

# AF-3100 $\alpha$

## General-purpose High-performance Inverter

AF-3100 $\alpha$  SERIES



 **SUMITOMO**  
MACHINERY CORPORATION OF AMERICA

Catalog

10.092.50.001

## General-Purpose High-Performance Inverter

# AF-3100 $\alpha$ SERIES

### Sensorless Vector, Volts/Hertz and Closed Loop Vector



Type of AF-3100 $\alpha$

AF312 2 - 5A5-U

5A5: 5.5kW/7.5 HP  
 7A5: 7.5kW/10 HP  
 011: 11kW/15 HP  
 015: 15kW/20 HP  
 022: 22kW/30 HP  
 030: 30kW/40 HP  
 037: 37kW/50 HP  
 045: 45kW/60 HP  
 055: 55kW/75 HP  
 075: 75kW/100 HP

2: 3-phase 200-230 V  
 4: 3-phase 380-460 V

Series name: AF-3100 $\alpha$

Note: 22kW to 75kW, 380-460 V class only.

### All types ensure silent operation

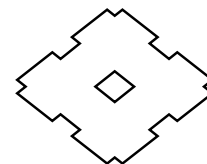
Adoption of the latest IGB technology ensures more silent and powerful operation.

### High-performance auto-tuning

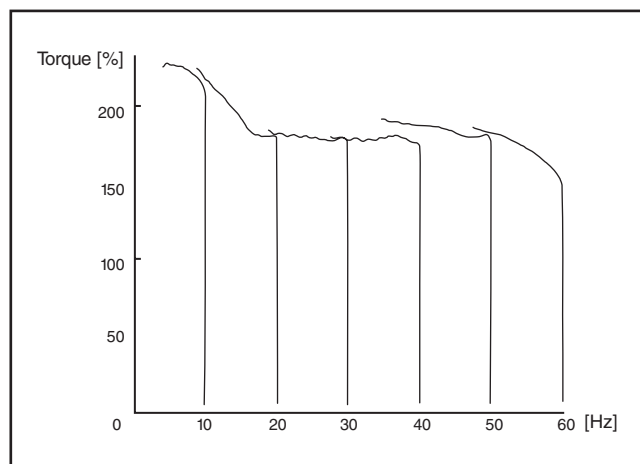
Just select the auto-tuning function, and the motor data are read automatically and the motor is controlled under optimum conditions.

### Complete control functions

Three modes of operation:  
 Sensorless Vector, Volts/Hertz  
 and Closed Loop Vector.

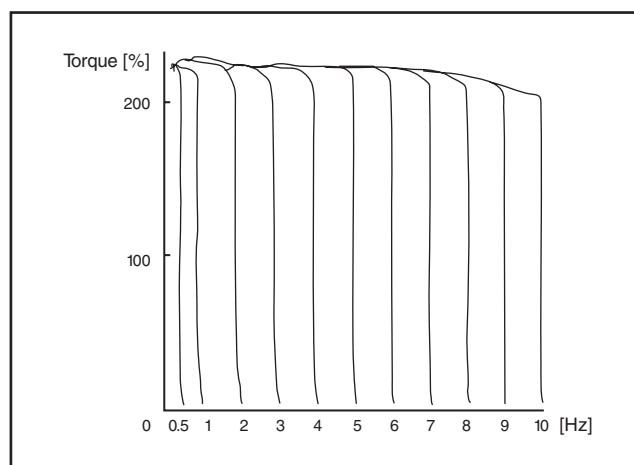


# FEATURES AND BENEFITS



- **High Precision Speed Control  $\pm 0.2\%$**
- **120:1 Constant Torque Speed Range [Sensorless Vector Mode]**
- **Sensorless Vector Control Mode**
- **Volts/Hertz Mode**
- **Closed Loop Vector Mode (1000:1 Constant Torque Speed Range)**

- **250% Maximum Starting Torque (Vector Mode)**
- **High-performance Auto-tuning**
- **Multi-motor (B-mode)**
- **IGBT Technology**
- **16 Preset Speeds**



## CONTENTS

Specifications . . . . .	2, 3
Operation Unit (OPU) . . . . .	4
Display . . . . .	5
Parameter Menus . . . . .	6-9
Option Cards . . . . .	10, 11

Options and Peripheral Equipment. . .	12, 13
Connection Diagram . . . . .	14
Terminal Functions . . . . .	15
Outside Dimensions. . . . .	16, 17

# SPECIFICATIONS

## 200V class

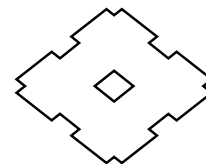
Type			AF3122 -5A5-U	AF3122 -7A5-U	AF3122 -011-U	AF3122 -015-U
Output	Applicable motor output (kW)		5.5	7.5	11	15
	Rated capacity (kVA)   Note 1		10	13	18	24
	Rated current (A)		24	32	44	56
	Rated overload current   Note 2		150% 1 min; 200% 0.5 sec			
	Rated voltage (V)   Note 3		3-phase; 200~230V			
Power Supply	Phase/voltage/frequency		3-phase; 200~220V/50Hz, 200~230V/60Hz			
	Voltage & frequency variance		Voltage: -15% and +10%   Frequency: ±5%			
	Required power capacity (kVA)   Note 4		7.6	10	15	20
Braking Torque	Standard		Approx. 10%			
	If option is used	Type	Braking resistor			
		Torque	150% or greater, short duty cycle			
Protective construction			Open Note 6		NEMA1	
Cooling method			Forced air cooling			
Approx. weight (kg)   Note 6			9	9	11	16

Note 1: Rated output voltage is 220 V.  
 2: The ratio (%) to the rated current of the inverter.  
 3: The maximum output voltage will not exceed the supply voltage. Any desired voltage smaller than the supply voltage can be set.  
 4: If an AC line reactor (AC/DC: option) is used.  
 5: The braking torque and the operation rate are subject to the braking unit and braking resistor used.  
 6: UL Approved in open chassis only (enclosure same as all other models).

## 400V class

Type			AF3124 -5A5-U	AF3124 -7A5-U	AF3124 -011-U	AF3124 -015-U	AF3124 -022-U	AF3124 -030-U	AF3124 -037-U	AF3124 -045-U	AF3124 -055-U	AF3124 -075-U
Output	Applicable motor output (kW)		5.5	7.5	11	15	22	30	37	45	55	75
	Rated capacity (kVA) Note 1		10	13	19	24	36	48	61	73	86	115
	Rated current (A)		13	16	24	32	48	64	80	96	112	150
	Rated overload current Note 2		150% 1 min; 200% 0.5 sec									
	Rated voltage (V) Note 3		3-phase; 380/V, 400~440V and 460V									
Power Supply	Phase/voltage/frequency		3-phase; 380Vand 400~420V/50Hz; 400~440V and 460V/60Hz									
	Voltage & frequency variance		Voltage: Within -15% and +10% Frequency: Within ±5%									
	Required power capacity (kVA) Note 4		7.6	9.9	14	19	29	39	48	58	71	98
Braking Torque	Standard		Approx. 10%									
	If option is used	Type	Braking resistor				Braking resistor and braking unit					
		Torque	150% or greater, short duty cycle				100% or greater Note 5					
Protective construction			Open	Note 6	NEMA 1							
Cooling method			Forced air cooling									
Approx. weight (kg)			9	9	11	16	26	32	45	45	58	65

Note 1: The rated output voltage is 440 V.  
 2: The ratio (%) to the rated current of the inverter.  
 3: The maximum output voltage will not exceed the supply voltage. Any desired voltage smaller than the supply voltage can be set.  
 4: If an AC line reactor (AC/DC: option) is used.  
 5: The braking torque and the operation rate are subject to the braking unit and braking resistor used.  
 6: UL Approved in open chassis only (enclosure same as all other models).



# SPECIFICATIONS

## Control method

Control	Control method	Sensorless Flux Vector, V/Hz, Closed Loop Vector
	Output frequency range	0~400.00Hz
	Frequency adjustment resolution	0.01 Hz: Digital setting 1/1000 of max. output frequency: Analog setting
	Frequency accuracy	0.01% of preset frequency: Digital setting Within $\pm 0.5\%$ of max. frequency ( $25 \pm 10^\circ\text{C}$ )
	Carrier frequency	Variable: 2.5-14.45 The maximum carrier frequency decreases for 30 kW or greater.
	Voltage/frequency characteristics	Three separate V/Hz patterns are possible.
	Torque boosting	Manual boosting (variable: 0-30%), automatic boosting, and sensorless speed control (automatic tuning)
	DC braking	Variable braking frequency start, 0.5-10 Hz; operation time, 0-10 sec; operation voltage, 0-30%.
	Acceleration/deceleration time	0.1-3,000 sec; selection of linear or S Curve; 1st and 2nd settings
	Frequency adjustment signal	Digital
		Analog
	Stall prevention	Variable: 0-200% (Factory preset at 160%)
	Starting torque	200% or greater if sensorless control is selected.
	Speed variance rate	$\pm 0.2\%$ or less. The load is 0-100% when sensorless control is selected.
	Trip-less operation	Current limit during constant speed operation, current limit during acceleration/deceleration, overvoltage stall prevention, instantaneous overcurrent limit function, and instantaneous stop restart function
Display	Operation input signal	Coast stop, external fault, FWD, REV rotation, external wiring. The following digital inputs are programmable. Note 1: Preset speed selection, JOG selection, 2nd acceleration/deceleration selection, B mode selection (See Note 2), operation command selection, frequency command selection, hold selection, frequency increase, frequency decrease, and catch on the fly start
	Output signal	Fault output via contacts FA and FB The following open collector outputs (See Note 3): Inverter fault output FA and FB, in operation, at frequency, frequency detection 1, frequency detection 2, current detection 1, current detection 2, start contact point ON, under-voltage, electronic thermal pre-alarm, stalling, retry attempt, torque detection 1, torque detection 2, zero speed detection, and user alarm
	Operation function	Upper/lower limit frequency setting, jump frequency, frequency bias, and instantaneous stop restart operation
Environment	Condition of operation	Output frequency, output voltage, output current, overload rate, custom display (display converted motor/load shaft speed (rpm) and line speed with unit indication), torque monitor, VRF monitor, IRF monitor, input/output contact point monitor, DC bus voltage, command frequency, cumulative operation time, ROM version, and two line display, such as output frequency and output current
	Preset information	Display of parameter and data
	Fault display	Upon a protective function (fault) the details are displayed. Up to four preceding errors can be displayed.
	Suggested locaton	Indoor. There shall be no corrosion, toxicity, inflammable gas, dust, or oil mist.
	Ambient temperature	-10 to $+40^\circ\text{C}$ ( $+50^\circ\text{C}$ when installed inside the panel) Note 4
	Storage temperature	$-10^\circ\text{C} \sim +60^\circ\text{C}$
	Ambient humidity	90% RH or less (Dew condensation not allowed)
Environment	Altitude	1000 m or less above sea level
	Vibration	0.6 G or less (As per JIS C0911)

Note 1: Six out of eleven functions can be selected by setting parameters.

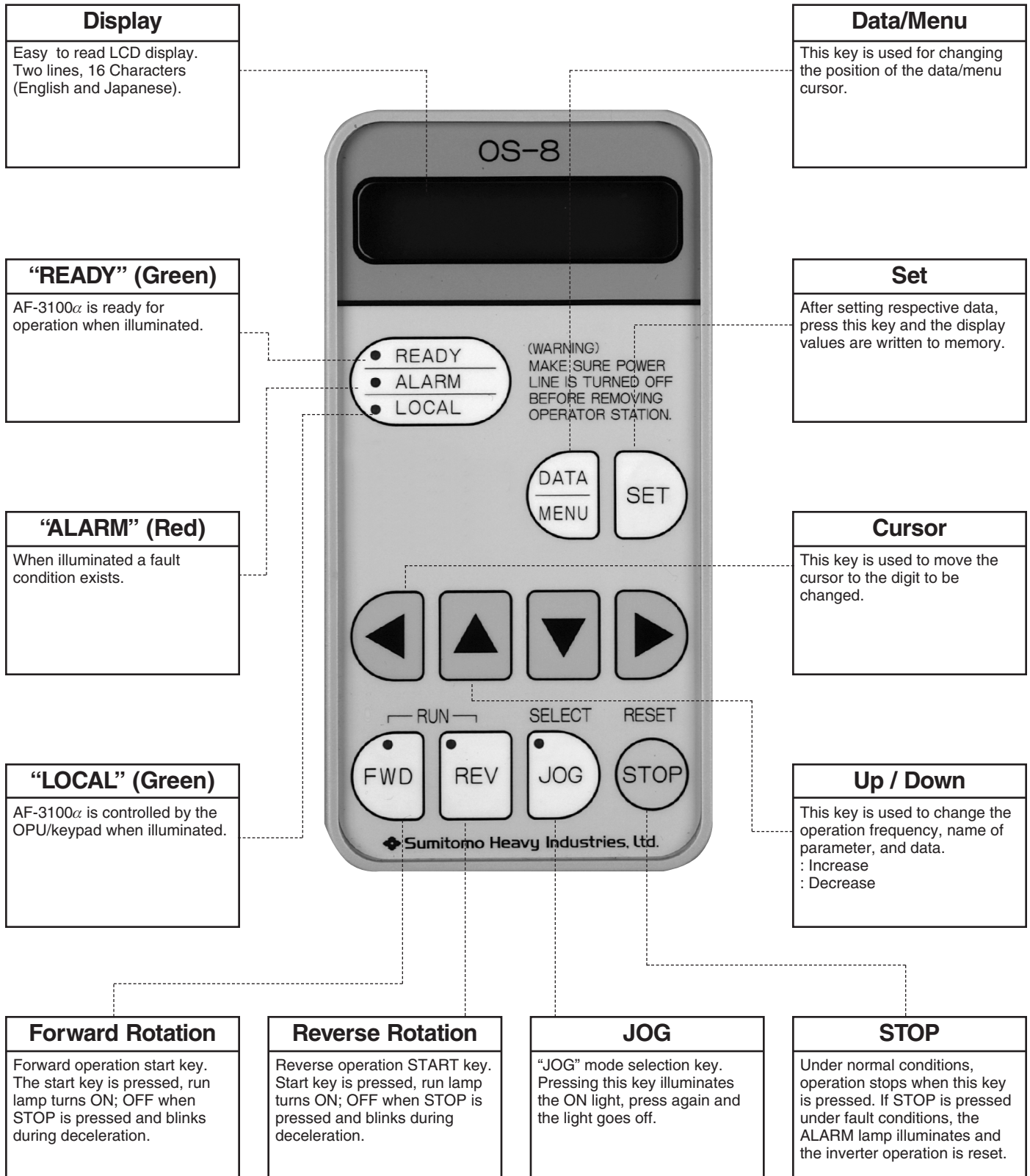
2: In addition to normal operation, the functions of acceleration/deceleration, V/Hz pattern, boost, and stall prevention can be changed. It is advantageous when two motors with different capacities are controlled by one inverter.

3: Four out of 15 functions can be selected by setting the appropriate parameters.

4: The maximum allowable temperature of  $50^\circ\text{C}$  can be achieved by removing the front cover if the equipment is installed inside an enclosure.

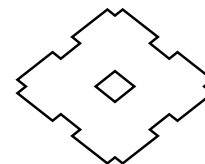
5: The base is the speed (rpm) at the base frequency.

# OPERATION UNIT (OPU)



\* If using the remote OPU removed from the main unit of the inverter, remote operation option is required.





# DISPLAY

Characters or numerals highlighted by the cursor can be changed on the OPU.

### Parameter Menu

(Line one, left side)

**Menu display area**

Press menu key.  
Move the cursor to line one, left side, using left arrow key and press the Up key and Down key .

Change the menu as follows:

When Down key is used

F 0 0

E 0 0

D 0 0

C 0 0

B 0 0

A 0 0

M 0 0

When Up key is used

### Menu number area

(Line one, left side, 2nd & 3rd characters)

**Parameter number**

Move the cursor to the 2nd and 3rd character from the left side, line one by pressing the right arrow key and press the Up key and Down key .

Change the numerical value at the position of the cursor.

### Data area

(Line one, left side, 4th character forward)

**Monitored value and preset value display area**

- M (monitor) shows the monitored value.  
(The cursor cannot be moved, and the monitored value cannot be changed.)
- Menus A-F show the preset parameters.  
(The cursor cannot be moved, and parameters cannot be changed.)

Note: Data exceeding the parameter range cannot be saved to memory.



### Display menu

**Monitor** M 0 0 ~

The monitor mode displays parameters such as speed, current, faults, etc.

**Menu A** A 0 0 ~

(Basic parameters)  
Used for setting basic parameters.

**Menu B** B 0 0 ~

(Frequency related parameters)  
Used for setting frequency related parameters.

**Menu C** C 0 0 ~

(Control related parameters)  
Used for setting motor control related parameters.

**Menu D** D 0 0 ~

(B mode parameters)  
Used for setting B mode related parameters.

**Menu E** E 0 0 ~

(Monitor related parameters)  
Used for setting monitor related parameters)

**Menu F** F 0 0 ~

(Special parameters)  
Used for setting special parameters.



### Comment area

(Line two)

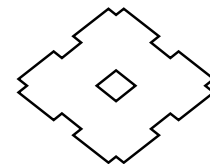
Comments on the functions of M (monitor) and A-F (functions) are shown in English. Display in KANA characters is possible.

# PARAMETER MENUS

## List of parameters

	Menu	Function	Display	Available Choices	Setting Unit	Factory Default	Ref. pg.
Basic parameters	A	00 Operation command mode	Operation command selection	0: Local; 1: Ext.	–	0: Local	35
		01 Frequency adjustment	Frequency adjustment	0.00~400.00Hz	0.01Hz	10.00Hz	
		02 Lower limit frequency	Lower Limit frequency	0.00~120.00Hz	0.01Hz	0:00Hz	
		03 Upper limit frequency	Upper limit frequency	0.50~400.00Hz	0.01Hz	120.00Hz	
		04 1st acceleration time	Acceleration time	0.1~3000.0sec	0.1sec	10.0sec	
		05 1st deceleration time	Deceleration time	0.1~3000.0 sec	0.1sec	10.0sec	
		06 1st acceleration/deceleration mode	Acceleration/deceleration time	0: Linear acceleration; 1: S-Curve acceleration	–	0: Linear acceleration	36
		07 1st S-Curve time	S-Curve time	0.0~3.0sec	0.1sec	0.5sec	
		08 V/Hz pattern selection	V/Hz pattern selection	0: Constant torque 1: Decreasing torque 2: Broken-line V/Hz	–	0: Constant torque	
		09 Boost voltage setting	Manual torque boost	0.0~30.0%	0.1%	3.0%	37
		10 Base frequency setting	Base frequency	1.00~400.00Hz	0.01Hz	60.00Hz	36
		11 Base frequency/voltage setting	Base voltage	0.0~230.0 (460.0) V	0.1V	( ) : For 460V Class	
		12 Frequency command selection	Frequency command selection	0: Local 1: VRF 5V 2: VRF 8V, 3: VRF 10V 4: IRF 200mA	–	0: Local	37
		13 Command standard frequency	Command standard frequency	1.00~400.00Hz	0.01Hz	60.00Hz	36
		14 Intermediate frequency	Intermediate frequency	0.00~400.00Hz	0.01Hz	6.00Hz	
		15 Intermediate voltage	Intermediate voltage	0.0~230.0 (460.0) V	0.1V	30.0(60.0)V	
		16 Boost selection	Boost selection	0: FWD/REV provided 1: REV not provided; 2: FWD provided 3: Automatic	–	0: FWD/REV provided	37
Frequency adjustment related parameters	B	00 1st frequency setting	1st frequency setting	0.00~400.00Hz	0.01Hz	20.00Hz	38
		01 2nd frequency setting	2nd frequency setting	0.00~400.00Hz	0.01Hz	30.00Hz	
		02 3rd frequency setting	3rd frequency setting	0.00~400.00Hz	0.01Hz	40.00Hz	
		03 4th frequency setting	4th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	
		04 5th frequency setting	5th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	
		05 6th frequency setting	6th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	
		06 7th frequency setting	7th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	
		07 1st jump start frequency	1st jump frequency start	0.00~400.00Hz	0.01Hz	0.00Hz	
		08 1st jump end frequency	1st jump frequency end	0.00~400.00Hz	0.01Hz	0.00Hz	
		09 2nd jump start frequency	2nd jump frequency start	0.00~400.00Hz	0.01Hz	0.00Hz	
		10 2nd jump end frequency	2nd jump frequency end	0.00~400.00Hz	0.01Hz	0.00Hz	
		11 3rd jump start frequency	3rd jump frequency start	0.00~400.00Hz	0.01Hz	0.00Hz	
		12 3rd jump end frequency	3rd jump frequency end	0.00~400.00Hz	0.01Hz	0.00Hz	
		13 Jogging frequency setting	Jogging frequency	0.00~20.00Hz	0.01Hz	5.00Hz	39
		14 Start frequency setting	Start frequency	0.00~60.00Hz	0.01Hz	0.50Hz	
		15 Acceleration frequency	Acceleration frequency	1.00~400.00 Hz	0.01Hz	60.00Hz	
		16 Frequency bias	Frequency bias	-30.0~0.0~+30.0%	0.1%	0.0%	
		17 2nd acceleration time	2nd acceleration time	0.1~3000sec	0.1sec	30.0 sec	
		18 2nd deceleration time	2nd deceleration time	0.1~3000sec	0.1sec	30.0sec	
		19 2nd acceleration/deceleration mode	2nd acceleration/deceleration mode	0: Linear acceleration; 1: S-Curve acceleration	–	0: Linear acceleration time	
		20 2nd S-Curve time	2nd S-Curve time	0.0~3.0sec	0.1sec	0.5sec	
		21 8th frequency setting	8th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	38
		22 9th frequency setting	9th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	
		23 10th frequency setting	10th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	
		24 11th frequency setting	11th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	
		25 12th frequency setting	12th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	
		26 13th frequency setting	13th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	
		27 14th frequency setting	14th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	
		28 15th frequency setting	15th frequency setting	0.00~400.00Hz	0.01Hz	0.00Hz	





	Menu	Function	Display	Available Choices	Setting Unit	Factory Default	Ref. pg.	
Control related parameters	C	00	DC braking frequency	DC braking frequency	0.00~10.00Hz	0.01Hz	0.50Hz	40
		01	DC braking voltage	DC braking voltage	0.0~30.0%	0.1%	0.0%	
		02	DC braking time	DC braking time	0.0~10.0sec	0.1sec	0.0sec	
		03	Overvoltage stall prevention	Overvoltage stall prevention	0: Not provided; 1: Provided	—	0: Not provided	
		04	Regenerative braking rate	Regenerative braking rate	0.0~30.0%	0.1%	0.0%	
		05	Stall prevention level at (constant speed)	Stall prevention (constant speed)	0.0~200.0%	0.1%	160.0%	
		06	Stall prevention level (accel/decel)	Stall prevention (Acceleration/deceleration)	0.0~200.0%	0.1%	160.0%	
		07	Constant output stall prevention compensation gain	Stall compensation gain	0.0~100.0%	0.1%	100.0%	
		08	Motor rated current (Electronic thermal relay)	Electronic thermal relay	0.1 ~ Inverter rated current	0.1A	Inverter rated current	41
		09	Number of motor poles	Number of motor poles	0:4P, 1: 6P	—	0: 4P	
		10	Motor type setting	Motor type See parameter C12, page 47.	0: General-purpose motor 1 1: General-purpose motor 2 2: General-purpose motor 3 3: AF motor 1; 4: AF motor 2 5: AF motor 3 6: Explosion-proof motor 1 7: Explosion-proof motor 2 8: Explosion-proof motor 3	—	0: General purpose motor 1 200V/60Hz (400V/60Hz)	41
		11	Motor rated watts	Motor rated watts	0: 2.2kW, 1: 3.7kW 2: 5.5kW, 3: 7.5kW 4: 11kW, 5: 15kW 6: 22kW, 7: 30kW 8: 37kW, 9: 45kW 10: 55kW, 11: 75kW	—	*kW	
		12	Control method selection	Control selection	0: V/Hz; 1: Sensorless 2: PG level	—	V/Hz	
		13	Carrier frequency	Carrier frequency	2.5Hz~*14 5kHz	0.5kHz	*	
		14	Motor wiring cable dia. (Note)	Cable diameter	3.5~325mm²	—	0: 3.5m²	
		15	Motor wiring cable length (Note)	Cable length	10~1500m	1m	10m	
		16	High start torque control selection	High start torque	0: Not provided; 1: Provided	—	0: Not provided	
		17	Energy saving control selection	Energy saving	0: Not provided; 1: Provided	—	0: Not provided	
	18	Droop control gain	Droop gain	0.0~50.0%	0.1%	0.0%		
	19	Slip compensation	Slip compensation	0: Provided; 1: FWD only provided 2: REV only provided 3: FWD/REV not provided 4: (future)	—	0: FWD/REV provided	42	
	20	Motor rated current	Tuning current	0.1~409.6A	0.1A	*		
	21	Motor rated voltage	Tuning voltage	0.1~230.0 (460.0) V	0.1V	200.0 (400.0) V		
	22	Motor rated frequency	Tuning frequency	50.00~120.00Hz	0.01Hz	60.00Hz		
	23	Motor rated speed (rpm)	Tuning speed (rpm)	1000.0~3600.0rpm	0.1rpm	—		
	24	Auto tuning selection	Auto tuning selection	0: End 1: Resistance only 2: Full tuning	—	0: End		
Motor B mode related parameters	D	00	B mode acceleration time	Acceleration time B	0.1~3000.0sec	0.1sec	30.0sec	43
		01	B mode deceleration time	Deceleration time B	0.1~3000.0sec	0.1sec	30.0sec	
		02	B mode acceleration/deceleration time	Accel/decel B mode	0: Linear acceleration; 1:S-Curve acceleration	—	0: Linear acceleration	
		03	B mode S-Curve time	S-Curve time B	0.0~3.0sec	0.1sec	0.0sec	44
		04	B mode V/Hz pattern selection	V/Hz pattern selection B	0: Low torque 1: Low limit torque 2: Break-point V/Hz	—	2: Broken-lineV/Hz	
		05	B mode boost voltage setting	Manual torque boost B	0.0~30.0%	0.1%	3.0%	43
		06	B mode base frequency setting	Base frequency B	1.00~400.00Hz	0.01Hz	60.00Hz	
		07	B mode base voltage setting	Base voltage B	0.0~230.0 (460.0) V	0.1V	200.0 (400.0) V	45
		08	B mode constant-speed stall prevention level	Stall prevention B	0.0~200.0%	0.1%	160.0%	
		09	B mode accel/decel stall prevention level	Stall prevention B	0.0~200.0%	0.1%	160.0%	
		10	B mode constant output stall prevention compensation gain	Stall compensation gain B	0.0~100.0%	0.1%	100.0%	43
		11	B mode intermediate frequency	Intermediate frequency B	0.00~400.00Hz	0.01Hz	6.00Hz	
		12	B mode intermediate voltage	Intermediate voltage B	0.0~230.0 (460.0) V	0.1V	30.0 (60.0)V	44
		13	B mode boost selection	Boost selection B	0: FWD/REV provided; 1:REV not provided 2: FWD not provided; 3: Automatic	—	0:FWD/REV PROVIDED	

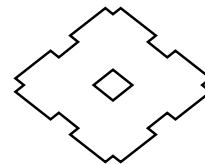
Note: The menus C14 and C15 are displayed and can be set only when the control method selection C12 is set to 1: Sensorless.

\*: Differs according to the rated capacity.

# PARAMETER MENUS

	Menu	Function	Display	Available Choices	Setting Unit	Factory Default	Ref. pg.
Monitor related parameters	E	00	Output frequency detection 1	Frequency detection 1	0.00~400.00Hz	0.01Hz	45
		01	Output frequency detection width 1	Frequency detection width 1	0.00~400.00Hz	0.01Hz	
		02	Frequency counter output selection	Frequency meter selection	0: Analog 1; 1: Analog 2 2: Digital 1; 3: Digital 2	–	
		03	Frequency counter scale	Frequency meter scale	1.00~400.00Hz	0.01Hz	
		04	Frequency counter correction	Frequency meter correction	-30.0~+30.0%	0.1%	
		05	Custom display mode unit	Custom display mode	0: No unit, 1: rpm 2: m/min	–	
		06	Custom display mode multiplier	Custom display multiplier	0.00~99.99	0.01	
		07	Digital output selection (X1)	Functional terminal selection (X1)	0: Fault; 1: In operation 2: At Frequency 3: Frequency 1 4: Frequency 2 5: Current 1; 6 Current 2 7: FR/RR ON (RUN) 8: Under-voltage 9: Thermal alarm 10: Stalling 11: Retry over 12: Torque detection 1 13: Torque detection 2 14: 0 speed 15: User alarm	–	46
		08	Digital output selection (X2)	Functional terminal selection (X2)	Same as above	–	
		09	Output frequency detection 2	Frequency detection 2	0.0~400.00Hz	0.01Hz	45
		10	Output frequency detection width 2	Frequency detection width 2	0.0~400.00Hz	0.01Hz	
		11	Current detection 1	Current detection 1	0.0~200.0%	0.1%	46
		12	Current detection 2	Current detection 2	0.0~200.0%	0.1%	
		13	Instantaneous stop/start selection	Instantaneous stop/start	0: Not provided; 1: Provided	–	
		14	Number of retry attempts	Number of retry attempts	0~3 times	–	
		15	Retry wait time	Retry wait time	0.0~10.0sec	0.1sec	
		16	Write selection	Write selection	0: enabled; 1: disabled	–	
		17	Fault clear	Fault clear	–	–	47
		18	Preset value initialization	Preset value initialization	–	–	
		19	Analog monitor AM1 selection	Analog monitor AM1	0: Output frequency 1: Frequency command 2: Output current 3: Output voltage 4: Overload rate; 5: Motor torque 6: Frequency 2	–	
		20	Analog monitor AM2 selection	Analog monitor AM2	Same as above	–	
		21	Analog monitor AM1 gain	Monitor AM1 gain	0.0~200.0%	0.1%	
		22	Analog monitor AM2 gain	Monitor AM2 gain	0.0~200.0%	0.1%	
		23	Analog monitor AM1 offset	Monitor AM1 offset	0.0~100.0%	0.1%	
		24	Analog monitor AM2 offset	Monitor AM2 offset	0.0~100.0%	0.1%	
		25	Relay 1 output selection	Relay 1 selection	0: Fault; 1: In operation 2: At Frequency 3: Frequency 1 4: Frequency 2 5: Current 1 6: Current 2 7: FR/RR ON 8: Under-voltage 9: Thermal alarm 10: Stalling 11: Retry over 12: Torque detection 1 13: Torque detection 2 14: 0 speed 15: User alarm	–	
		26	Relay 2 output selection	Relay 2 selection	Same as above	–	
		27	Relay 1 output delay time	Relay 1 delay time	0.0~10.0sec	0.1 sec	
		28	Relay 2 output delay time	Relay 2 delay time	0.0~10.0sec	0.1 sec	

Note: Display and setting of E19-E24 are possible when the analog monitor card is installed. (Refer to the section "Option Cards")  
 Display and setting of E25-E28 are possible when the relay card is installed. (Refer to the section "Option Cards")  
 Display and setting of E29-E35 are possible when the PG card is installed. (Refer to the section "Option Cards.")



	Menu	Function	Display	Available Choices	Setting Unit	Factory Default	Ref. pg.
Special parameters	F	00 ES selection	ES selection	0: N.O. contact; 1: N.C. contact	—	0: N.O. (normally open)	48
		01 DFL selection	DFL selection	0: Preset 0; 1: Preset 1 2: Preset 2; 3: Preset 3 4: JOG selection 5: Acceleration/deceleration 2 6: B mode selection 7: Operation command 8: Frequency command 9: Hold selection 10: FRQ up; 11: FRQ down 12: Catch on the Fly		0: Preset 0	
		02 DFM selection	DFM selection	Same as above	—	1: Preset 1	
		03 DFH selection	DFH selection	Same as above	—	2: Preset 2	
		04 JOG selection	JOG selection	Same as above	—	4: JOG selection	
		05 AD2 selection	AD2 selection	Same as above	—	5: Accel/Decel	
		06 BMD selection	BMD selection	Same as above	—	6: B mode selection	
		07 JOG acceleration time	JOG acceleration time	0.1~3000; 0.1 sec	0.1sec	0.1sec	
		08 JOG deceleration time	JOG deceleration time	0.1~3000; 0.1 sec	0.1sec	0.1sec	
		09 DRV selection	DRV selection	Same as E07/08	—	1: In operation	49
		10 UPF selection	UPF selection	Same as E07/08	—	2: Frequency reaching	
		11 At Frequency (UPF) limit settings	At Frequency limit	0.0~100.0%	0.1%	5.0%	
		12 Torque detection level 1	Torque detect level 1	0.0~200.0%	0.1%	100.0%	50
		13 Torque detection level 2	Torque detect level 2	0.0~200.0%	0.1%	150.0%	
		14 Permissible motor rotation	Rotation permission selection	0: FWD/REV 1: FWD only 2: REV only	—	0: FWD/REV	
		15 Permissible motor rotation	Rotation direction selection	0: Ordinary 1: FWD < — > REV	—	0: Ordinary	
		16 Display language selection	Language selection	0: Japanese; 1: English	—	1: English	
		17 Operation command mode 2 selection	Operation command 2	0: Local; 1: Ext.	—	0: Local	
		18 Frequency command 2 selection	Frequency command 2	0: Local; 1: VRF 5V 2: VRF 8V; 3: VRF 10V 4: IRF 20mA	—	0: Local	
		19 Monitor menu selection	Monitor menu	M00~M19	—	M00	
		20 Accel/decel jump frequency (start)	At frequency accel jump (begin)	0.00~400.00Hz	0.01Hz	400.00Hz	
		21 Accel/decel jump frequency (end)	At frequency accel jump (end)	0.00~400.00Hz	0.01Hz	400.00Hz	
		22 Accel/decel time jump freq gain	At frequency acceleration gain	0.1~10.0	0.1	1.0	
		23 User alarm time	User alarm time	0~30000hr	1hr	30000hr	
		24 DRV terminal output delay time	DRV delay time	0.0~10.0sec	0.1sec	0.0sec	
		25 UPF terminal output delay time	UPF delay time	0.0~10.0sec	0.1sec	0.0sec	
		26 X1 terminal output delay time	X1 delay time	0.0~10.0sec	0.1sec	0.0sec	
		27 X2 terminal output delay time	X2 delay time	0.0~10.0sec	0.1sec	0.0sec	
		28 Torque detect 1	Torque detect 1	0: Normal operation 1: Slow speed only 2: Fault during operation 3: Slow speed fault only	—	0: Normal operation	
		29 Torque detect 2	Torque detect 2	Same as above	—	0: Normal operation	

# OPTION CARDS

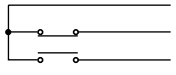
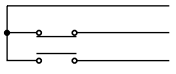
**Option Cards:** Only one option card can be used.

## 1. Relay output card

**Part Number:** CF310051-01

Function: The open collector output signal is converted into the dry contact signal. Parameters E25 and E26 can be used.

Contact rating: 230 VAC, 1A; 30 VDC, 1A

Relay to output	Terminal block	Details of detection
RY1		Output selected by relay 1 output selection (E25)
RY2		Output selected by relay 2 output selection (E26)

## 2. Analog monitor card

**Part Number:** CF310050-01

Function: Two signals for output are selected from among the following: output frequency, frequency adjustment, output current, output voltage, and motor torque.

Output signal: (1) Analog output: 0-10 VDC

Resolution ... 5 mV/10 V

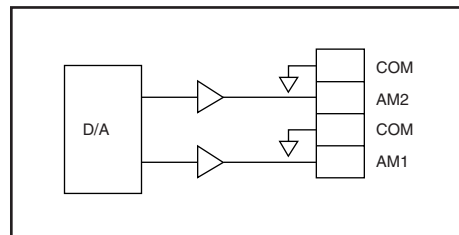
Error ... Within  $\pm 1\%$  (Motor torque: Within  $\pm 20\%$ )

Max. output current ... 3 mA

Selection of output signal: The analog signals output to AM1-COM (Parameter E19) and AM2-COM (Parameter E20) are selected as follows:

Setting	Signal Description	Signal Level 10 V DC = 100% gain
0	Output frequency	Standard frequency (Parameter A13 setting)
1	Command frequency	Standard frequency (Parameter A13 setting)
2	Output current	Rated current for inverter
3	Output voltage	Base frequency/voltage
4	Overload rate	Electronic thermal trip level
5	Motor torque	When motor is 100% loaded
6	Output speed (rpm)	Standard frequency (Parameter A13 setting)

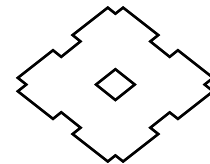
### Internal block diagram



If this option is selected, E19 and E24 are automatically added to the parameter menu.

Menu	Function	Setting range	Setting for shipment
E19	Selection of output signal from terminals AM1 and COM	0~6	0 (Output frequency)
E20	Selection of output signal from terminals AM2 and COM	0~6	0 (Output frequency)
E21	Gain control for the signal selected for output AM1	0~200%	100%
E22	Gain control for the signal selected for output AM2	0~200%	100%
E23	Offset control for the signal selected for AM1	0~100%	0%
E24	Offset control for the signal selected for AM2	0~100%	0%

Recommended wiring: twisted, shielded wire.



### 3. Pulse Generator (PG) Feedback Option

If this option is mounted, E29 through E35 are automatically added to the parameter menu.

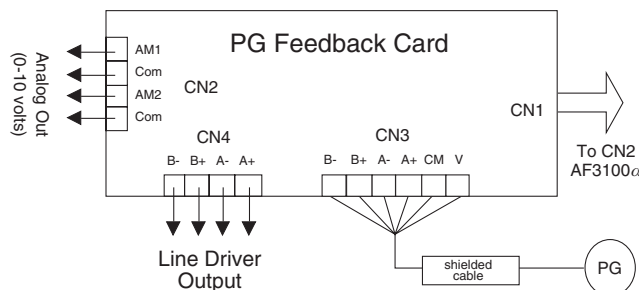
Type: CF31057-01

Indication:

Function: Allows the AF3100 $\alpha$  to operate in the vector mode with feedback from the Pulse Generator (PG). The PG card installs in the AF3100 $\alpha$ .

Note:

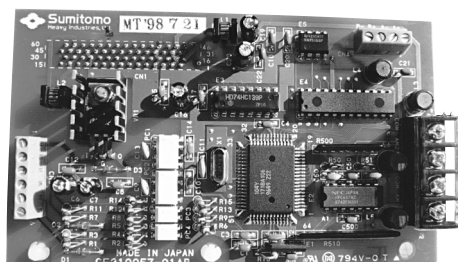
For Analog Output Signal parameters (E19 to E24) refer to the AF3100a Maintenance Manual or the AF3100a Catalog Parameters. E19 through E24 allow programming the output signals AM1 and AM2.



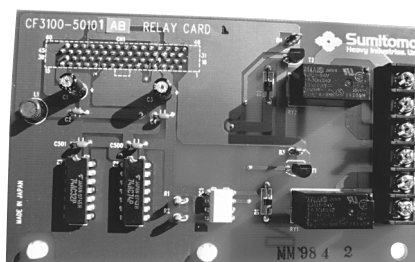
Parameter	Function	Range	Factory Setting
E29	PG Pulse Count	100 ~ 5000	1024
E30	PG Standard Phase Selection	0 or 1	0
E31	Speed Proportional Gain	0.0 ~ 500%	100%
E32	Speed Integral Gain	0.0 ~ 500%	100%
E33	Disturbance Observer Gain	0.0 ~ 100%	70%
E34	Disturbance Observer Compensation Time	0.01 ~ 9.99 seconds	0.05
E35	% Torque Limit Command (see parameter C05)	0: Panel, 1:0-5V; 0-8V, 2: 0-8V; 3: 0-10V, 4: 0-20ma	0

Settings for Analog Monitor Output Signals for AM1 and AM2. Refer to parameters E19 and E20.

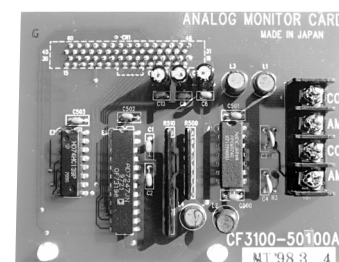
Setting	Signal Description	Signal Level 10 V DC = 100% gain
0	Output frequency	Full Scale w/gain = 100% Vout + 10 Volts
1	Command frequency	Command Frequency
2	Output current	Rated Current for Inverter
3	Output voltage	Base Frequency Voltage
4	Overload rate	Electronic Thermal Trip
5	Motor torque	100% motor load
6	Output speed (rpm)	Standard frequency command



PG Card



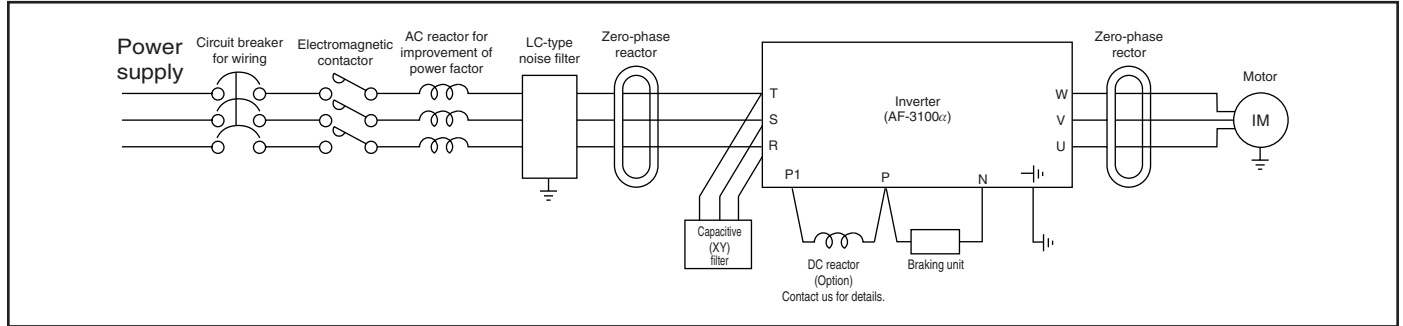
Relay Card



Analog Card

# OPTIONS AND PERIPHERAL EQUIPMENT

## Connection of Peripheral Equipment



AC Line Reactor						Dimensions					
240V @ 6%		480V @ 3%									
Voltage	HP	kW	Current	Watts	SMA Part No.	Height		Width		Depth	
						in	mm	in	mm	in	mm
230 Volt	7.5	5.5	24	36	AEP3901-T09	12	305	12	305	6	152
	10	7.5	33	55	AEP3901-T10	12	305	12	305	6	152
	15	11	47	70	AEP3901-T12	12	305	12	305	6	152
	20	15	63	105	AEP3901-T13	16	406	16	406	16	406
380-460 Volt	7.5	5.5	13	38	AEP3901-T07	8	203	8	203	6	152
	10	7.5	17	40	AEP3901-T08	12	305	12	305	6	152
	15	11	25	48	AEP3901-T09	12	305	12	305	6	152
	20	15	33	70	AEP3901-T10	12	305	12	305	6	152
	30	22	48	113	AEP3901-T12	12	305	12	305	6	152
	40	30	66	129	AEP3901-T13	16	406	16	406	16	406
	50	37	80	129	AEP3901-T13	16	406	16	406	16	406
	60	45	100	152	AEP3901-C14	16	406	16	406	16	406
	75	55	120	148	AEP3901-C15	16	406	16	406	16	406
	100	75	160	165	AEP3901-C16	16	406	16	406	16	406

NEMA 1 (Specify if Open Chassis required)

T = Terminal Block

C = Copper Bar

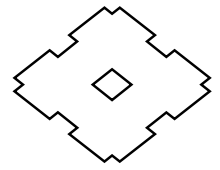
## Dynamic Braking Resistors & Dimensions (150% Torque, 10% Duty Cycle)

AF-3100 $\alpha$ Ratings				Dimensions						Braking Unit	Stages perUnit
Voltage	HP	kW	DBR Model No.	Height		Width		Depth			
				in	mm	in	mm	in	mm		
200-230 Volt	7.5	5.5	DBR-12-5A5	5	127	14	356	13	330	*	
	10	7.5	DBR-12-7A5	5	127	14	356	13	330	*	
	15	11	DBR-12-011	5	127	21	533	13	330	*	
	20	15	DBR-12-015	7	178	29	737	18	457	*	
400-460 Volt	7.5	5.5	DBR-14-5A5	5	127	14	356	13	330	*	
	10	7.5	DBR-14-7A5	5	127	14	356	13	330	*	
	15	11	DBR-14-011	5	127	21	533	13	330	*	
	20	15	DBR-14-015	5	127	21	533	13	330	*	
	30	22	DBR-14-022	5	127	28	711	13	330	DU-406S	1
	40	30	DBR-14-030	5	127	28	711	13	330	DU-407S	1
	50	37	DBR-14-037	7	178	29	737	18	457	DU-405S	2
	60	45	DBR-14-045	7	178	29	737	18	457	DU-406S	2
	75	55	DBR-14-055	14	356	29	737	18	457	DU-407S	2
	100	75	DBR-14-075	14	356	29	737	18	457	DU-406S	3

Notes: Other values can be ordered for increased torque and/or duty cycle.

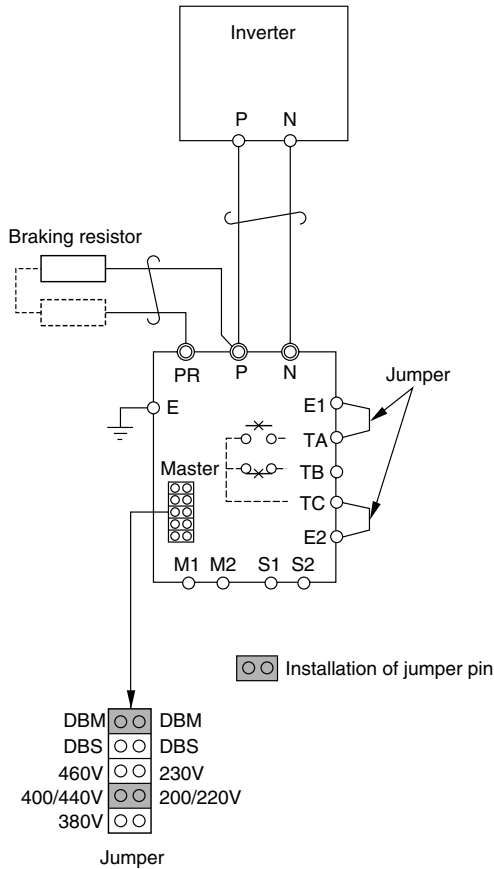
\* No braking unit required.

For connection diagram refer to braking unit instruction manual.

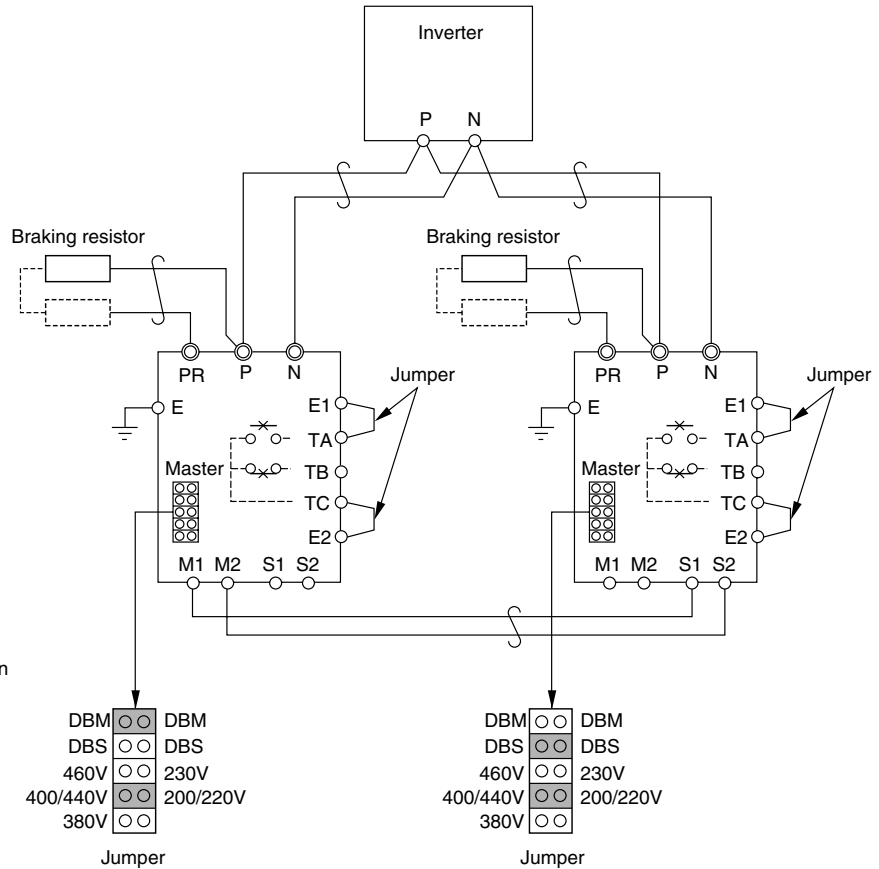


## Connection diagram of braking unit/braking resistor

### ① One braking unit



### ② Two braking units



The above examples show jumper installation when the inverter supply voltage is 200/220 V and 400/440 V.

## Precautions

1. Remove the jumpers from E1-TA and E2-TC if thermal relay output terminals TA, TB, and TC are used in external circuits.
2. When two or more braking units are used, switch the jumpers from the master (DBM) to the slave (DBS), and vice-versa. If one braking unit is used set the jumper in the master (DBM) configuration. The original setting is DBM. If the power supply is 230 VAC for the 200 V class or 380 V/460 V for the 400 V class, properly configure the jumpers for the applied voltage. Original settings are 200/220 V for the 200 V class and 400/440 V for the 400 V class.
3. If two braking units are used, connect the P and N terminals from the braking units to the P and N terminals on the inverter.
4. The wiring distance between the inverter and braking unit must be less than or equal to 5 meters (16 ft) and the distance between the braking unit and braking resistor shall also be less than 5 m (16 ft.). Wiring to be twisted. When two or more braking units are used, use twisted wire for M1, M2, S1 and S2.
5. Do not locate near flammable material as the temperature rise of the braking resistor may exceed 150°C.
6. Install the braking resistor in a well-ventilated area.
7. Incorrect connection of terminals P, N, and PR will result in failure of the inverter and braking unit.
8. When resistors other than those specified are connected, the braking unit may inadvertently fail.
9. Do not touch terminals or jumper pins if the charge lamp is lit even after the power is turned OFF.

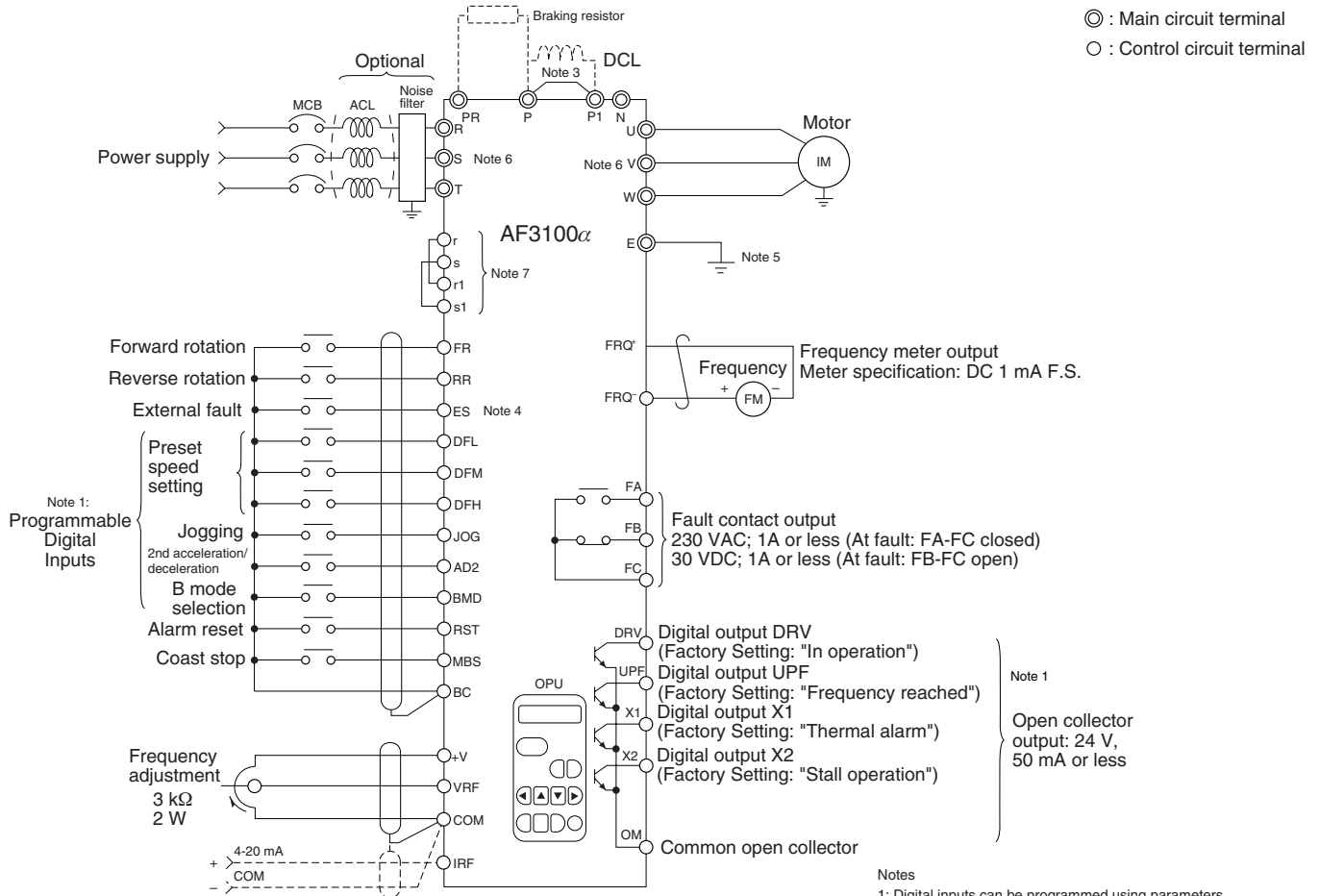


# STANDARD CONNECTION DIAGRAM

**5.5-15 kW/200 V class**  
**5.5-75 kW/400 V class**

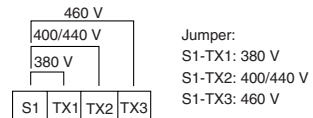
**22 kW or > 400 V class**

Note 8

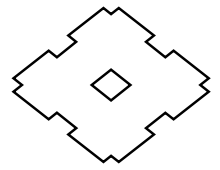


Shielded or twisted shielded wire

Twisted wire



- Remove jumper if a DC reactor is used.
- Using parameter F00, the fault output relay may be programmed as External Fault N.C. or External Fault N.O.
- Inverter and motor must be grounded.
- Primary circuit terminals with a minimum of 37 kW uses a bus bar.
- If the control power source has a separate input, remove r-r1 and s-s1 jumpers. Connect the control input voltage at r1 and s1 for both 200 and 400 volt units.
- For connections of dynamic braking resistor and dynamic braking units, refer to the operations manual for the braking unit and resistor shipped with those units. Follow the connection diagrams in the manual or contact the factory for assistance. A connection is made between P and N on the braking unit and the inverter, while the dynamic braking resistor is connected to P and PR on the braking unit.



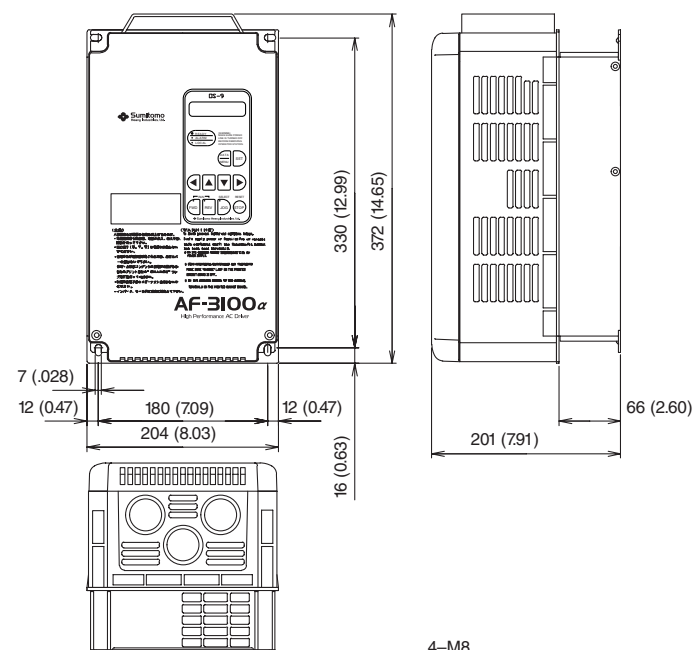
# TERMINAL FUNCTIONS

Kind	Terminal Code	Name of terminal	Function	
Main Circuit	R, S, T	AC power input	Commercial 3-phase power supply.	
	U, V, W	Inverter output	3-phase motor.	
	P, P1	Line reactor connection	Remove the jumpers between terminals P and P1 to allow for connection of the optional DC line reactor.	
	P, N	Braking unit connection	Connection for the Optional Braking Unit Card.	
	P, PR	Braking resistor connection	Optional braking resistor connection. The PR terminal is provided in the 5.5-15 kW unit.	
	E	Ground	Inverter chassis grounding terminal.	
	TX1, TX2, TX3, S1	Supply voltage selection	Supply voltage selection terminals. Only on 460 V class units of 15 kW or above.	
Control circuit (Input signal)	r, r1, s, s1	Control power selection	For inverter supplied control power, connect r-r1 and s-s1, respectively. For externally supplied control power remove the r-r1 and s-s1 jumpers; input 230 VAC power to r1 and s1. (Input 230 VAC to both 230 and 460 V units). The external control circuit terminal block (see note) is on the driver card.	
	+V	Power supply for the external speed potentiometer	Power supply for the external speed (frequency) potentiometer (variable resistor: 1-5k $\Omega$ ). 10 VDC; maximum supplied current 10 mA.	
	VRF	Frequency adjustment input voltage	When 0-5, 0-8, or 0-10 VDC is input, the output frequency reaches its maximum at 5 V, 8 V and 10 V, respectively. Select parameter A 00/12 for 0-5, 8, or 10 V operation.	
	IRF	Frequency adjustment current input	4-20 mA (DC), the output frequency reaches its maximum at 20 mA, minimum at 4mA. Input resistance: 250 $\Omega$ .	
	COM	Common for analog inputs	Common terminal for frequency adjustment signals (terminals: +V, VRF, and IRF).	
	FR	Forward rotation	FR-BC contact closed results in forward rotation; deceleration/stop when the contact is open.	
	RR	Reverse rotation	RR-BC contact closed results in reverse rotation; deceleration/stop when the terminals are open.	
	ES	External fault	When the contact terminals ES-BC are closed, the inverter faults and an alarm signal is latched and output to FA and FB. To re-start the inverter a reset must be initiated by closing RST-BC. External relays can be used to fault the inverter by closing ES-BC, the fault can be software selected to External Fault (NO) or External Fault (NC). The factory default External Fault (NO).	
	MBS	Coast Stop	When the contact terminals MBS-BC are closed, a coast stop is initiated. Operation begins from 0 Hz when the MBS-BC is re-opened and the signal FR or RR is closed. When the digital input is set for catch on the fly start, operation from coast stop is allowed. No alarm signals are output.	
	JOG	Digital input terminal 1	The following functions can be selected: Preset speed selection, JOG selection, 2nd deceleration selection, B mode selection, local/remote operation command, frequency command selection, hold selection, frequency increase, frequency decrease, and catch on the fly function.	
	AD2	Digital input terminal 2		
	BMD	Digital input terminal 3		
	DFH	Digital input terminal 4		
	DFM	Digital input terminal 5		
	DFL	Digital input terminal 6		
	RST	Alarm reset	When the terminals RST-BC are closed, the inverter is reset to allow for normal operation.	
	BC	Common	Common for digital input signals.	
	FRQ+, FRQ-	Frequency counter output	Depending on the selection (see parameter E02), a 0 to 1 mA DC current is output on terminals FRQ+ and FRQ-in proportion to the output frequency of the inverter. Digital pulses with the same frequency as the output frequency of the inverter can also be selected for output. Factory default setting is a pulse output frequency at 1 mA for 60 Hz. The input impedance of the meter shall be less than 500 $\Omega$ .	
Control circuit (Output signal)	UPF	Digital output terminal 1	The following functions can be selected: fault, in-operation, at frequency, frequency detection 1, frequency detection 2, current detection 1, current detection 2, run signal initiated (FF/RR), under-voltage, thermal alarm, stall operation, retry attempts exceeded, torque detection 1, torque detection 2, and zero speed detection function.	
	DRV	Digital output terminal 2		
	X1	Digital output terminal 3		
	X2	Digital output terminal 4		
	OM	Common open collector output	Common terminal for open collector transistors.	
	FA, FB, FC	Error Detect	Contact point output Normally Open or Normally Closed Form C contact. Fault: FA-FC closed; FB-FC open Normal: FA-FC open; FB-FC closed	Contact Ratings AC 230V 1A MAX DC 30V 1A MAX

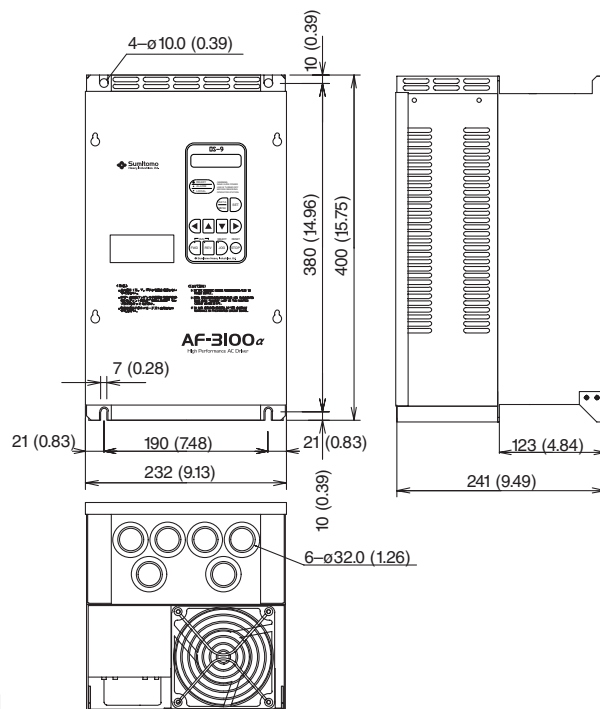
Note: 5.5-11 kW: Bus bar card  
15 kW: IPM card  
20 kW or more: Driver card

# OUTSIDE DIMENSIONS

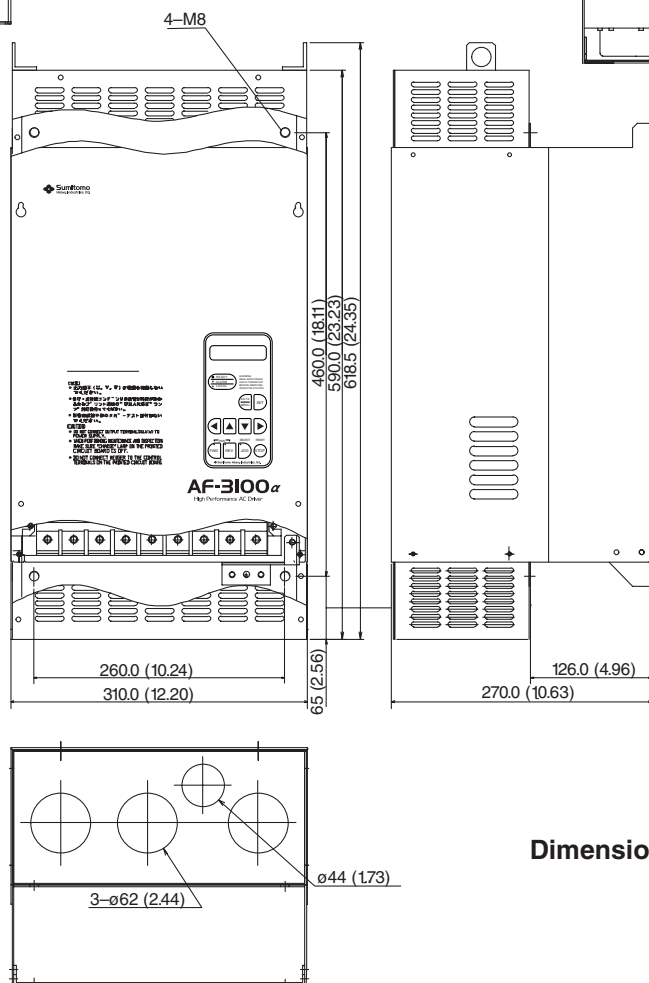
## 5.5, 7.5kW 200V/400V



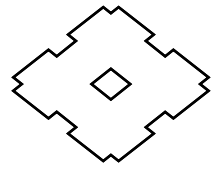
## 15kW 200V/400V



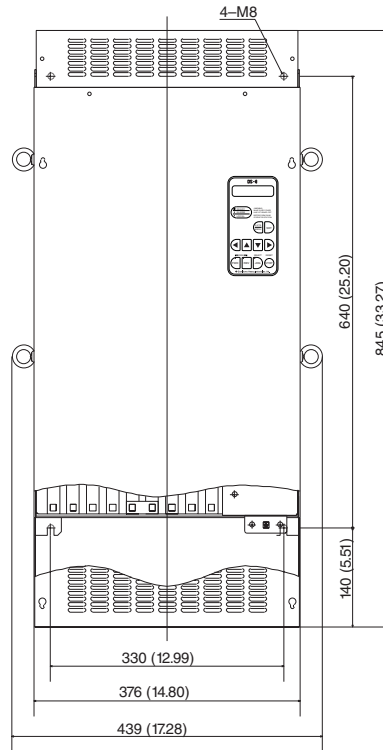
## 22, 30kW 400V



Dimensions in mm (inch)

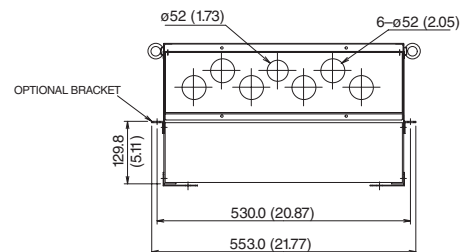
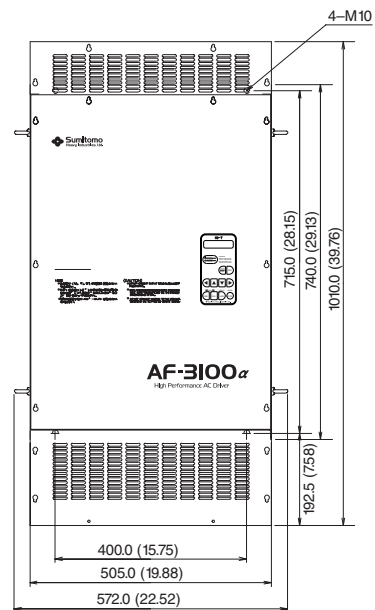
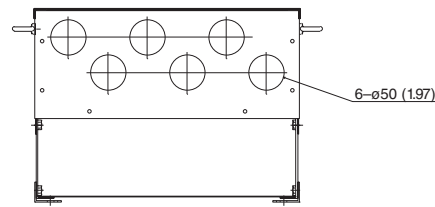


### 37, 45kW 400V



Numbers in ( ) = inches

### 55, 75kW 400V

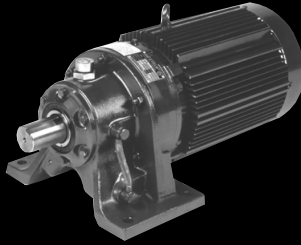


#### SPEED REDUCER



SM-CYCLO  
Concentric

#### GEARMOTOR



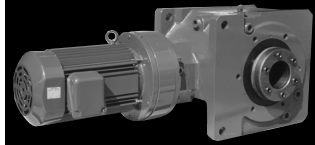
SM-CYCLO  
Concentric

#### SHAFT MOUNTED GEARMOTOR



SM-HELICAL BUDDYBOX  
Parallel Offset

#### BEVEL GEARMOTOR



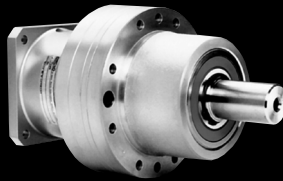
SM-BEVEL BUDDYBOX  
Right Angle

#### LOW RATIO PLANETARY



SM-CYCLO  
Concentric

#### PRECISION CYCLO



Concentric

#### MECHANICAL VARIABLE SPEED



SM-BEIER

#### ELECTRICAL VARIABLE SPEED



AF-3100x  
AC Drive

NTAC-2000  
AC Drive

#### HELICAL GEAR REDUCER



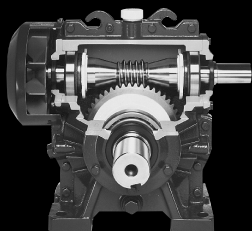
PARAMAX  
Parallel Offset  
& Right Angle

#### SHAFT MOUNT SPEED REDUCER



SM-SHAFT MOUNT  
Parallel Offset

#### DOUBLE ENVELOPING WORM GEAR



SM-HEDCON  
Right Angle

#### SHAFT MOUNT GEARMOTOR



SM-HYPONIC  
Right Angle

#### WORM GEARMOTOR



SM-ULYSSES  
Right Angle

#### PARTS & SERVICE



WORLDWIDE

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Providing

THE AVAILABLE SOLUTION, WORLDWIDE

ALL  
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- ▲ MOTORS
- ▲ CONTROLLERS

ALL  
TYPES

- ▲ CONCENTRIC
- ▲ PARALLEL OFFSET
- ▲ RIGHT ANGLE

ALL  
SPEEDS

- ▲ CONSTANT SPEED
- ▲ MECHANICAL VS
- ▲ ELECTRICAL VS

WORLD-  
WIDE

- ▲ THE AMERICAS
- ▲ ASIA
- ▲ EUROPE

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