	
			Desired 1 point on non-linear V/Hz curve: 0 to 500V, 0 to 400 Hz can be set.	
	Torque boost		Auto torque boost (constant torque load) Manual torque boost (Constant torque load or variable torque load can be selected.)	
	Starting torque		150% or over (Auto torque boost in 5 Hz operation)	
	Start/Stop		Keypad operation: Start and stop with RUN/STOP keys External signal: FWD-stop (REV-stop) [3-wire operation possible], (Digital input) coast-to-stop command, external alarm, alarm reset, etc. Timer operation: Stop after elapse of the time set with the keypad. Link operation: Communication via RS485 (option)	
	Frequency setting		Can be set with UP or DOWN key. Can be set with built-in potentiometer. Can be set with external potentiometer.	
		(Analog input)	0 to +10 Vdc 4 to 20mA dc	
		(Multistep freq. setting)	Multistep speed operation: Selectable from 8 steps by 3-bit external signal	
		(Link operation)	Can be set with communication via RS485 (option)	
	(Freq. setting change)		Two types of freq. settings can be switched with an external signal (digital input).	
	(Freq. aux. setting)		Built-in potentiometer, terminal 12 input, or terminal C1 input can be selected to add the frequency.	
	(Inverse operation)		Possible to switch (0 to +10 Vdc)/(0 to 100%) to (+10 to 0 Vdc)/(0 to 100%) with an external signal. Possible to switch (4 to 20mA dc)/(0 to 100%) to (20 to 4mA dc)/(0 to 100%) with an external signal.	
	Acceleration/ deceleration time		Programmable from 0.00 to 3600s. (Two accel/decel profiles can be programmed.) Four acceleration and deceleration patterns can be selected: Linear, S-curve (weak), S-curve (strong), Non-linear (Max. constant output).	
	DC injection braking		Starting frequency: 0.0 to 60.0 Hz, Braking time: 0.0 to 30.0s, Braking level: 5 to 100% of rated current	
	Frequency limiter		High and low limiters [Hz] can be set. (Setting range: 0 to 400 Hz)	
	Bias frequency		Biases of set freq. and PID command can be set between 0 and ±100%.	
	Gain for frequency setting		Analog input gain can be set within the range from 0 to 200%. At voltage input, proportional frequency can be set to 10.5V and 21mA by adjusting gain.	
	Jump frequency control		Three operation points and their jump hysteresis width (0 to 30 Hz) can be set.	
	Jogging operation		Operation by the RUN key or digital input signal (FWD¤REV) (Frequency setting and ACC/DEC time common setting exclusive for jogging)	
	Timer operation		Operation starts and stops at the time set from keypad (1 cycle).	
	Auto-restart after momentary power failure		Restarts the drive without stopping the motor after instantaneous power failure.	
	Slip compensation		Compensates for decrease in speed according to the load during constant speed operation.	
	Current limit (By hardware)		Limits the current to prevent overcurrent trip caused by rapid load change or instantaneous power failure when current limitation by the software is impossible. (This function can be canceled.)	
	(By software)		Automatically reduces the frequency to make output current under the preset value. (Current limit condition can be selected from between “constant speed operation only” and “acceleration and constant speed operation”.)	
	PID control		Process PID control can be made. Process command: Keypad, built-in potentiometer, analog input (12, C1), RS485 communication Feedback signal: Analog input (12, C1)	
	Automatic deceleration		If selected, makes the deceleration time three times longer to avoid OV trip when dc link circuit voltage exceeds the overvoltage limit.	
	Auto energy saving operation		Controls output voltage to minimize motor loss during constant speed operation. (Torque boost during acceleration can be selected from manual variable torque, manual constant torque and auto torque.)	
	Overload prevention control		Decreases the output frequency automatically to prevent tripping before the inverter’s overload preventive function is activated by ambient temperature rise, frequent use, or large motor load.	
	Cooling fan stop operation		Detects drive inside temperature and stops cooling fan when the temperature is low.	

The simplified torque-vector control system and the automatic torque boost function provide consistent high torque.

Broad Product Family

GE Fuji Electric has a wide range of 230V and 460V 3-phase, and 1-phase drives to meet all your variable speed drive applications.

The AF-300 G11™

One of the most versatile drives in the industry.

1/4 to 125 hp in 230 Vac
1/2 to 600 hp in 460 Vac

The AF-300 E11™

High performace in a small package.

1/8 to 10 hp in 230 Vac
1/2 to 10 hp in 460 Vac

The AF-300 P11™

Ideal for pump systems and air moving systems.

1/4 to 150 hp in 230 Vac
1/2 to 800 hp in 460 Vac

Safety Precautions

1. The contents of this catalog are provided to help you select the product model that is best for your application. Before actual use, be sure to read the applicable instruction Manual or User's Manual thoroughly to assure correct operation by trained and qualified personnel.

2. This product is not designed or manufactured for use in machines or systems on which human life is dependent. If you are planning to use the products described here for special purposes such as: control of nuclear power stations; in sea, air or space craft; in medical equipment; for land transportation; or in any systems related to these applications, please contact GE Fuji. If these products are to be used in any equipment in which there is a risk to human life or the possibility of a major loss in the event of failure, be sure to install the appropriate safety equipment.

GE Fuji Drives USA

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