



www.saftronics.com

PC10

Mini Vector AC Drive



Engineering Specification Guide

Saftronics, Inc.
5580 Enterprise Pkwy., Ft. Myers, FL 33905
Telephone: (239) 693-7200
Fax: (239) 693-2431
www.saftronics.com

REV January 2003
Document Part Number 027-2139E

CONTENTS		PAGE
1	Three-Phase 230V Input	3
2	Three-Phase 460V Input	4
3	Common Specifications	5

1. THREE-PHASE 230V INPUT

Item		Detail specifications								
Drive HP		1/8	1/4	1/2	1	2	3	5	7.5	10
Nominal applied motor ^{*1} [Hp]		1/8	1/4	1/2	1	2	3	5	7.5	10
Output ratings	Rated capacity ^{*2} [kVA]	0.3	0.6	1.2	2.0	3.2	4.4	6.8	9.9	13.1
	Rated voltage ^{*3} [V]	Three-phase 200V / 50 Hz, 200V, 220V, 230V / 60 Hz (with AVR function) ^{*12}								
	Rated current ^{*4} [A]	0.7 (0.8)	1.4 (1.5)	2.5 (3.0)	4.0 (5.0)	7.0 (8.0)	10 (11)	16.5 (17)	23.5 (25)	31 (33)
	Overload current rating	150% of rated output current for 1 min. 200% of rated output current for 0.5 s								
	Rated frequency [Hz]	50, 60Hz								
Input ratings	Phases, Voltage, Frequency	Three-phase 200 to 230 V / 50 to 60 Hz ^{*11}								
	Voltage/frequency fluctuation	Voltage : +10 to -15% Voltage unbalance 2% or less ^{*10} Frequency : +5 to -5%								
	Momentary voltage dip capability ^{*5}	Operation continues at 165V or higher voltage. When the input voltage drops below 165V from the rated voltage, operation continues for 15 ms.								
	Rated current [A] (With DCR) (Without DCR) ^{*9}	0.59 1.1	0.94 1.8	1.6 3.4	3.1 6.4	5.7 11.1	8.3 16.1	14 25.5	19.7 40.8	26.9 52.6
	Required power supply capacity ^{*6} [kVA]	0.3	0.4	0.6	1.1	2.0	2.9	4.9	6.9	9.4
Braking	Braking torque ^{*7} [%]	100		70			40		20	
	Braking torque ^{*8} [%]	150								
	DC braking	Starting frequency: 0.0 to 60 Hz, braking current (0 to 100% in 1% increment), braking time (0.0 to 30.0 s)								
Enclosure(IEC60529)		IP20								
Cooling method		Self cooling				Fan cooling				
Weight (lbs)		2.4	2.4	2.8	3.1	5.1	5.1	7.9	17.7	17.7

*1 The applicable standard motor refers to a 4 pole standard motor.

*2 The rated capacity indicates a 230V input rating.

*3 Voltages greater than the source voltage cannot be output.

*4 Amperage values in parentheses () are applicable to operation with 3 kHz or lower carrier frequencies (f26 = 3 or less). These values also apply when the ambient temperature is below 40°C.

*5 Tests are performed under standard load conditions (load equivalent of 85% with an applicable standard motor) defined by JEMA.

*6 Data is with DC reactor (DCR) installed.

*7 Indicates the average braking torque for decelerating and stopping one motor from 60Hz. (Varies according to the efficiency of the motor.)

*8 Indicates the value with an external braking resistor (option).

*9 Calculated on assumption that the drive is connected to 500 kVA power supply.

*10 Refer to IEC1800-3 5.2.3.

*11 Safe separation for control interface of this drive is provided when this drive is installed in overvoltage category II (CE standard). Basic insulation for control interface of this drive is provided when this drive is installed in overvoltage category III (CE standard).

*12 Automatic voltage regulator. (FO5)

2. THREE-PHASE 460V INPUT

Item		Detail specifications						
Drive HP		1/2	1	2	3	5	7.5	10
Nominal applied motor ^{*1} [Hp]		1/2	1	2	3	5	7.5	10
Output ratings	Rated capacity ^{*2} [kVA]	1.2	2.0	2.9	4.4	7.2	10.3	14.3
	Rated voltage ^{*3} [V]	Three-phase 380,400,415V/50Hz, 380,400,440,460V/60Hz (with AVR function)						
	Rated current ^{*4} [A]	1.4 (1.5)	2.1 (2.5)	3.7 (3.7)	5.3 (5.5)	8.7 (9.0)	12 (13)	16 (18)
	Overload capability	150% of rated output current for 1 min. 200% of rated output current for 0.5s						
	Rated frequency [Hz]	50, 60Hz						
Input ratings	Phases, Voltage, Frequency	Three-phase 380 to 480 V / 50 to 60Hz ^{*11}						
	Voltage/frequency fluctuation	Voltage : +10 to -15% Voltage unbalance 2% or less ^{*10} Frequency : +5 to -5%						
	Momentary voltage dip capability ^{*5}	Operation continues at 300V or higher voltage. When the input voltage drops below 300V from the rated voltage, operation continues for 15 ms.						
	Rated current [A] (With DCR)	0.82	1.5	2.9	4.2	7.1	10.0	13.5
	(Without DCR) ^{*9}	1.8	3.5	6.2	9.2	14.9	21.5	27.9
Required power supply capacity ^{*6} [kVA]	0.6	1.1	2.1	3.0	5.0	7.0	9.4	
Braking	Braking torque ^{*7} [%]	70			40		20	
	Braking torque ^{*8} [%]	150						
	DC braking	Starting frequency: 0.0 to 60.0 Hz, braking current (0 to 100% in 1% increment), braking time (0.0 to 30.0 s)						
Enclosure(IEC60529)		IP20						
Cooling method		Natural cooling			Fan cooling			

*1 The applicable standard motor refers to a 4 pole standard motor.

*2 The rated capacity indicates a 460V input rating.

*3 Voltages greater than the source voltage cannot be output.

*4 Amperage values in parentheses () are applicable to operation with 3 kHz or lower carrier frequencies (F26 = 3 or less). These values also apply when the ambient temperature is below 40°C.

*5 Tests at standard load condition (85% load).

*6 Indicates the value when using a DC reactor (DCR).

*7 Indicates the average braking torque for decelerating and stopping one motor from 60Hz. (Varies according to the efficiency of the motor.)

*8 Indicates the value with an external braking resistor (option).

*9 Calculated on assumption that the drive is connected to 500 kVA power supply.

*10 Refer to IEC61800-3 5.2.3.

*11 Safe separation for control interface of this drive is provided when this drive is installed in overvoltage category II (CE standard). Basic insulation for control interface of this drive is provided when this drive is installed in overvoltage category III (CE standard).



*12 Automatic voltage regulator. (FO5)

3. COMMON SPECIFICATIONS

Item		Detail specifications	
Output frequency	Adjustment	Maximum frequency	50 to 400 Hz variable
		Base frequency	25 to 400 Hz variable
		Starting frequency	0.1 to 60.0 Hz variable, Holding time : 0.0 to 10.0s
		Carrier frequency	0.75 to 15 kHz (The carrier frequency may automatically drop to 0.75 kHz to protect the inverter.)
	Accuracy	Analog setting: Within $\pm 0.2\%$ ($25 \pm 10\text{ }^\circ\text{C}$) Digital setting: Within 0.01% (-10 to $+50\text{ }^\circ\text{C}$)	
Setting resolution	Analog setting: 1/3000 of maximum output frequency Keypad panel setting: 0.01 Hz (99.99 Hz or lower), 0.1 Hz (100.0 to 400.0 Hz) Link setting : 1/20000 of Maximum frequency (0.003Hz at 60Hz,0.006Hz at 120Hz,0.02Hz at 400Hz) or 0.01Hz (Fixed)		
Control	Voltage/freq. Characteristics	Adjustable at base and maximum frequency, with AVR control : 80 to 240 V(200V class),160 to 480V(400V class)	
	Torque boost	Automatic : Automatic torque boost can be selected with code setting. Manual : Setting by codes 1 to 31 (Boost for Variable torque available)	
	Starting torque	Starting torque 200% or above (with dynamic torque vector turned on, during 0.5 Hz operation)	
	DC braking	Braking time (0.0 to 30.0 s), braking current (0 to 100%), braking starting frequency (0.0 to 60.0 Hz) variable	
	Control method	Sinusoidal PWM (Dynamic torque vector control) with "current vibration suppression function" and "dead time compensation function"	
	Operation method	Keypad operation: starting and stopping with RUN and STOP keys. Digital input signal: forward (reverse) operation, stop command (3-wire operation possible), coast-to-stop command, external alarm, error reset, etc. Link operation : RS485 Modbus RTU (Standard) Profibus-DP,Interbus-S,DeviceNet,Modbus Plus, CAN open (Option)	

*1 Automatic voltage regulator (FO5).

COMMON SPECIFICATIONS - CONTINUED

Item	Detail specifications
Frequency setting (UP/DOWN control) (Multistep frequency) (Link operation)	Keypad operation:  key and  key. Setting with potentiometer (external potentiometer: 1 to 5 k Ω 1/2 W) Setting with 0 to ± 5 Vdc. Setting with 0 to ± 10 Vdc. Setting with 4 to 20 mAdc. 0 to +10 Vdc / 0 to 100% can be switched to +10 to 0 Vdc / 0 to 100% externally. 4 to 20 mAdc / 0 to 100% can be switched to 20 to 4 mAdc / 0 to 100% externally. An external signal can be used to control the UP or DOWN command. Up to 16 different frequencies can be selected by digital input signals. Link operation : RS485 (Standard) Profibus-DP, Interbus-S, DeviceNet, Modbus Plus, CAN open (Option)
Acceleration / deceleration time (Mode select)	Variable setting in 0.01 to 3600s range. (2 sets of time can be set internally for each of acceleration and deceleration.) Linear, S-curve (weak, strong), Non-linear available.
Frequency limiter	The high and low frequency limits can be set variably in a 0 to 100% range in Hz.
Bias frequency	Can be set variably in -400 to 400 Hz range.
Gain (frequency setting)	Can be set variably in a 0 to 200% range.
Jump frequency control	Three jump frequencies and jump width (0 to 30 Hz) can be set.
Rotating motor pickup (Flying start)	Operation without shock is possible.
Auto-restart after momentary power failure	The motor speed can be detected after power recovery so that the motor is started at the speed.
Slip compensation control	The load during regular operation can be detected for the control of the frequency. The compensation value can be set variably in a 0.00 to +15.00 Hz range to the rated frequency.
Droop operation	The load during regular operation can be detected for the control of the frequency. The compensation value can be set in a -9.9 to 0.0 Hz range to the rated frequency. (Speed droop characteristics)
Torque limiter	When the load torque in the driving or braking mode exceeds the setting, the frequency is controlled to control the load torque to an almost constant level. The limiting torque can be set 20 to 200% and the driving and braking torque values can be independently set. The second torque limits can be set.

COMMON SPECIFICATIONS - CONTINUED

Item	Detail specifications
Control	<p>This function can control flowrate, pressure, etc. with analog feedback signal. The reference and feedback values are displayed in %.</p> <p>Reference signal</p> <p>Keypad operation (▲) key and (▼) key. : 0.0 to 100%</p> <p>Voltage input (Terminal 12) : 0 to 10Vdc</p> <p>Current input (Terminal C1) : 4 to 20mAdc</p> <p>Multistep frequency setting : Setting freq./Max. freq.x100%</p> <p>RS485 : Setting freq./Max. freq.x100%</p> <p>Feedback signal</p> <p>Terminal 12 (0 to +10Vdc or +10 to 0Vdc)</p> <p>Terminal C1(4 to 20mAdc or 20 to 4mAdc)</p>
	<p>Second motor's setting</p> <p>The V/f pattern of the second motor can be internally set for selection by means of an external signal.</p> <p>The constant of the second motor can be internally set for selection by means of an external signal.</p> <p>The electronic thermal overload relay of the second motor can be internally set for selection by means of an external signal.</p>
	<p>Energy saving operation</p> <p>Weak magnetic flux can be set for small loads for operation with an increased motor efficiency.</p>
Display	<p>During operation/stop</p> <p>The keypad panel can be extended. (Optional 5m extension cable is available.)</p> <p>7-segment LED display items</p> <ul style="list-style-type: none"> • Set frequency • Output frequency • PID setting/feedback value • Output current • Motor r/min • Output voltage • Line speed <p>(A soft filter is provided to attenuate the fluctuation in the displayed value.)</p> <p>A charge lamp indicates power supply.</p>
	<p>When setting</p> <p>The function code and data code are displayed.</p>
	<p>When tripping</p> <p>[The cause of tripping is displayed.]</p> <ul style="list-style-type: none"> • OC1 (overcurrent: during acceleration) • OC2 (overcurrent: during deceleration) • OC3 (overcurrent: during constant speed operation) • OU1 (overvoltage: during acceleration) • OU2 (overvoltage: during deceleration) • OU3 (overvoltage: during constant speed operation) • LU (undervoltage) • Lin (input phase loss) • dbH (external damping resistor overheat (thermal overload relay)) • OH1 (overheat: heat sink) • OH2 (overheat: external thermal overload relay) • OL1 (overload: motor 1) • OL2 (overload: motor 2) • OLU (overload: inverter) • Er1 (memory error) • Er2 (keypad panel communication error) • Er3 (CPU error) • Er4 (option error) • Er5 (option error) • Er7 (output wiring error) (impedance unbalance) • Er8 (RS485 communication error)
	<p>During operation, when tripping</p> <p>The latest four records of trip history are stored and displayed.</p>

COMMON SPECIFICATIONS - CONTINUED

	Item	Detail specifications
Protection	Overload protection	Inverter protection electronic thermal overload relay
	Overvoltage protection	An excess in the DC link circuit voltage (approx. 400 Vdc for 200V class, approx. 800Vdc for 400V class) is detected for inverter protection.
	Overcurrent protection	The inverter is protected against an overcurrent caused by an overload on the output side.
	Surge protection	The inverter is protected against a surge voltage penetrating between the power supply cable of the main circuit and the ground.
	Undervoltage protection	Voltage drop (approx. 200Vdc for 200V class, approx. 400Vdc for 400V class) in the DC link circuit voltage is detected to stop the inverter.
	Overheat protection	The inverter is protected against failure and overload of the cooling fan.
	Short-circuit protection	The inverter is protected against an overcurrent caused by a short-circuit on the output side.
	Ground fault protection	The inverter is protected against an overcurrent caused by ground fault in the output wiring. * Detection when starting
	Motor protection	Electronic thermal overload relays protect general purpose motors and Fuji's inverter motor. The thermal time constant can be adjusted to 0.5 to 10.0 min. Second electronic thermal overload relay can be provided. (Switching with external signal)
	Braking resistor protection	Upon an overheat of the damping resistor (external unit), discharging operation and inverter operation stop
	Stall prevention (simple torque limit)	<ul style="list-style-type: none"> • When the output current exceeds the setting during acceleration, the frequency change is stopped to avoid overcurrent stop. • When the output current exceeds the setting during constant speed operation, the frequency is decreased to maintain an almost constant torque. • When the DC voltage exceeds the limit during deceleration, the frequency change is stopped to avoid overvoltage stop.
	Input phase loss protection	The inverter is protected against phase loss in the input voltage.
	Output phase loss protection	An unbalance in the impedance of the output circuit is detected to output an alarm. (Error during tuning only)
	Auto reset	The number of retries and wait time can be set for the alarm stop.
Environment	Installation location	<ul style="list-style-type: none"> • Indoors • Places without corrosive gases, flammable gases or dust (degree of pollution: 2) • Places without direct sunlight
	Ambient temperature	-10 to +50 °C
	Relative humidity	5 to 95% RH (without condensation)
	Altitude	1000 m Max. (Atmospheric pressure 86 to 106 kPa)
	Vibration	3mm 2 to 9 Hz 9.8m/s ² 9 to 20 Hz 2m/s ² 20 to 55 Hz 1m/s ² 55 to 200 Hz
	Storage temperature	-25 to +65 °C
	Storage humidity	5 to 95% RH (without condensation)