

User Manual

High Performance / Low-Noise Micro-Type AC Motor Drives



Voltage Range:

1-phase 115V series:0.2~0.75kW	(0.25~1HP)
1-phase 230V series:0.4~5.5kW	(0.5~7.5HP)
3-phase 460V series:0.75~5.5kW	(1.0~10HP)
3-phase 575V series:0.75~7.5kW	(1.0~10HP)



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*We reserve the right to change the information in this manual without prior notice



Preface

Thank you for choosing DELTA's high-performance VFD-M Series. VFD-M Series are manufactured by adopting high-quality components, material and incorporating the latest microprocessor technology available.

Getting Started

This manual will be helpful in the installation, parameter setting, troubleshooting, and daily maintenance of the AC motor drives. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the AC motor drives. Keep this operating manual handy and distribute to all users for reference.

\triangle	Always read this manual thoroughly before using VFD-M series AC Motor Drives.
	DANGER! AC input power must be disconnected before any maintenance. Do not connect or disconnect wires and connectors while power is applied to the circuit. Maintenance must be performed by qualified technicians.
	CAUTION! There are highly sensitive MOS components on the printed circuit boards. These components are especially sensitive to static electricity. To avoid damage to these components, do not touch these components or the circuit boards with metal objects or your bare hands.
	DANGER! A charge may still remain in the DC-link capacitor with hazardous voltages even if the power has been turned off. To avoid personal injury, please ensure that power has turned off before operating AC drive and wait ten minutes for capacitors to discharge to safe voltage levels.
	CAUTION! Ground the VFD-M using the ground terminal. The grounding method must comply with the laws of the country where the AC drive is to be installed. Refer to Basic Wiring Diagram.
	CAUTION! The final enclosures of the AC drive must comply with EN50178. (Live parts shall be arranged in enclosures or located behind barriers that meet at least the requirements of the Protective Type IP20. The top surface of the enclosures or barrier that is easily accessible shall meet at least the requirements of the Protective Type IP40). (Users must provide this environment for VFD-M series.)
	DANGER! The AC drive may be destroyed beyond repair if incorrect cables are connected to the input/output terminals. Never connect the AC drive output terminals U/T1, V/T2, and W/T3 directly to the AC main circuit power supply.

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DELTA VFD-M Series

CHAPTER 1 RECEIVING AND INSPECTION

This VFD-M AC drive has gone through rigorous guality control tests at the factory before shipment. After receiving the AC motor drive, please check for the following:

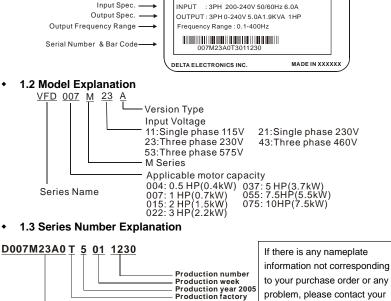
Receiving

- ✓ Check to make sure that the package includes an AC drive, the User Manual, and rubber bushinas.
- ✓ Inspect the unit to insure it was not damaged during shipment.
- ✓ Make sure that the part number indicated on the nameplate corresponds with the part number of your order.

MODEL : VFD007M23A

1.1 Nameplate Information: Example of 1HP 230V AC drive

AC Drive Model -



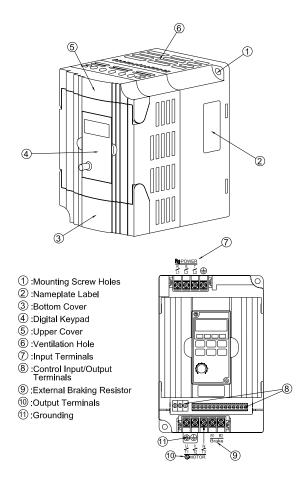
(Taoyuan)

Model

problem, please contact your distributor

230V 3-phase 1HP(0.75kW)

1.4 External Parts and Labels



CHAPTER 2 STORAGE AND INSTALLATION

2.1 Storage

The AC drive should be kept in the shipping carton before installation. In order to retain the warranty coverage, the AC drive should be stored properly when it is not to be used for an extended period of time. Some storage suggestions are:

Store in a clean and dry location free from direct sunlight or corrosive fumes.

Store within an ambient temperature range of -20 °C to +60 °C.

Store within a relative humidity range of 0% to 90% and non-condensing environment.

Store within an air pressure range of 86 kPA to 106kPA.

2.2 Ambient Conditions

Operation	Air Temperature: -10 [°] C to +50 [°] C (14 [°] F to 122 [°] F), for 5.5 kW models and above: -10 [°] C to +40 [°] C (14 [°] F to 104 [°] F) Relative Humidity: 0% to 90%, no condensation allowed Atmosphere pressure: 86 to 106 kPa Installation Site Altitude: below 1000m Vibration: Maximum 9.80 m/s ² (1G) at less than 20Hz Maximum 5.88 m/s ² (0.6G) at 20Hz to 50Hz
Storage	Temperature: -20°C to +60°C (-4°F to 140°F) Relative Humidity: Less than 90%, no condensation allowed Atmosphere pressure: 86 to 106 kPa
Transportation	Temperature: -20° C to $+60^{\circ}$ C (-4° F to 140° F) Relative Humidity: Less than 90%, no condensation allowed Atmosphere pressure: 86 to 106 kPa Vibration: Maximum 9.80 m/s ² (1G) at less than 20Hz, Maximum 5.88 m/s ² (0.6G) at 20Hz to 50Hz
Pollution Degree	2: good for a factory type environment.

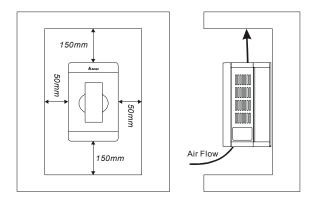
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SELTA VFD-M Series

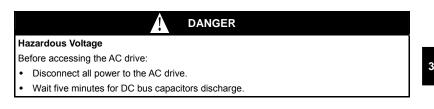
2.3 Installation:

Improper installation of the AC drive will greatly reduce its life. Be sure to observe the following precautions when selecting a mounting location. Failure to observe these precautions may void the warranty!

- Do not mount the AC drive near heat-radiating elements or in direct sunlight.
- Do not install the AC drive in a place subjected to high temperature, high humidity, excessive vibration, corrosive gases or liquids, or airborne dust or metallic particles.
- Mount the AC drive vertically and do not restrict the air flow to the heat sink fins.
- The AC drive generates heat. Allow sufficient space around the unit for heat dissipation as shown in the figure below:



CHAPTER 3 WIRING



Any Electrical or mechanical modification to this equipment without prior written consent of Delta Electronics, Inc. will void all warranties and may result in a safety hazard in addition to voiding the UL listing.

Short Circuit Withstand:

Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, for all 460V Models, the maximum is 480 Volts, 230V Models, the maximum is 240 Volts.

General Wiring Information

Applicable Codes

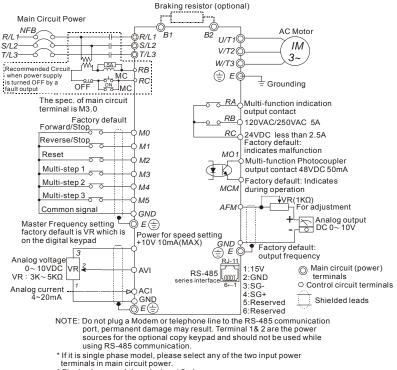
All VFD-M AC drives are Underwriters Laboratories, Inc. (UL) and Canadian Underwriters Laboratories (cUL) listed, and therefore comply with the requirements of the National Electrical Code (NEC) and the Canadian Electrical Code (CEC).

Installation intended to meet the UL and cUL requirements must follow the instructions provided in "Wiring Notes" as a minimum standard. Follow all local codes that exceed UL and cUL requirements. Refer to the technical data label affixed to the AC drive and the motor nameplate for electrical data.

The "Line Fuse Specification" in Appendix B, lists the recommended fuse part number for each M-Series part number. These fuses (or equivalent) must be used on all installations where compliance with U.L. standards is a required.

3.1 Basic Wiring Diagram

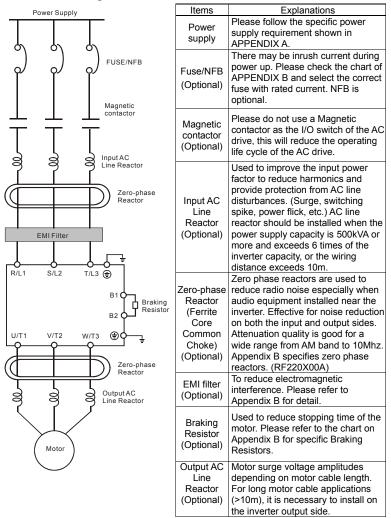
Users must connect wiring according to the following circuit diagram shown below.



* Single phase model can be input 3-phase power.

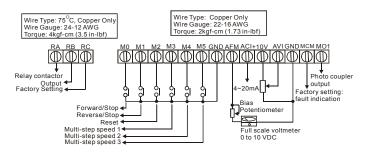
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3.2 External Wiring





3.3 Control Terminal Wiring (Factory Settings)

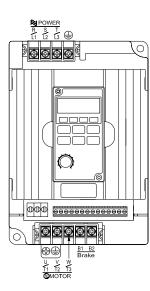


Terminal symbols	Terminal name	Remarks
RA – RC	Multi-Function Indication Output Contact	Refer to Pr.46 Relay output contact RA-RC (N.O. Contact)
RB – RC	Multi-Function Indication Output Contact	RB-RC (N.C. Contact)
MO1 -MCM	Multi-function PHC output	Refer to Pr.45
RJ – 11	Serial communication port	RS-485 serial communication interface
+10V - GND		Power Supply (+10 V)
AVI - GND	Analog voltage freq. command	0 to +10 V (Max. Output Frequency) Input
ACI - GND	Analog current freq. command	4 to 20mA (Max. Output Frequency) Output
AFM - GND	Analog frequency/current meter	0 to +10 V (Max. output Frequency) Output
M0 - GND	Multi-function auxiliary input	
M1 - GND	Multi-function input 1	Refer to Pr.38 to Pr.42
То	То	
M5 - GND	Multi-function input 5	

Note: Use twisted-shielded, twisted-pair or shielded-lead wires for the control signal wiring. It is recommended to run all signal wiring in a separate steel conduit. The shield wire should only be connected at the drive. Do not connect shield wire on both ends.



3.4 Main Circuit Wiring



Wire	Type:	75	°C	Copper	Only
------	-------	----	----	--------	------

Model Name	Max. Current (input / output)	Wire Gauge AWG (mm ²)	Torque kgf-cm (in-lbf)
VFD002M11A	6A/1.6A	12-14	
VFD004M11A	9A/2.5A	(3.3-2.1)	
VFD007M11A	16A/4.2A	12 (3.3)	1
VFD004M21B(1-phase)	6.3A/2.5A		1
VFD004M21B(3-phase)	3.2A/2.5A	12-14	14
VFD007M21B(1-phase)	11.5A/5.0A	(3.3-2.1)	(12)
VFD007M21B(3-phase)	6.3A/5.0A		
VFD015M21B(1-phase)	15.7A/7.0A	12 (3.3)	
VFD015M21B(3-phase)	9.0A/7.0A	12-14 (3.3-2.1)	
VFD022M21A(1-phase)	27A/10A	8 (8.4)	
VFD022M21A(3-phase)	15A/10A	8-12 (8.4-3.3)	15
VFD037M23A	19.6A/17A	8-10 (8.4-5.3)	(13)
VFD055M23A	28A/25A	8 (8.4)	
VFD007M43B	4.2A/3.0A	12-14 (3.3-2.1)	
VFD007M53A	2.4A/1.7A	12-14 (3.3-2.1)	
VFD015M43B	5.7A/4.0A	12-14 (3.3-2.1)	14
VFD015M53A	4.2A/3.0A	12-14 (3.3-2.1)	(12)
VFD022M43B	6.0A/5.0A	12-14 (3.3-2.1)	
VFD022M53A	5.9A/4.2A	12-14 (3.3-2.1)	
VFD037M43A	8.5A/8.2A	8-14 (8.4-2.1)	
VFD037M53A	7.0A/6.6A	8-14 (8.4-2.1)	
VFD055M43A	14A/13A	8-12 (8.4-3.3)	15
VFD055M53A	10.5A/9.9A	8-12 (8.4-3.3)	(13)
VFD075M43A	23A/18A	8-10 (8.4-5.3)	
VFD075M53A	12.9A/12.2A	8-12 (8.4-3.3)	

Note: It needs to use the Recognized Ring Terminal to conduct a proper wiring.

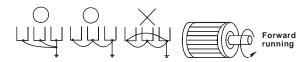
CALELTA VFD-M Series

Terminal Explanations

Terminal Symbol	Explanation of Terminal Function
R/L1, S/L2, T/L3	AC line input terminals (three phase)
U/T1, V/T2, W/T3	Motor connections
B1 – B2	Connections for Braking Resistor (optional)
÷	Earth Ground

3.5 Wiring Notes: PLEASE READ PRIOR TO INSTALLATION.

- CAUTION: Do not connect the AC power to the U/T1, V/T2, W/T3 terminals, as it will damage the AC drive.
- 2. MARNING: Ensure all screws are tightened to the proper torque rating.
- During installation, follow all local electrical, construction, and safety codes for the country the drive is to be installed in.
- 4. Ensure that the appropriate protective devices (circuit breaker or fuses) are connected between the power supply and AC drive.
- 5. Make sure that the leads are connected correctly and the AC drive is properly grounded.
- 6. Use ground leads that comply with AWG/MCM standards and keep them as short as possible.
- Multiple VFDB units can be installed in one location. All the units should be grounded directly to a common ground terminal. The VFDB ground terminals may also be connected in parallel, as shown in the figure below. Ensure there are no ground loops.



8. When the AC drive output terminals U/T1, V/T2, and W/T3 are connected to the motor terminals U, V, and W, respectively, the motor will rotate counterclockwise (as viewed from the shaft ends of the motor) when a forward operation command is received. To reverse the direction of motor rotation, switch over any of the two motor leads.

- Make sure that the power source is capable of supplying the correct voltage and required current to the AC drive.
- 10. Do not attach or remove wiring when power is applied to the AC drive.
- 11. Do not inspect components unless inside "CHARGE" lamp is turned off.
- 12. Do not monitor the signals on the circuit board while the AC drive is in operation.
- For the single-phase rated AC drives, the AC power can be connected to any two of the three input terminals R/L1, S/L2, T/L3. Note: This drive is not intended for the use with single-phase motors.
- 14. Route the power and control wires separately, or at 90 degree angle to each other.
- 15. If a filter is required for reducing EMI (Electro Magnetic Interference), install it as close as possible to AC drive. EMI can also be reduced by lowering the Carrier Frequency.
- 16. If the AC drive is installed in the place where a load reactor is needed, install the filter close to U/T1, V/T2, W/T3 side of AC drive. Do not use a Capacitor or L-C Filter (Inductance-Capacitance) or R-C Filter (Resistance-Capacitance), unless approved by Delta.
- When using a GFCI (Ground Fault Circuit Interrupt), select current sensor with sensitivity of 200mA, and not less than 0.1-second detection to avoid nuisance tripping.

3.6 Motor Operation Precautions

- 1. When using the AC drive to operate a standard 3-phase induction motor, notice that the energy loss is greater than for an inverter duty motor.
- Avoid running a standard induction motor at low speed. Under these conditions, the motor temperature may rise above the motor rating due to limited airflow produced by the motor's fan.
- 3. When the standard motor operates at low speed, the output load must be decreased.
- If 100% output torque is desired at low speed, it may be necessary to use a special "inverter-duty" rated motor.

3

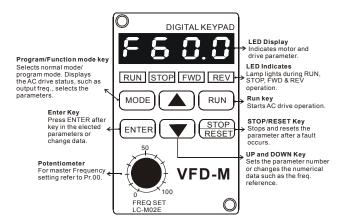
ELTA VFD-M Series

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CHAPTER 4 DIGITAL KEYPAD OPERATION

4.1 Description of Digital Keypad

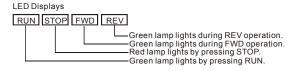
The digital keypad includes two parts: Display panel and keypad. The display panel provides the parameter display and shows the operation status of the AC drive and the keypad provides programming and control interface.





MODE	Function / Program Pressing the "mode" key repetitively displays the AC drive status such as the reference frequency, output frequency, and output current.
ENTER	Enter Pressing the "ENTER" key will store or display parameter settings.
RUN	Run Starts AC drive operation. This key has no effect when the drive is controlled by the External Control Terminals.
STOP RESET	Stop / Reset Used to stop AC drive operation. If the drive has stopped due to a fault, clear the fault first, then press this key to reset the drive.
	Up / Down Press the "Up" or "Down" keys momentarily to change parameter settings. These keys may also be used to scroll through different operating values or parameters. Pressing the "Up" or "Down" key momentarily, will change the parameter settings in single-unit increments. To quickly run through the range of settings, press and hold the "DOWN" key.

4.2 Explanation of the LED Indicators





4

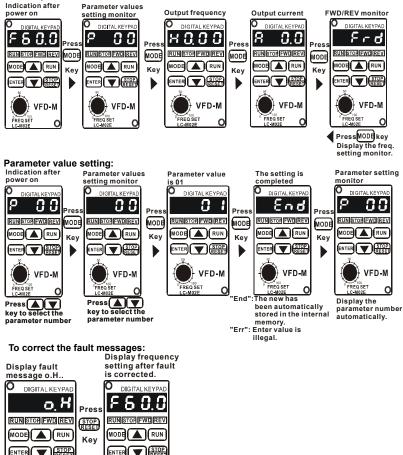
4.3 Explanations of Display Messages

Displayed Message	Descriptions
F80.0	The AC drives Master Frequency.
H60.0	The Actual Operation Frequency present at terminals U, V, and W.
JSCC	The custom unit (v), where v = H x Pr65.
c 999	The counter value (c).
8 5.8	The output current present at terminals U, V, and W
: 58	The internal PLC process step currently being performed.
P 0 1	The specified parameter.
8 1	The actual value stored within the specified parameter.
Frd	The AC drive forward run status.
-Eu	The AC drive reverse run status.
೯೧೮	"End" displays for approximately 1 second if input has been accepted. After a parameter value has been set, the new value is automatically stored in memory. To modify an entry, use the and keys.
Err	"Err" displays, if the input is invalid.



4.4 Explanation of Digital Keypad LC-M02E Operation

To view parameters:



FREO SET

LC-M02E

VFD-M

C

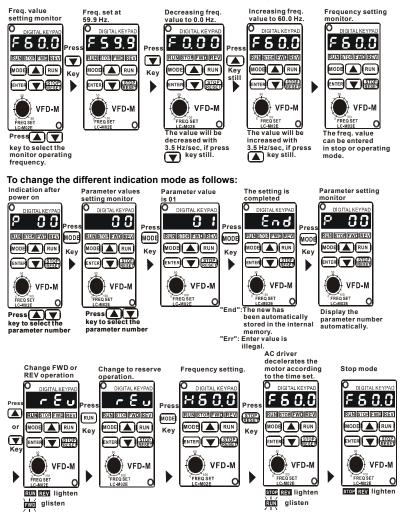
LC-M02E

0



To change frequency, proceed as follows:

Note: The Pr.00 has to be set to d00 in order to operate via digital keypad.



4-5

ELTA VFD-M Series

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CHAPTER 5 DESCRIPTION OF PARAMETER SETTINGS

 \mathcal{M} : The parameter can be set during operation.

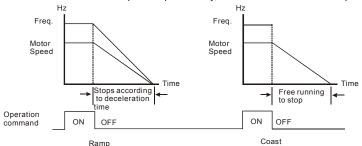
Master frequency determined by 0 to +10 V input		
Master frequency determined by potentiometer on digital keypad. (LC-M02E)		
by the Digital Keypad.		
inals.		
Operation instructions determined by the External Control Terminals. Keypad STOP key is not effective.		
11013.		
cation		

	hod	Factory Setting: 00
 Settings	00	Ramp to stop
	01	Coast to stop
This paramet stop commar		termines how the motor is stopped when the AC drive receives a valid

1. Ramp: The AC drive decelerates the motor to Minimum Output Frequency (Pr.08) and then stops according to the deceleration time set in Pr.11 or Pr.13.

Series

2. Coast: The AC drive will stop the output instantly, and the motor will coast to stop.



Note: The motor stop method is usually determined by the application or system requirements.

Pr.03 Maximum Output Frequency	Factory Setting: 60.00
Settings 50.00 to 400.0 Hz	Unit: 0.1Hz

This parameter determines the AC drive's Maximum Output Frequency. All the AC drive analog inputs (0 to +10V, 4 to 20mA) are scaled to correspond to the output frequency range.

Pr.04 Maximum Voltage Frequency (Base Frequency)	Factory Setting: 60.00
Settings 10.00 to 400.0Hz	Unit: 0.1Hz

This parameter should be set according to the rated frequency as indicated in the motor nameplate. Pr.04 and Pr.03 determine the volts per hertz ratio.

For example: if the drive is rated for 460 VAC output and the Maximum Voltage Frequency is set to 60Hz, the drive will maintain a constant ratio of 7.66 v/Hz. Setting of Pr.04 must be equal to or greater than setting of Mid-Point Frequency (Pr.06).

Pr.05 Maximum Output Voltage (Vmax)				
Settings	115V/230V series	0.1 to 255.0V	Factory Setting: 220.0	
	460V series	0.1 to 510.0V	Factory Setting: 440.0	
	575V series	0.1 to 637.0V	Factory Setting: 575.0	

Selta VFD-M Series

This parameter determines the Maximum Output Voltage of the AC drive. The Maximum Output Voltage setting must be smaller than or equal to the rated voltage of the motor as indicated on the motor nameplate. Setting of Pr.05 must be equal to or greater than setting of Mid-Point Voltage (Pr.07).

Pr.06	Mid-Point Frequency	Factory Setting: 1.50
	Settings 0.10 to 400.0Hz	Unit: 0.1Hz

The parameter sets the Mid-Point Frequency of V/F curve. With this setting, the V/F ratio between Minimum Frequency and Mid-Point frequency can be determined. Setting of this parameter must be equal to or greater than Minimum Output Frequency (Pr.08) and equal to or less than Maximum Voltage Frequency (Pr.04).

Pr.07	Mid-Point	Mid-Point Voltage				
	Settings	115V/230V series	0.1 to 255.0V	Factory Setting: 10.0		
		460V series	0.1 to 510.0V	Factory Setting: 20.0		
		575V series	0.1 to 637.0V	Factory Setting: 26.1		

□ The parameter sets the Mid-Point Voltage of any V/F curve. With this setting, the V/F ratio between Minimum Frequency and Mid-Point Frequency can be determined. Setting of this parameter must be equal to or greater than Minimum Output Voltage (Pr.09) and equal to or less than Maximum Output Voltage (Pr.05).

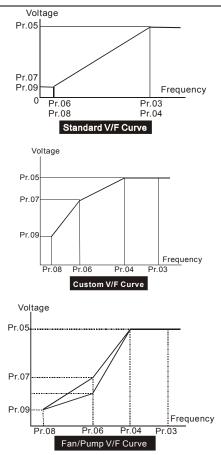
Pr.08 Minimum Output Frequency	Factory Setting: 1.50
Settings 0.10 to 20.00Hz	Unit: 0.1Hz

□ The parameter sets the Minimum Output Frequency of the AC drive. Setting of this parameter must be equal to or less than Mid-Point Frequency (Pr.06).

Pr.09 Minimum Output Voltage					
Settings	115V/230V series	0.1 to 255.0V	Factory Setting: 10.0		
	460V series	0.1 to 510.0V	Factory Setting: 20.0		
	575V series	0.1 to 637.0V	Factory Setting: 26.1		

□ This parameter sets the Minimum Output Voltage of the AC drive. Setting of this parameter must be equal to or less than Mid-Point Voltage (Pr.07).

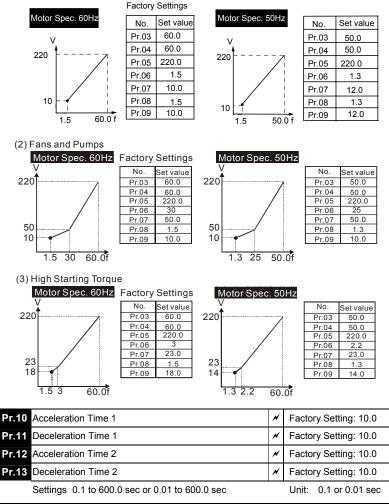






Commonly used V/F Setting

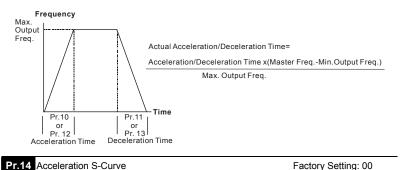
(1) General Purpose



Revision December 2007, ME12, SW V3.04

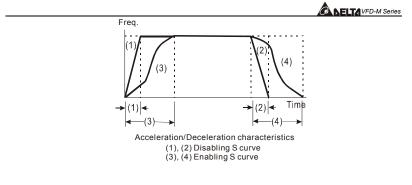
Series

- Pr.10. This parameter is used to determine the time required for the AC drive to ramp from 0 Hz to its Maximum Output Frequency (Pr.03). The rate is linear unless the S-Curve (Pr.14) is "Enabled".
- Pr.11. This parameter is used to determine the time required for the AC drive to decelerate from the Maximum Output Frequency (Pr.03) down to 0 Hz. The rate is linear unless the S-Curve (Pr.14) is "Enabled".
- Pr.12 and Pr.13: Provide an additional Accel/Decel time although Time 1 is the default. A Multi-Function input terminal must be programmed to select Accel/ or Decel/ Time 2 and the terminal must be closed to select Accel/Decel Time 2 (See Pr.38 to Pr.42).
- In the below diagram, suppose the Maximum Output Frequency is 60 Hz (Master Freq), Minimum Output Frequency (start-up) is 1.0 Hz, and accel/decel time 1 is 10 seconds. The actual time for the AC drive to accelerate from start-up to 60 Hz is 9.83 seconds (deceleration time is also 9.83 seconds), can be determined by the formula.





This parameter is used whenever the motor load needs to be accelerated or decelerated smoothly. The desired accel/decel effect is selectable from 0 to 7, in which the larger the number, the greater the effect achieved. If the default value of Pr.111 Deceleration S Curve is unchanged ("0"), then Pr.14 sets both acceleration and deceleration S-Curves. If Pr.111 is set to any value other than "0", then Pr.14 will set the acceleration S-Curve and Pr.111 will set the deceleration S-Curve.

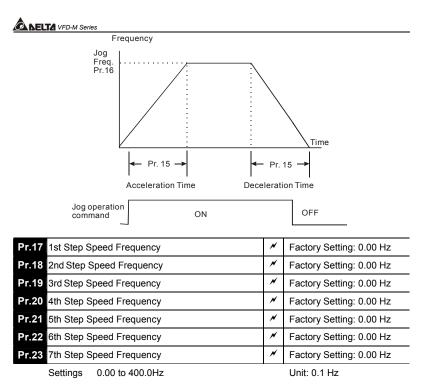


Pr.15 Jog Accel / Decel Time	*	Factory Setting: 1.0 sec
Settings 0.1 to 600.0 sec or 0.01 to 600.0 sec		Unit: 0.1 or 0.01 sec

This parameter sets the acceleration or deceleration time for Jog operation.

Pr.16 Jog Frequency		Factory Setting: 6.00 Hz
Settings 0.00 to 400.0 Hz		Unit: 0.1 Hz

When the JOG function is activated, the AC drive will accelerate from Minimum Output Frequency (Pr.08) to Jog Frequency (Pr.16). Drive must be in "stop" status for the operator to activate the JOG function. Likewise, during Jog operation, other commands cannot be accepted through the keypad but FORWARD, REVERSE and STOP. The JOG function can be remotely activated when the Jog terminal is closed, and if the Jog terminal opens, the AC drive will decelerate from Jog Frequency to zero. The accel / decel time is entered as Jog Accel / Decel Time (Pr.15). Multi-function Input terminals (M1-M5) can also be used to initiate the JOG operation if so programmed.



- Multi-Function Input Terminals (refer to Pr.38 to Pr.42) are used to select Multi-Step speeds. The desired speed frequencies are entered in Pr.17 to Pr.23. When the associated multi-function input terminal is closed, drive will run at one of these specific frequencies.
- Multi-step speeds (Pr.17 to Pr.23), Pr.78, Pr.79, and Pr.81 to Pr.87; are used for multi-step motion control, which is executed in an orderly manner, similar to a PLC program.

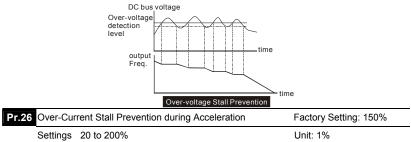
Pr.24 Reverse Operation Inhibition			Factory Setting: 00
Settings 00 I		Enable REV operation	
	01	Disable REV operation	

□ This parameter is used to disable motor rotation in reverse.

Pr.25 Over–Voltage Stall Prevention

Settings	115V/230V series	330-450Vdc	Factory Setting: 390
	460V series	660-900Vdc	Factory Setting: 780
	575V series	825-1025Vdc	Factory Setting: 975
	00 disable		

- During deceleration, the DC bus voltage may exceed its maximum allowable value due to motor regeneration. When this function is enabled, the AC drive will stop decelerating, and maintain a constant output frequency to prevent from over-voltage tripping. Drive will resume deceleration when the voltage drops below the setting for Pr.25.
- Note: In applications where inertia is low, over-voltage during deceleration would not occur. When inertia is high, the AC drive will automatically extend the deceleration period. If a faster stop is needed, then a dynamic braking resistor should be used.



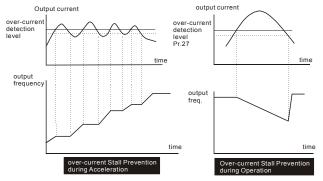
00 disable

- A setting of 100% is equal to the Rated Output Current of the drive.
- Under certain conditions, the AC drive output current may increase abruptly, and exceed the value specified by Pr.26. This is commonly caused by rapid acceleration or excessive load on the motor. When this function is enabled, the AC drive will stop accelerating and maintain a constant output frequency. Drive will resume accelerating only after the current drops below the setting for Pr.26.

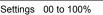
Pr.27	Over-Cur	rent Stall Prevention during Operation	Factory Setting: 150%
Settings 20 to 200%		20 to 200%	Unit: 1%
		00: disable	

Series

During a steady-state operation with the motor load rapidly increasing, the AC drive output current may exceed the limit specified in Pr.27. When this occurs, the output frequency will decrease to maintain a constant motor speed. The drive will accelerate to the steady-state output frequency only when the output current drops below the setting for Pr.27.



Pr.28 DC Braking Current Level



Unit: 1%

Factory Setting: 00

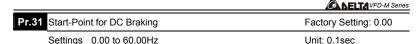
This parameter determines the amount of DC Braking Current applied to the motor during starting and stopping. When setting the DC Braking Current, please note that 100% corresponds to the rated current of the AC drive. It is recommended to start with a low DC Braking Current level and then increase it until proper holding torque has been attained.

Pr.29 DC Braki	ing Time during Start-up	Factory Setting: 0.0
Settings	0.0 to 5.0 sec	Unit: 0.1sec

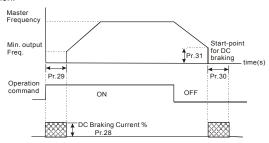
This parameter determines the duration for the DC Braking Current applied during starting. DC Braking is applied until the Minimum Frequency is reached.

Pr.30 DC Braking Time during Stopping	Factory Setting: 0.0
Settings 0.0 to 25.0 sec	Unit: 0.1sec

This parameter determines the duration for the DC Braking voltage to be applied during stopping. If stopping with DC Braking is desired, then Pr.02 must be set to Ramp to Stop (0.0).



This parameter sets the frequency at which the DC Braking will begin during deceleration.



Notes:

- DC Braking during starting is used for loads that may move before the AC drive starts, such as hoists and cranes. These loads may also be moving in the wrong direction. Under such circumstances, the DC Braking can be used to hold the load in position before applying a forward motion.
- DC Braking during stopping is used to stop faster than the ramp-to-stop or to hold a stopped load in position. A dynamic braking resistor may be needed in order to stop loads of high inertia.

Pr.32 Momentary Power Loss Operation Selection Factory Setting: 00					
Settings	Settings 00 Operation stops after momentary power loss		er loss		
Operation continues after momentary power loss Speed sea with the Master Frequency reference value					
	02	Operation continues after momentary power loss Speed search start with the min frequency			
Pr.33 Maximum Allowable Power Loss Time Factory Setting: 2.0 sec			Factory Setting: 2.0 sec		
Settings 0.3 to 5.0 sec Unit: 0.1sec		Unit: 0.1sec			

After a power loss, the AC drive will resume operation only if the power loss duration is shorter than the time defined by Pr.33. If the Maximum Allowable Power Loss Time is exceeded, the AC drive output is then turned off.

Pr.34 Base-Block Time for Speed Search	Factory Setting: 0.5 sec

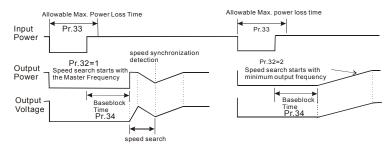
Settings 0.3 to 5.0 sec

When a momentary power loss is detected, the AC drive will stop its output and will wait during a specified time interval called Base Block (entered in Pr.34) before resuming operation. Setting of this parameter should make the residual output voltage due to regeneration almost zero, before the drive resumes operation.

This parameter also determines the search time when performing external Base-Block and Fault Reset (Pr.72).

Pr.35 Maximur	Factory Setting: 150	
Settings	30 to 200%	Unit: 1%

Following a power failure, the AC drive will start its speed search operation only if the output current is greater than the value determined by Pr.35. When the output current is less than that of Pr.35, the AC drive output frequency is at a "speed synchronization point" and will accelerate or decelerate back to the operating frequency at which it was running prior to the power failure.



Pr.36 Upper Bound of Output Frequency Factory Setting: 400

Settings 0.10 Hz to 400.0 Hz

Unit: 0.1Hz

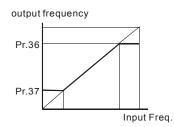
Unit: 0.1sec

- The Upper/Lower Bounds help prevent operation error and machine damage.
- If the Upper Bound of Output Frequency is 50Hz and the Maximum Output Frequency is 60Hz, the Maximum Output Frequency will be limited to 50Hz.
- Setting of this parameter must be equal to or greater than the Lower Bound of Output Frequency (Pr.37).



Pr.37 Lower Bound of Output Frequency	Factory Setting: 0 Hz
Settings 0.00 Hz to 400.0 Hz	Unit: 0.1Hz

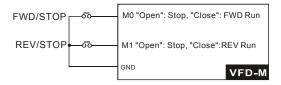
- Setting of this parameter must be equal to or less than the Upper Bound of Output Frequency
- If the Lower Bound of Output Frequency is 10Hz, and the Minimum Output Frequency (Pr.08) is set at 1.0Hz, then any command frequency between 1-10Hz will generate a 10Hz output from the drive.



Pr.38 Multi-function Input Terminal (M0, M1)			nput Terminal (M0, M1)	Factory Setting: 00
Settings 00 M0: FWD/STOP, M1: REV/STOP			M0: FWD/STOP, M1: REV/STOP	
01 M0: RUN/STOP, M1: REV/FWD		M0: RUN/STOP, M1: REV/FWD		
		02	M0, M1, M2: 3-wire operation control mo	ode

Explanations:

00: Two wire operation: Only Pr.38 can be set to "0".

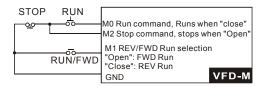


01: Two wire operation: Only Pr.38 can be set to "1".



Note: Multi-function Input Terminal M0 does not have its own parameter designation. M0 must be used in conjunction with M1 to operate two and three wire control.

02 Three Wire Control: Only Pr.38 can be set to "2".



Note: When the "2" setting is selected for Pr.38, the value in Pr.39 will be ignored.

Pr.39 Multi-function Input Terminal (M2)	Factory Setting: 05
Pr.40 Multi-function Input Terminal (M3)	Factory Setting: 06
Pr.41 Multi-function Input Terminal (M4)	Factory Setting: 07
Pr.42 Multi-function Input Terminal (M5)	Factory Setting: 08

Settings 00 to 32

Parameters & Functions table:

Value	Function	Value	Function
00	No Function	01	Output OFF (N.O.) (enabled when running)
02	Output OFF (N.C.) (enabled when running)	03	External Fault (N.O.)
04	External Fault (N.C.)	05	External Reset
06	Multi-Step Speed Command 1	07	Multi-Step Speed Command 2

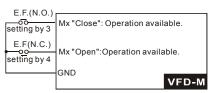
			C NELTA VFD-M Series
Value	Function	Value	Function
08	Multi-Step Speed Command 3	09	Jog Operation
10	Accel/Decel Speed Inhibit	11	First or Second Accel/Decel Time Selection
12	External Base Block (N.O.)	13	External Base Block (N.C.)
12	(Normally Open Contact Input)	15	(Normally Close Contact Input)
14	Increase Master Frequency	15	Decrease Master Frequency
16	Run PLC Program	17	Pause PLC Program
18	Counter Trigger Signal	19	Counter Reset
20	No Function	21	RESET Command (N.C)
22	Control source: External Terminal	23	Control source: Keypad
24	Control source: Communication	25	Parameter Lock (Write disable, Read is always 0)
26	PID Disable (N.O.)	27	PID Disable (N.C.)
28	Second Source for Frequency	29	Forward (contact is open) / Reverse
	Command		(contact is close)
30	One-Shot PLC Run	31	Index Input Signal
32	Virtual Timer Input		

Explanations:

00: no function.

- **01, 02:** when it is set to 01 or 02, AC drive output will stop immediately. If there is start signal after stopping, the output will start from the minimum frequency.
- 03, 04 External Faults: Parameter values 3 and 4 program Multi-Function Input Terminals:

M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) to be External Fault (E.F.) inputs.



Note: When an External Fault input signal is received, the AC drive output will turn off, drive will display " E.F." on Digital Keypad, and the motor will coast. Normal operation can resume after the External Fault is cleared and the AC drive is reset.

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05 External Reset:

Parameter value 5 programs Multi-Function Input Terminals: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) to be an External Reset.



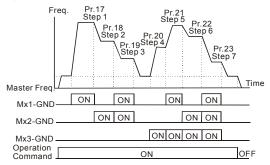
Note: the External Reset has the same function as the Reset key on the Digital keypad. It will reset the drive after a fault.

06, 07, 08 Multi-Step Speed Command:

Parameter values 06, 07,and 08 program any three of the following Multi-Function Input Terminals: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) for Multi-step Speed Command function.

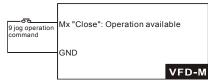


Note: These three inputs select up to seven multi-step speeds defined by Pr.17 to Pr.23 as shown in the following diagram. Pr.78 to Pr.87 can also control output speed by programming the AC drive's internal PLC function.



09 Jog Operation Control:

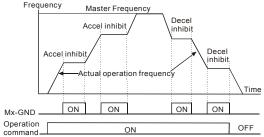
Parameter value 09 programs Multi-Function Input Terminal: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) for Jog control.



Note: Jog operation programmed by 9 can only be initiated while the motor is stop. (Refer to Pr.15, Pr.16.)

10 Accel/Decel Speed Inhibit:

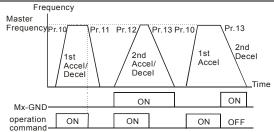
Parameter value 10 programs Multi-Function Input Terminal: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) for Accel/Decel Inhibit. After receiving this command, the AC Drive stops accelerating or decelerating and maintains a constant speed.



11 First or Second Accel/Decel Time Selection:

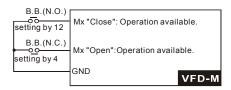
Parameter value 11 programs a Multi-Function Input Terminal: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) for selecting the First or Second Accel/Decel time. (Refer to Pr.10 to Pr.13.)



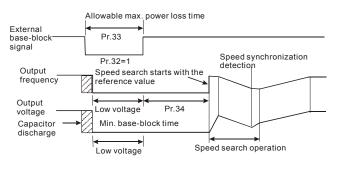


12, 13 External Base Block:

Parameter values 12, 13 program Multi-Function Input Terminals: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) for external Base Block control. Value 12 is for normally open (N.O.) input, and value 13 is for a N.C. input.



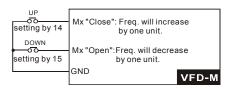
Note: When a Base-Block signal is received, the AC drive will stop all output and the motor will coast. When base block control is deactivated, the AC drive will start its speed search function and synchronize with the motor speed, and then accelerate to the Master Frequency.





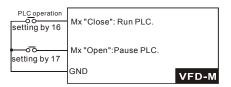
14, 15 Increase/Decrease Master Frequency:

Parameter values 14, 15 program the Multi-Function Input Terminals: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) to incrementally increase/ decrease the Master Frequency each time an input is received.



16, 17 PLC Function Control:

Parameter value 16 programs Multi-Function Input Terminal: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) to enable the AC drive internal PLC program. Parameter value 17 programs an input terminal to pause the PLC program.



Note: Pr.17 to Pr.23, Pr.78, Pr. 79, Pr.81 to Pr.87 define the PLC program. Another related function is "30 One-Shot PLC Run". It can be set to use a not-latched contact as the run signal.

18 Counter Trigger:

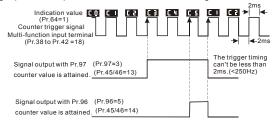
Parameter value 18 programs Multi-Function Input Terminal: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) to increase the AC drive's internal counter. When an input is received, the counter is increased by 1.





Note: The Counter Trigger input can be connected to an external Pulse Signal Generator when

counting a process step or unit of material. See the diagram below.



19 Counter Reset:

Parameter value 19 programs Multi-Function Input Terminal: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42) to reset the counter.



20 Parameter Disable:

Enter value (20) to disable any Multi-Function Input Terminal: M1 (Pr.38), M2 (Pr.39), M3 (Pr.40), M4 (Pr.41) or M5 (Pr.42)

Note: Purpose of this function is to isolate unused Multi-Function Input Terminals. Any unused terminals should be programmed to 20 to insure they have no effect on drive operation.

22 Control Source: External Terminal / 23 Control Source: Keypad / 24 Control Source: Communication:

Enter values 22, 23, or 24 to set the control source to be the external terminals, keypad or communication respectively. This setting is used to create functions for manual/auto, and remote/near-end control. When these three functions are used at the same time, the priority is 22-I/O > 23-Keypad > 24-Communication.



25 Parameter Lock (Write disable, Read is always 0)

This function will disable the write function and all the content of read are 0. The application is for customer having a key to control the operator to modify parameters or modify the parameter by improper use.

26 PID Disable (N.O.) / 27 PID Disable (N.C.)

This function pause the PID control. It is commonly used for manual operation or function testing, and to recover the PID function when the system is normal.

28 Second Source of Frequency Command

This function is used with Pr. 142 to select a different frequency source for control.

29 Forward (contact is open) / Reverse (contact is close)

This function has top priority to set the direction for running (If "Pr. 24 inhibit REV function" is not set). No mater what the present direction of run is, the contact N.O. is forward and the contact N.C. is reverse, once this function is set.

The requirement for setting direction is Pr. 24 > setting 29 of Pr. 39-Pr. 42 > Pr. 38.

31 Index Input Signal

This function is used with parameters 149 to 151. The position where AC drive stops will be regarded as the zero position and it will move to the angle that Pr. 150 sets.

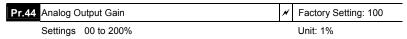
32 Counter Incremented by Drive Output Frequency

This function is for counting at the speed of the output frequency.

Note: The settings 00~32 in Pr. 39 to Pr.42 can be used to set multi-function terminals (M2-M5) but the settings cannot be used repeatedly at the same time (besides settings 20).

Pr.43 Analog O	utput	Signal	*	Factory Setting: 00
Settings 00 Analog Frequency Meter (0 to Maximu			O	utput Frequency)
01 Analog Current Meter (0 to 250% of the		rate	ed AC drive current)	
	02	Feedback Signal (0 - 100%)		
	~~			

This parameter selects if the Output Frequency, Current, PID feedback or Output Power will be the output signal on the AFM terminal (0 to 10V).



This parameter sets the voltage range of the analog output signal on output terminal AFM.



The analog output voltage is directly proportional to the output frequency of the AC drive. A setting of 100% on Pr.44 makes the Maximum Output Frequency (Pr.03) of the AC drive to correspond to the +10VDC analog voltage output. (The actual voltage is about +10VDC, and can be adjusted by Pr.44)

The analog output voltage is also directly proportional to the output current of the AC drive. A setting of 100% on Pr.44 makes the 2.5 times rated current of the AC drive to correspond to the +10 VDC analog voltage output. (The actual voltage is about +10 VDC, and can be adjusted by Pr.44)

Note: Any type of voltmeter can be used. If the meter reads full scale at a voltage less than 10 volts, then Pr.44 should be set by the following formula:

Pr.44 = ((meter full scale voltage)/10)×100% For Example: When using a meter with a full scale of 5 volts, adjust Pr.44 to 50%

Pr.45 Multi-function Output Terminal 1 (Photocoupler output)	Factory Setting: 00
Pr.46 Multi-function Output Terminal 2 (Relay output)	Factory Setting: 07
Settings 00 to 24	



Function	Table List:		
Setting	Functions	Setting	Functions
00	AC Drive Operational	13	Top Count Value Attained
01	Maximum Output Frequency Attained	14	Preliminary Counter Value Attained
02	Zero speed	15	Warning (PID feedback loss, communication error)
03	Over-Torque detection	16	Below the Desired Frequency
04	Base-Block (B.B.) Indication	17	PID supervision
05	Low-Voltage Indication	18	Over Voltage supervision
06	AC Drive Operation Mode	19	Over Heat supervision
07	Fault Indication	20	Over Current stall supervision
08	Desired Frequency attained	21	Over Voltage stall supervision
09	PLC Program Running	22	Forward command
10	PLC Program Step Completed	23	Reverse command
11	PLC Program Completed	24	Zero Speed (Includes Drive Stop)
12	PLC Operation Paused		

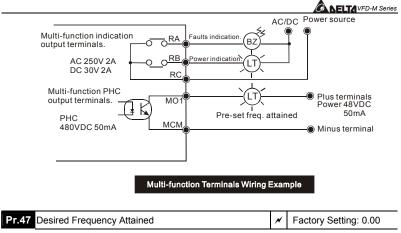
Function Explanations:

- 00 AC Drive operational: terminal output is activated when there is power output from drive.
- 01 Maximum Output Frequency Attained: terminal output is activated when the AC drive attains Maximum Output Frequency.
- 02 Zero speed: terminal output is activated when Command Frequency is lower than the Minimum Output Frequency.
- **03 Over-Torque Detection:** terminal output is activated when over-torque is detected. Parameter Pr.61 determines the Over-Torque detection level.
- 04 Base-Block (B.B.) Indication: terminal output is activated when the AC drive output is shut-off by the external Base-Block.
- 05 Low Voltage Indication: terminal output is activated when low voltage is detected.
- 06 AC Drive Operation Mode: terminal output is activated when the operation of AC Drive is controlled by External Control Terminals.
- **67 Fault Indication:** terminal output is activated when certain faults occur (oc, ov, oH, oL, oL1, EF, cF3, HPF, ocA, ocd, ocn, GF).
- 08 Desired Frequency Attained: terminal output is activated when the desired frequency (Pr.47) is attained.

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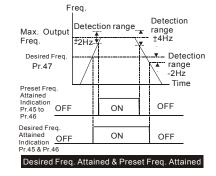
- **09 PLC Program Running:** terminal output is activated when the PLC program is running.
- 10 PLC Program Step Completed: terminal output is activated for 0.5 sec. when each multi-step speed is attained.
- 11 PLC Program completed: terminal output is activated for 0.5 sec. when the PLC program cycle has completed.
- 12 PLC Program Operation Paused: terminal output is activated when PLC operation is paused.
- **13 Top Count Value Attained:** terminal output is activated when counter reaches the Top Count Value. See diagram for Pr.38 to Pr.42=18.
- **14 Preliminary Count Value Attained:** terminal output is activated when counter reaches the Preliminary Count Value. See diagram for Pr.38 to Pr.42=18.
- **15** Warning (PID feedback loss, communication error): the contact will be "close" when PID feedback loss or communication is error.
- **16 Below the Desired Frequency:** the contact will be "close" when output frequency is less than desired frequency.
- **PID supervision:** the contact will be "close" when PID offset exceeds the setting of P126 and P127.
- **18 Over voltage supervision:** the contact will be "close" before over voltage. It will be activated at 370Vdc in 230V series and at 740Vdc in 460 series.
- 19 Over Heat supervision: the contact will be "close" before 90°C.
- 20 Over Current stall supervision: the contact will be "close" before exceeding the setting of P26/P27.
- **21 Over voltage stall supervision:** the contact will be "close" before exceeding the setting of P25.
- 22 Forward command: the contact will be "close" with forward command.
- 23 Reverse command: the contact will be "close" with reverse command.
- 24 Zero Speed (Includes Drive Stop): the contact will be "close" when the setting frequency is less than min. frequency or drive stop.



Settings 0.00 to 400.0 Hz

Unit: 0.1Hz

This parameter allows monitoring a certain frequency and then activates one of the Multi-function output terminals (Pr.45 or Pr.46 set to 8) when that frequency is achieved.



Pr.48 Adjust Bias of External Input Frequency			Factory Setting: 0.00 Hz
Settings	0.00 to 200.0%		Unit: 0.1Hz

This parameter provides a frequency offset when the source of frequency command is the analog input. A Series

Pr.49 Potentiometer Bias Polarity / Factory Setting: 00

Settings 00 Positive Bias

01 Negative Bias

This parameter sets the potentiometer Bias Frequency to be positive or negative.

Pr.50 Pote	entiometer Frequency Gain	*	Factory Setting: 100.0
Set	tings 0.10 to 200.0%		Unit: 1%

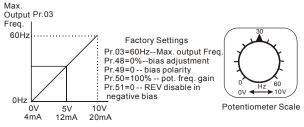
This parameter sets the ratio of analog input vs frequency output.

Pr.51 Potentiometer Reverse Motion Enable		Factory Setting: 00	
Settings	00	Reverse Motion Disabled in negative bias	
	01	Reverse Motion Enabled in negative bias	
Pr.48 to Pr.51 are used when the source of frequency command is the analog signal (0 to			

+10V DC or 4 to 20mA DC). Refer to the following examples.

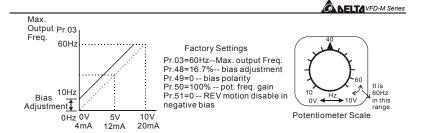
Example 1:

Set Pr.00=1 to command frequency with the potentiometer on keypad or Pr.00=2 (4 to 20mA current signal) potentiometer/current signal of external terminal.



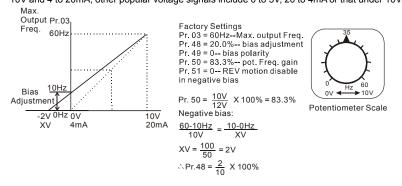
Example 2:

A Bias Adjustment (16.7% of 60Hz) determines the Output Frequency to be 10 Hz with the potentiometer set at 0V as shown. Notice that the entire V/F is transposed accordingly. An analog input voltage 0-8.33V (or current 4-13.33mA) would set frequency as 0-60Hz.Once the Maximum Output Frequency is reached any further increase on the potentiometer will not increase output frequency (If you want to use the range of 60Hz, please refer to the example 3).



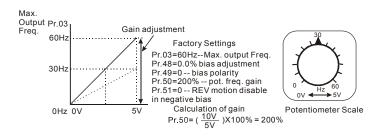
Example 3:

The whole scale of the potentiometer may be used as desired. In addition to the signals 0 to 10V and 4 to 20mA, other popular voltage signals include 0 to 5V, 20 to 4mA or that under 10V.



Example 4:

This example shows how to use Gain to set a potentiometer range of 0 to 5 Volts for 0-60 Hz. As an option, you also could set Pr. 03 = 120Hz

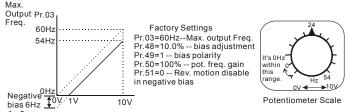


5-27

SELTA VFD-M Series

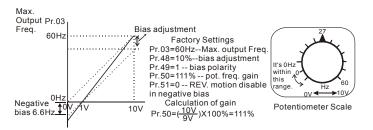
Example 5:

In this example, a 6 Hz (10% of 60 Hz) negative bias is used. This setting is used to provide a noise margin (1V in this example) in noisy environments. Note that the top frequency is reduced to 54 Hz.



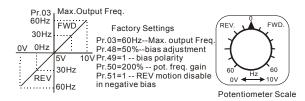
Example 6:

This example also uses negative bias and includes a potentiometer frequency gain to allow the AC drive to reach the Maximum Output Frequency.



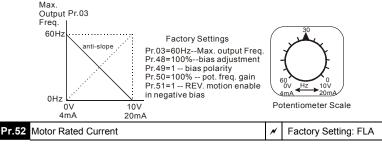
Example 7:

In this example, the potentiometer is programmed to run a motor in forward or reverse direction. The motor will idle when the potentiometer is set at the scale mid-point. Please note that this adjustment will disable the external FWD and REV controls.



Example 8:

This example shows how to set up the "anti-slope", which is an inversely proportional variation of frequency to the input analog signal, required for some applications in process control. A sensor will generate a large signal (such as 20mA or 10V) and the AC Drive will slow or stop.



Settings 30.0% FLA to 120.0% FLA

Unit: 0.1A

Factory setting is the AC drive rated current. When setting this parameter, just input the motor rated current value without any calculation.

Use the following criteria to determine the setting of this parameter: no-load current < rated current of motor < rated current of AC drive. You can use this parameter to limit the output current to the motor as to prevent overheat.</p>

Pr.53 Motor No-Load C	urrent	×	Factory Setting: 0.4*FLA
Settings 00%FL	A to 99%FLA		Unit: 0.1A

The rated current of the AC drive means 100%. Setting of this parameter affects the slip compensation. The setting value must be smaller than the motor rated current setting in Pr.52. (this parameter displays the value of actual current.)

Pr.54 Torque Compensation	*	Factory Setting: 00
Settings 00 to 10		

This parameter forces the AC drive to increase its voltage output during start-up in order to obtain a higher initial starting torque.

Pr.55 Slip Compensation	×	Factory Setting: 0.00
Cattinga 0.00 to 10.00		

Settings 0.00 to 10.00

This parameter can be used to compensate motor slip. Although no linear, it typically adds 6 Hz for a setting of 10 if Pr.03=60 Hz. When the output current of the AC drive is greater than the motor no-load current (Pr.53), the AC drive will adjust its output frequency according to this parameter.

Pr.56 R	eserved
---------	---------

Pr.57 Rated Current Display of the AC motor drive	Factory Setting: ##.#
---	-----------------------

Settings Read Only

Pr.57 displays the rated current of the AC motor drive. By reading this parameter the user can check if the AC motor drive is correct. See Pr.80 for details.

Pr.58 Electronic Thermal Overload Relay Selection		Factory Setting: 02	
Settings	00	Standard Motor (self cool motor)	
	01	Inverter Motor (auxiliary cool fan on motor)	
	02	Inactive	

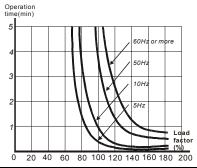
This function is used to limit the output power of the AC drive when powering a "self-cooled motor" at low speed.

Pr.59 Electronic Thermal Motor Overload	Factory Setting: 60
0.111.000.10.000.000	Lindte A second

Settings 30 to 300sec

Unit: 1 second

The parameter determines the time required to activate the I²t electronic thermal motor overload protection. The graph below shows I²t curves at 150% output power for 1 minute.



Pr.60 Over-Tor	que D	etection Mode	Factory Setting: 00
Settings	00	Over-Torque detection disabled.	
	01	Enabled during constant speed operatio detection (Pr.62) elapses.	n until the allowable time for
	02	Enabled during constant speed operation	and halted after detection
	03	Enabled during acceleration until the a (Pr.62) elapses.	
	04	Enabled during acceleration and halted a	after detection.
Pr.61 Over-Tor	que D	etection Level	Factory Setting: 150
Settings	30 to	200%	Unit: 1%
	4	,	
rated curren	it is eq	ual to 100%.)	
	_		
Settings	0.0 to	etection Time o 10.0sec n for over-torque detection. When the out	Factory Setting: 0.1sec Unit: 0.1 sec out current is larger than the
Settings This is the o over-torque (Pr.62) is tin	0.0 to duratio detect ned-ou	o 10.0sec	Unit: 0.1 sec out current is larger than the exists and the detection time
Settings This is the o over-torque (Pr.62) is tin	0.0 to duratio detect ned-ou se. (Pl	o 10.0sec In for over-torque detection. When the out tion level (Pr.61), an over-torque condition ut. Any of the multi-function output terminal lease refer to Pr. 45 and Pr.46)	Unit: 0.1 sec out current is larger than the exists and the detection time
Settings This is the or over-torque (Pr.62) is tin will then clo	0.0 to duratio detect ned-ou se. (Pl	o 10.0sec In for over-torque detection. When the out tion level (Pr.61), an over-torque condition ut. Any of the multi-function output terminal lease refer to Pr. 45 and Pr.46)	Unit: 0.1 sec out current is larger than the exists and the detection time s set to indicate over-torque
Settings This is the o over-torque (Pr.62) is tin will then clo Pr.63 Loss of A	0.0 to duratio detect ned-ou se. (Pl	o 10.0sec In for over-torque detection. When the out tion level (Pr.61), an over-torque condition ut. Any of the multi-function output terminal ease refer to Pr. 45 and Pr.46) 20mA)	Unit: 0.1 sec out current is larger than the exists and the detection time s set to indicate over-torque
Settings This is the o over-torque (Pr.62) is tin will then clo Pr.63 Loss of A	0.0 to duratio detect ned-ou se. (Pl .CI (4-	o 10.0sec in for over-torque detection. When the out tion level (Pr.61), an over-torque condition ut. Any of the multi-function output terminal lease refer to Pr. 45 and Pr.46) 20mA) Decelerate to 0 Hz	Unit: 0.1 sec out current is larger than the exists and the detection time s set to indicate over-torque Factory Setting: 00
Settings This is the c over-torque (Pr.62) is tin will then clo Pr.63 Loss of A Settings	0.0 to duratio detect ned-ou se. (Pl CI (4- 00 01 02	2 10.0sec on for over-torque detection. When the output tion level (Pr.61), an over-torque condition ut. Any of the multi-function output terminal lease refer to Pr. 45 and Pr.46) 20mA) Decelerate to 0 Hz Stop immediately and display "EF"	Unit: 0.1 sec out current is larger than the exists and the detection time s set to indicate over-torque Factory Setting: 00
Settings This is the c over-torque (Pr.62) is tin will then clo Pr.63 Loss of A Settings	0.0 to duratio detect ned-ou se. (Pl CI (4- 00 01 02	o 10.0sec In for over-torque detection. When the out tion level (Pr.61), an over-torque condition ut. Any of the multi-function output terminal ease refer to Pr. 45 and Pr.46) 20mA) Decelerate to 0 Hz Stop immediately and display "EF" Continue operation by last frequency cor	Unit: 0.1 sec but current is larger than the exists and the detection time s set to indicate over-torque Factory Setting: 00
Settings This is the c over-torque (Pr.62) is tin will then clo Pr.63 Loss of A Settings Pr.64 User Def	0.0 to duratio deteci- ned-ou se. (Pl SCI (4- 00 01 02 ined F	o 10.0sec In for over-torque detection. When the output tion level (Pr.61), an over-torque condition at. Any of the multi-function output terminal lease refer to Pr. 45 and Pr.46) 20mA) Decelerate to 0 Hz Stop immediately and display "EF" Continue operation by last frequency cor unction for Display	Unit: 0.1 sec out current is larger than the exists and the detection time s set to indicate over-torque Factory Setting: 00 nmand Factory Setting: 06
Settings This is the c over-torque (Pr.62) is tin will then clo Pr.63 Loss of A Settings Pr.64 User Def	0.0 to duratio detect ned-ou se. (Pl CCI (4- 00 01 02 ined F 00	o 10.0sec In for over-torque detection. When the output tion level (Pr.61), an over-torque condition at. Any of the multi-function output terminal lease refer to Pr. 45 and Pr.46) 20mA) Decelerate to 0 Hz Stop immediately and display "EF" Continue operation by last frequency cor unction for Display Displays AC drive output frequency (Hz)	Unit: 0.1 sec out current is larger than the exists and the detection time s set to indicate over-torque Factory Setting: 00 nmand Factory Setting: 06

- 04 PV (i)
- 05 Displays the value of the internal counter (c)
- 06 Displays the setting Frequency (F)
- 07 Displays the parameter setting (P)
- 08 Reserved
- 09 Output Current (A)
- 10 Display program operation (0. xxx), Fwd, or Rev
- The parameter can be set to display the user-defined value. (where $v = H \times Pr.65$)

Pr.65 Coefficient K	*	Factory Setting: 1.00
Settings 0.01 to 160.0		Unit: 0.01

- Decomposition of the the set of t
- The display value is calculated as follows: Display value = output frequency x K
- The display window is only capable of showing four digits, yet you could use Pr.65 to create larger numbers. The display windows uses decimal points to signify numbers up to three digits as illustrated in next page:

Display	Number Represented	
9999	The absence of a decimal point indicates a four-digit integer.	
999.9	A signal decimal point between the middle and the right-most numbers is a true decimal point. For example, the number 123.4 would be displayed as "123.4".	
9999.	A single decimal point after the right-most number is not a true decimal point; instead it indicates that a zero follows the right-most number. For example, the number 12340 would be displayed as "1234."	
999.9.	Two decimal points (one between the middle and the right-most numbers, and one after the right-most number) are not true decimal points; instead they indicate that two zeros follow the right-most number. For example, the number 345600 would be displayed as "345.6.".	

Pr.66 Communication Frequency	Factory Setting: 0.00
Settings 0.00 to 400.0 Hz	Unit: 0.1 Hz

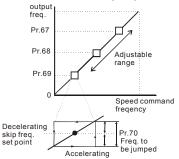
□ This parameter defines the Master Frequency when the AC drive is controlled by the communication interface.

Pr.67 Skip Frequency 1	Factory Setting: 0.00
Pr.68 Skip Frequency 2	Factory Setting: 0.00
Pr.69 Skip Frequency 3	Factory Setting: 0.00
Settings 0.00 to 400.0 Hz	Unit: 0.1 Hz

These three parameters determine the three Skip Frequencies that in conjunction with Pr.70, Skip Frequency Band, will cause the AC drive to skip operating in each frequency band. Note: Pr.67 > Pr.68 > Pr.69.

Pr.70 Skip Frequency Band	Factory Setting: 0.00
Settings 0.00 to 20.00 Hz	Unit: 0.1 Hz

This parameter determines the frequency band for a given Skip Frequency. Half of the Skip Frequency Band is above the Skip Frequency and the other half is below. Programming this parameter to 0.1 disables all skip frequencies.



Pr.71	PWM Ca	PWM Carrier Frequency									
		115V series		Fasters Cattings 45							
	Sottingo	230V series	01 to 15 (1KHz to 15KHz)	Factory Setting: 15 VFD075M43A is 10							
Settings	Settings	460V series									
		575V series	01 to 10 (1KHz to 10KHz)	Factory Setting: 6							
	Note: 1-9kHz in sensorless vector control mode										

 The parameter defines the carrier frequency of the PWM (Pulse-Width Modulated) output.

Carrier Frequency	Acoustic Noise	Electromagnetic Noise, Leakage Current	Heat Dissipation
1KHz ↓ 15KHz	Significant Minimal	Minimal ↓ Significant	Minimal ↓ Significant

From the above table, we see that the carrier frequency of PWM output has a significant influence on the electromagnetic noise, heat dissipation of the AC drive, and the acoustic noise to the motor.

Pr.72 Auto Restart Attempts After Fault	Factory Setting: 00
---	---------------------

Settings 00 to 10

When this parameter is enabled (set different to zero), the AC Drive will restart/reset automatically up to 10 times after the occurrence of certain type of faults (over-current OC, over-voltage OV). If enabled, the AC drive will restart on "speed search", which begins at Master Frequency. Setting this parameter to 0 will disable this operation. To set the fault recovery time after a fault, please see base-block time for speed search (Pr.34).

Pr.73 Present F	Factory Setting: 00					
Pr.74 Second M	Pr.74 Second Most Recent Fault Record					
Pr.75 Third Mos	st Rece	ent Fault Record	Factory Setting: 00			
Settings	00	(no fault occurred)				
	01	Over-current (oc)				
	02	Over-voltage (ov)				
	03	Overheat (oH)				
	04	Overload (oL)				
	05	Overload 1 (oL1)				
	06	External Fault (EF)				
	07	CPU failure 1 (CF1)				
	08	CPU failure 3 (CF3)				
	09	Hardware Protection Failure (HPF)				



- 10 Over-current during acceleration (OCA)
- 11 Over-current during deceleration (OCd)
- 12 Over-current during steady state operation (OCn)
- 13 Ground fault or fuse failure (GFF)
- 14 Low voltage (not record)
- 15 3 Phase Input Power Loss
- 16 CPU Failure (CF2)
- 17 External Base-Block (bb)
- 18 Overload 2 (oL2)
- 19 Auto Adjustable accel/decel failure (cFA)
- 20 Software protection code (codE)

Pr.	76 Paramete	er Lock	and Configuration	Factory Setting: 00					
	Settings	00	All parameters can be set/read						
		01	All parameters are read-only						
		02-08	Reserved						
		09	Resets all parameters to 50Hz factory of	defaults					
		10	Resets all parameters to 60Hz factory of	defaults					
ш	This param	This parameter allows the user to reset the drive to factory settings.							

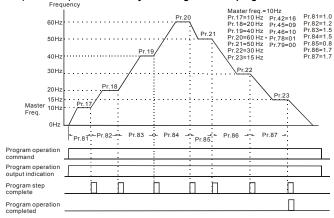
Pr.77	Time for Auto Reset the Restart Times after Fault	Factory Setting: 60.0
	Settings 0.1 to 6000.0 sec	Unit: 0.1 second

If there is no fault in the period of this setting, it will reset the rest restart times that used after fault to the setting of restart times.

Pr.78 PLC Ope	ration	Mode	Factory Setting: 00
Settings	00	Disable PLC operation	
	01	Execute one program cycle	
	02	Continuously execute program cy	vcles
	03	Execute one program cycle step	by step (separated by "STOP")

5

- Continuously execute program cycles step by step (separated by "STOP")
- This M drive can be programmed to execute a sequence of operations named "PLC mode". The PLC program can be used in lieu of any external controls, relays or switches. The AC drive will change speeds and directions according to the user's desired programming. This parameter selects the PLC operation mode for the drive. Please review the following examples:
- Example 1 (Pr.78 =01): Execute one cycle of the PLC program. Its relative parameter settings are:
- 1 Pr.17 to Pr.23: 1st to 7th step speed (sets the frequency for each step speed)
- 2 Pr.38 to Pr.42: Multi-Function Input Terminals (program one multi-function terminal for PLC auto-operation (16)).
- **3 Pr.45 to Pr.46:** Multi-Function Output Terminals : program a Multi-Function Output Terminal for PLC operation indication (09), one cycle in PLC auto mode (10) or PLC operation fulfillment attainment (11).
- 4 Pr.78: PLC mode.
- 5 Pr.79: Direction of operation for Master Frequency and 1st to 7th step speeds.
- 6 Pr.81 to Pr.87: operation time setting of Master Frequency and 1st to 7th step speeds.

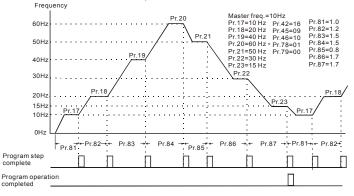


Example 1 (Pr.78 = 01) Execute one cycle through the PLC program:

Note: The above diagram shows one complete PLC cycle. To restart the cycle, turn the PLC Program input off and then back on.

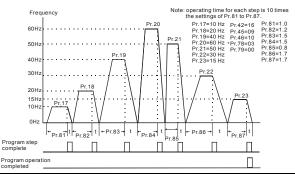
Example 2 (Pr.78 = 02) Continuously executes program cycles:

The diagram below shows the PLC program stepping through each speed and then automatically starting again. To stop the PLC program, either pause or stop the program. (Refer to Pr.38 to Pr.42 value 17 and 18)



Example 3 (Pr.78 = 03) Execute one cycle step by step:

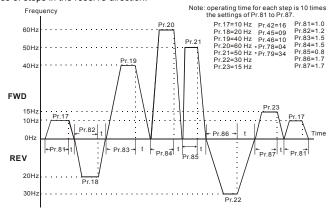
This example shows how the PLC function can perform one cycle at a time, within a complete cycle. Each step will use the accel/decel times in Pr.10 to Pr.13. It should be noted that the time interval for each step may be shorter than expected due to the time required for acceleration and deceleration.



Revision December 2007, ME12, SW V3.04

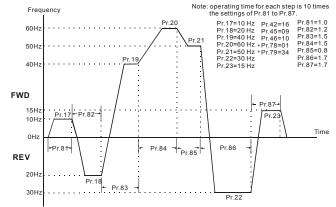
Example 4 (Pr.78 = 04) Continuously executes program cycles step by step:

In this explanation, the PLC program runs continuously step by step. Also shown are examples of steps in the reserve direction.



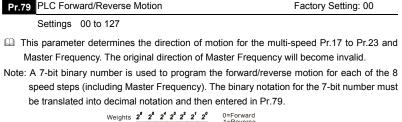
Example 5 (Pr.78 = 01) Execute one cycle through the PLC program:

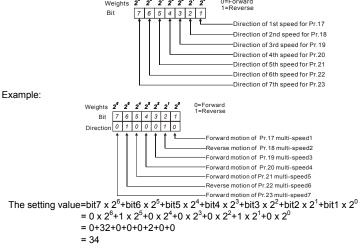
In this example, the PLC program runs continuously. It should be noted that the time interval for each step may be shorter than expected due to the time required for acceleration and deceleration.



Application Note:

PLC program execution will be interrupted when values for JOG parameters 15 and 16 are changed.





Pr.80 Identity Code of the AC Motor Drive Factory

Factory Setting: ##

Settings Read Only

This parameter displays the identity code of the AC motor drive. The capacity, rated current, rated voltage and the max. carrier frequency relate to the identity code. Users can use the following table to check how the rated current, rated voltage and max. carrier frequency of the AC motor drive correspond to the identity code.

	11	5V serie	es		230V series				
kW	0.2	0.4	0.75	0.4	0.75	1.5	2.2	3.7	5.5
HP	0.25	0.5	1.0	0.5	1	2	3	5	7.5
Model Number (Pr.80)	20	22	24	00	02	04	06	08	10
Rated Output Current (A)	1.6	2.5	4.2	2.5	5.0	7.0	10	17	25
Max. Carrier Frequency (kHz)	15kHz								

	460V series							575V series				
kW	0.75	1.5	2.2	3.7	5.5	7.5	0.75	1.5	2.2	3.7	5.5	7.5
HP	1	2	3	5	7.5	10	1	2	3	5	7.5	10
Model Number (Pr.80)	03	05	07	09	11	13	50	51	52	53	54	55
Rated Output Current (A)	3.0	4.0	5.0	8.2	13	18	1.7	3.0	4.2	6.6	9.9	12.2
Max. Carrier Frequency (kHz)	15kHz								10	κHz		

Pr.81	Time Duration of 1st Step Speed (correspond to Pr.17)	Factory Setting: 00
Pr.82	Time Duration of 2nd Step Speed (correspond to Pr.18)	Factory Setting: 00
Pr.83	Time Duration of 3rd Step Speed (correspond to Pr.19)	Factory Setting: 00
Pr.84	Time Duration of 4th Step Speed (correspond to Pr.20)	Factory Setting: 00
Pr.85	Time Duration of 5th Step Speed (correspond to Pr.21)	Factory Setting: 00
Pr.86	Time Duration of 6th Step Speed (correspond to Pr.22)	Factory Setting: 00
Pr.87	Time Duration of 7th Step Speed (correspond to Pr.23)	Factory Setting: 00
	Settings 00 to 9999 second	Unit: 1 sec

Pr.81 to Pr.87 input the duration of each Multi-step speed operation defined by Pr.17 to Pr.23.

Note: If any duration is set to "0" (sec), the corresponding step operation will be skipped. This is commonly used to reduce the number of program steps.

Pr.88 Communication Address	Factory Setting: 01
Settings 01 to 254	

This parameter sets the Ac drive address identification when using the RS-485 serial port for communication.

Pr.89 Transmission Speed (Baud rate)

Factory Setting: 01

Settings 00 4800 bps

- 01 9600 bps
- 02 19200 bps
- 03 38400 bps

Description of the This parameter sets the transmission speed for communication on the RS-485 serial port

Pr.90 Transmission Fault Treatment				Factory Setting: 03
S	ettings	00	Warn and Continue Operating	
		01	Warn and RAMP to Stop	
		02	Warn and COAST to Stop	
		03	Keep Operation without Warning	
Pr.91 T	ime Out I	Detec	tion	Factory Setting: 0.0
S	ettings	0.1 to	o 120.0 sec	
		0.0.1	to all to	

0.0 disable

This parameter is used for ASCII mode. When the over-time detection is enabled, the separation between characters cannot exceed 500 ms.

Pr.92 Commun	Pr.92 Communication Protocol					
Settings	00	Modbus ASCII mode, <7,N,2>				
	01	Modbus ASCII mode, <7,E,1>				
	02	Modbus ASCII mode, <7,0,1>				
	03	Modbus RTU mode, <8,N,2>				
	04	Modbus RTU mode, <8,E,1>				
	05					
💷 1. Compute	1. Computer Control					

★ Each drive has a built-in RS-485 serial interface, marked (RJ-11 Jack) on the control terminal block, whose pins are defined as shown:



- ★ Either ASCII or RTU Modbus protocols are used for communication. Users can select the desired mode along through parameters Pr.92 and Pr.113.
- ★ Each VFD-M AC drive has a pre-assigned communication address specified by Pr.88. The master controller communicates with each AC drive according to its particular address.
- ★ Code Meaning:

ASCII mode:

Each 8-bit data is the combination of two ASCII characters. For example, a 1-byte data: 64 Hex, shown as '64' in ASCII, consists of '6' (36Hex) and '4' (34Hex).

Character	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H

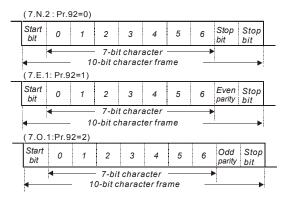
Character	'8'	' 9'	'A'	'B'	'C'	'D'	'E'	'F'
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

RTU mode:

Each 8-bit data is the combination of two 4-bit hexadecimal characters. For example, 64 Hex.

🛄 2. Data Format

2.1 10-bit character frame (For 7-bit character):





2.2 11-bit character frame (For 8-bit character):





3. Communication Protocol

3.1 Communication Data Frame:

STX	ADR1	ADR0	CMD1	CMD0	0	1		N-1	Ν	ETX	CHK1	CHK0
02H	Add	ress	CN	ΛD	Data characters		03H	Check	k Sum			

3.2 ASCII mode:

STX	Start character: (3AH)
ADR 1	
ADR 0	Communication address:
CMD 1	8-bit address consists of 2 ASCII codes
CMD 0	
DATA (n-1)	Contents of data:
	n x 8-bit data consist of 2n ASCII codes.
DATA 0	n≦25 maximum of 50 ASCII codes
LRC CHK 1	LRC check sum:
LRC CHK 0	8-bit check sum consists of 2 ASCII codes
END 1	END characters:
END 0	END 1 = CR (0DH), END 0 = LF (0AH)

RTU mode:

START	A silent interval of more than 10 ms
ADR	Communication address: 8-bit address
CMD	Command code: 8-bit command
DATA (n-1)	
	Contents of data: n×8-bit data, n<=25
DATA 0	
CRC CHK Low	CRC check sum:
CRC CHK High	16-bit check sum consists of 2 8-bit characters
END	A silent interval of more than 10 ms

- 3.3 ADR (Communication Address) Valid communication addresses are in the range of 0 to 254. An address equals to 0 means a broadcast to all AC drives (AMD) in the network. In this case, the AMD will not reply to the master device. For example, communication to AMD with address 16 decimal: ASCII mode: (ADR 1, ADR 0)='1','0' => '1'=31H, '0'=30H RTU mode: (ADR)=10H
- 3.4 CMD (Command code) and DATA (data characters)

The format of data characters depends on the command code. The available command codes are described as followed: Command code: 03H, read N words. The maximum value of N is 12. For example, reading continuous 2 words from starting address 2102H of AMD with address 01H.

ASCII mode:

Command message:

commana mocougo.					
STX	:.'				
ADR 1	ʻ0'				
ADR 0	'1'				
CMD 1	ʻ0'				
CMD 0	'3'				
	'2'				
Starting data	'1'				
address	ʻ0'				
	'2'				
	ʻ0'				
Number of data	ʻ0'				
(Count by word)	ʻ0'				
	'2'				
LRC CHK 1	'D'				
LRC CHK 0	'7'				
END 1	CR				
END 0	LF				

Response message:

·:'
ʻ0'
'1'
ʻ0'
'3'
ʻ0'
'4'
'1'
'7'
'7'
ʻ0'
'7'
'1'
CR
LF



RTU mode:

Command message:

ADR	01H
CMD	03H
Starting data	21H
address	02H
Number of data	00H
(count by word)	02H
CRC CHK Low	6FH
CRC CHK High	F7H

Response message:

ADR	01H
CMD	03H
Number of data	04H
(Count by byte)	
Content of data	17H
address 2102H	70H
Content of data	00H
address 2103H	00H
CRC CHK Low	FEH
CRC CHK High	5CH

Command code: 06H, write 1 word

For example, writing 6000(1770H) to address 0100H of AMD with address 01H.

ASCII mode:

Command message:

STX	·:'	
ADR 1	·0'	
ADR 0	'1'	
CMD 1	ʻ0'	
CMD 0	'6'	
	ʻ0'	
	'1'	
	ʻ0'	
Data addraga	·0'	
Data address	'1'	
	'7'	
	'7'	
	'0'	
LRC CHK 1	'7'	
LRC CHK 0	'1'	
END 1	CR	
END 0	LF	

01H

06H

01H 00H

17H 70H

86H 22H Response message:

i teoponeo meeeuge.			
:			
ʻ0'			
'1'			
ʻ0'			
'6'			
ʻ0'			
'1'			
'0'			
ʻ0'			
'1'			
'7'			
'7'			
ʻ0'			
'7 '			
'1'			
CR			
LF			

Response message:

ADR	01H
CMD	06H
Data address	01H
Data address	00H
Data content	17H
Data content	70H
CRC CHK Low	86H
CRC CHK High	22H

CRC CHK High 221
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RTU mode: Command message:

ADR

CMD Data address

Data content

CRC CHK Low

3.5 CHK (check sum)

ASCII mode:

LRC (Longitudinal Redundancy Check) is calculated by summing up, module 256, the values of the bytes from ADR1 to last data character then calculating the hexadecimal representation of the 2's-complement negation of the sum.

For example, reading 1 word from address 0401H of the AC drive with address 01H

STX	·.'	
ADR 1	'0'	
ADR 0	'1'	
CMD 1	ʻ0'	
CMD 0	'3'	
Starting data	ʻ0'	
address	'4'	
	'0'	
	'1'	
Number of data	ʻ0'	
	'0'	
	'0'	
	'1'	
LRC CHK 1	'F'	01H+03
LRC CHK 0	'6'	2's-com
END 1	CR	
END 0	LF	
II mode:		

01H+03H+04H+01H+00H+01H=0AH, the 2's-complement negation of 0AH is <u>**F6**</u>H.

RTU mode:

ADR	01H
CMD	03H
Starting address	21H
	02H
Number of data	00H
(count by word)	02H
CRC CHK Low	6FH
CRC CHK High	F7H

CRC (Cyclical Redundancy Check) is calculated by the following steps:

- Step 1: Load a 16-bit register (called CRC register) with FFFFH.
- Step 2: Exclusive OR the first 8-bit byte of the command message with the low order byte of the 16-bit CRC register, putting the result in the CRC register.
- Step 3: Shift the CRC register one bit to the right with MSB zero filling. Extract and examine the LSB.
- Step 4: If the LSB of CRC register is 0, repeat step 3, else Exclusive or the CRC register with the polynomial value A001H.



- Step 5: Repeat step 3 and 4 until eight shifts have been performed. When this is done, a complete 8-bit byte will have been processed.
- Step 6: Repeat steps 2 to 5 for the next 8-bit byte of the command message.

Continue doing this until all bytes have been processed. The final contents of the CRC register is the CRC value. When transmitting the CRC value in the message, the upper and lower bytes of the CRC value must be swapped, i.e. the lower order byte will be transmitted first.

The following is an example of CRC generation using C language. The function takes two arguments:

Unsigned char* data \leftarrow a pointer to the message buffer Unsigned char length \leftarrow the quantity of bytes in the message buffer

> The function returns the CRC value as a type of unsigned integer. Unsigned int crc chk(unsigned char* data, unsigned char length){ int i: unsigned int reg_crc=0xFFFF; while(length--){ reg crc ^= *data++: for(j=0;j<8;j++){ if(reg crc & 0x01){ /* LSB(b0)=1 */ reg crc=(reg crc>>1) 0 0xA001; }else{ reg crc=reg crc >>1; } } } return reg crc; }

3.6 Address list:

The contents of available addresses are shown as below:

Content	Address	Functions
AC drive	00nnH	00 means parameter group, nn means parameter number, for
Parameters		example, the address of Pr.100 is 0064H. Referencing to
		chapter 5 for the function of each parameter. When reading parameter by command code 03H, only one parameter can be
		read at one time.

5



Γ	Content	Address		Functions	
ŀ				00: No function	
			DH 0 4	01: Stop	
			Bit 0-1	10: Run	
				11: Jog + Run	
		2000H	Bit 2-3	Reserved	
		200011		00: No function	
	Command		Bit 4-5	01: FWD	
	Read/Write		Dit 4 -0	10: REV	
				11: Change direction	
		000411	Bit 6-15	Reserved	
		2001H	Freq. command		
		2002H	Bit 0	1: EF (external fault) on 1: Reset	
		20020	Bit 1 Bit 2-15	Reserved	
ł			Error co		
				rrors occurred	
				-current (oc)	
				heat (oH)	
				e overload (oL)	
	Status monitor		05: Moto	05: Motor overload1 (oL1)	
	Read only			rnal fault (EF)	
	ricede offity		07: CPU	failure (cF1)	
			08: CPU	or analog circuit failure (cF3)	
			09: Hard	ware protection failure (HPF)	
		2100H		ent exceeds 2 times rated current during accel (ocA)	
				ent exceeds 2 times rated current during decel (ocd)	
				ent exceeds 2 times rated current during steady state ration (ocn)	
				ind Fault (GF)	
				voltage (Lv)	
			15: Reserved		
				failure 1 (cF2)	
			17: Base		
			18: Over	load (oL2)	
				accel/decel failure (cFA)	
			20: Softv	vare protection enable (codE)	
				Status of AC Drive	
				00: RUN LED light off, STOP LED light up	
			Bit 0-1	01: RUN LED blink, STOP LED light up	
			DIL U- I	10: RUN LED light up, STOP LED blink	
		2101H		11: RUN LED light up, STOP LED light off	
			Bit 2	01: Jog active	
				00: REV LED light off, FWD LED light up	
			Bit 3-4	01: REV LED blink, FWD LED light up	
			511 5-4	10: REV LED light up, FWD LED blink	
				11: REV LED light up, FWD LED light off	

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Content	Address		Functions	
Contont	7 100.000	Bit 5-7	Reserved	
		Bit 8	1: Main freq. Controlled by communication	
		Bit 9	1: Main freq. Controlled by external terminal	
		Bit 10	1: Operation command controlled by communication	
		Bit 10	1: Parameters have been locked	
		-		
		Bit 12	0: Stop 1: Run	
		Bit 13	1: Jog command	
		Bit 14-15	Reserved	
	2102H	Frequen	cy command F (XXX.XX)	
	2103H	Output F	requency H (XXX.XX)	
	2104H	Output C	Current A (XXX.X)	
	2105H	DC-BUS	Voltage U (XXX.X)	
	2106H	Output V	/oltage E (XXX.X)	
	2107H	Step nur	nber of Multi-Step Speed Operation (step)	
	2108H	Time of I	PLC Operation (sec)	
	2109H	Value of	External Trigger (count)	
	210AH			
	210BH			
	210CH	Pr.65 X I	High word of H (XXX.XX)	
	210DH	AC Drive Temperature (XXX.X)		
	210EH	PID Fee	dback Signal (XXX.XX)	
	210FH	PID Targ	et Value (XXX.XX)	
	2110H	AC Drive	e Mode Type Information	

3.7 Communication program of PC:

-

The following is a simple example of how to write a communication program for Modbus ASCII mode on a PC by C language.

#include<stdio.h>
#include<dos.h>
#include<conio.h>
#include<process.h>
#define PORT 0x03F8 /* the address of COM1 */
/* the address offset value relative to COM1 */
#define THR 0x0000

Series

```
#define RDR 0x0000
#define BRDL 0x0000
#define IER 0x0001
#define BRDH 0x0001
#define LCR 0x0003
#define MCR 0x0004
#define LSR 0x0005
#define MSR 0x0006
unsigned char rdat[60]:
/* read 2 data from address 2102H of AC drive with address 1 */
 unsigned char tdat[60]={':','0','1','0','3','2','1','0','2', '0','0','2','D','7','\r','\n'};
 void main(){
 int i:
 outportb(PORT+MCR.0x08):
                                       /* interrupt enable */
 outportb(PORT+IER,0x01);
                                     /* interrupt as data in */
  outportb(PORT+LCR,(inportb(PORT+LCR) | 0x80));
    /* the BRDL/BRDH can be access as LCR.b7==1 */
  outportb(PORT+BRDL.12):
                                        /* set baudrate=9600.
12=115200/9600*/
  outportb(PORT+BRDH,0x00);
  outportb(PORT+LCR,0x06);
                                        /* set protocol, <7,N,2>=06H
<7.E.1>=1AH. <7.O.1>=0AH
<8.N.2>=07H, <8,E,1>=1BH
<8.0.1>=0BH */
  for(i=0;i<=16;i++){
    while(!(inportb(PORT+LSR) & 0x20)); /* wait until THR empty */
    outportb(PORT+THR.tdat[i]): /* send data to THR */
 }
  i=0:
  while(!kbhit()){
    if(inportb(PORT+LSR) & 0x01){ /* b0==1, read data ready */
      rdat[i++]=inportb(PORT+RDR); /* read data form RDR */
    }
      } }
```



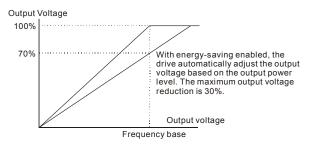
Pr.93 Acc	cel 1 to Accel 2 Frequency Transition	Factory Setting: 0.00	
Pr.94 Dec	cel 1 to Decel 2 Frequency Transition	Factory Setting: 0.00	
Set	tings 0.01 to 400.0 Hz	Unit: 0.10 Hz	

0.00 disable

These functions are used to change acceleration or deceleration depending on attained frequency and not by closing contacts on the external terminals. The priority of this parameter is higher than the time of Accel/Decel 1 and Accel/Decel 2.

Pr.95 Aut	to energ	jy-sav	ving	Factory Setting: 00
Set	ttings	00	Disable auto energy-saving operation	
		01	Enable auto energy-saving operation	

When this function is enabled, the AC drive operates at full voltage during speed changes. At the constant speed periods, drive calculates the optimal output voltage value for the load and may get it reduced up to 30% below the Maximum Output Voltage.



Pr.96 Count Down Completion

Factory Setting: 00

Settings 00 to 9999

This parameter defines the top count value for the VFD-M internal counter. Please also see Pr.45 and Pr.46 (setting 13). Counting is incremented when the Multi-Function Input Terminal M1 or M2, makes a low-to-high transition. Upon completion of the count, either Multi-Function Output Terminal (MO1) or the Multi-Function Relay Contact (RA, RB) will close. 5

Series

Pr.97 Preset Count Down Completion

Factory Setting: 00

Settings 00 to 9999

This parameter sets a preliminary count value for the internal counter. Counter is incremented by a low-to-high transition on one of the programmed Multi-Function Input Terminals: M1 or M2 (see Pr.44 or Pr.45, setting 14). Count starts at 01. Upon completion the selected Multi-Function Output Terminal will close. Preliminary Count could be used to initiate an external event before the "terminal count" is reached. (See Pr.38, 39, 40, 41, 42, 45, and 46 for further details.)

Pr.98 Total Time Count from Power On (Days)	Read Only
Settings 00 to 65535 days	
Pr.99 Total Time Count from Power On (Minutes) Read Only
Settings 00 to 1440 minutes	
Pr.100 Software Version	Read Only

This parameter shows the software version for the AC motor drive.

Pr.101 Au	to Accele	ration/Deceleration	Factory Setting: 00
Se	ttings 0	D Linear acceleration/deceleration	
	0	Auto acceleration, linear decelerat	ion
	0	2 Linear acceleration, auto deceleration	tion
	0	Auto acceleration/deceleration	
04 Linear Accel/Decel Stall Prevention during Deceleration			n during Deceleration
(Please refer to Accel/Decel time setting at parameter Pr.10-Pr			
	When this parameter is set to 03, the AC drive will accel/decel in the fastest and smoothest possible way by automatically adjusting the accel /decel time.		
Difference of the second secon	acceleration/deceleration time)		
02			
03		ic acceleration, deceleration (Operat	

- 04 If this parameter is set to 04, Accel/Decel time will be equal to or more than parameter Pr.10 ~Pr.13.
- This parameter should not be used when a braking unit is installed.

Pr.102 Auto Voltage Regulation (AVR) Factory Setting: 00
--

Settings 00 AVR function enabled

- 01 AVR function disabled
- 02 AVR function disabled when stop
- 03 AVR function disabled for deceleration
- AVR function automatically regulates the AC drive output voltage to the Maximum Output Voltage (Pr.03). For instance, if Pr.03 is set at 200 VAC and the input voltage varies from 200V to 264VAC, then the Maximum Output Voltage will automatically be regulated to 200 VAC.
- When the AVR function is disabled, the Maximum Output Voltage follows the variations of the input voltage (180V to 264 VAC).
- Selecting program value 2 enables the AVR function and also disables the AVR function during deceleration. This offers a quicker deceleration.

Pr.103 Auto Tun	e Mot	or parameters	Factory Setting: 00
Settings	00	Disable	
	01	Auto tune for R1	
	02	Auto tune for R1 + No Load testing	

For Auto Tune, set Pr.103 to 01 or 02 and press the RUN key. When it is set to 02, motor should have no load.

Pr.104 R1 Value

Factory Setting: 00

Settings 00 to $65535m\Omega$

As an option to Auto Tune, this parameter inputs the motor resistance.

Pr.105	Control	Mode
--------	---------	------

Factory Setting: 00

Settings 00 V/F Control

01 Sensor-less Control

5

SELTA VFD-M Series

Pr.106 R	ated Slip	Factory Setting: 3.0
----------	-----------	----------------------

Settings 0.00 to 10.00 Hz

Unit: 0.01Hz

■ Example of Slip calculation: The rated speed of 4 poles/3 ϕ / 60Hz/ 220V on the nameplate is 1710RPM. The rated slip is then: 60-(1710/(120/P))=3Hz. (being P the number of poles)

Pr.107 Vector Voltage Filter	Factory Setting: 10	
Settings 5 to 9999	Unit: 2ms	
Pr.108 Vector Slip Compensation Filter	Factory Setting: 50	
Settings 25 to 9999	Unit: 2ms	

This parameter sets the low-pass filter in vector control.

Example: Pr. 107 = 10 X 2ms =20ms, Pr. 108 = 50 X 2 ms =100ms.

Pr.109 Selection	n for Z	ero Speed Control	Factory Setting: 00
Settings	00	No output	
	01	Control by DC voltage	

This parameter is used to select the control method at zero speed. If set to 01, the voltage in Pr.110 is used for holding torque.

Pr.	110 Voltage of Zero Speed Control	Factory Setting: 5.0
	Settings 0.0 to 20.0 % of Max. output voltage (Pr.05)	Unit: 0.1%
Ш	This parameter should be used in conjunction with Pr.109.	

Example: if Pr.05 = 100 and this parameter is set to 20.0, the level of output voltage is 100 X 20.0% = 20.

Pr.111 Deceleration S Curve Factory Setting: 00 Settings 00 to 07

- When this parameter is set differently to zero, it selects a deceleration S-curve and overrides Pr.14. Otherwise, Pr.14 sets the deceleration S-curve.
- Note: From the diagram shown below, the original setting accel/decel time will be for reference when the function of the S-curve is enabled. The actual accel/decel time will be determined based on the S-curve selected (1 to 7).



D. 440 Establish Transis I Oscardina Time	Eastern Oalling Od
Pr.112 External Terminal Scanning Time	Factory Setting: 01

Settings 01 to 20

Unit: 2msec

Factory Setting: 00

This function screens the signal on I/O terminals for CPU malfunctions due to external transients. A setting of 02, makes the scanning time to be $2 \times 2 = 4$ msec.

Set Pr.77 to 02 before changing settings in Pr.112.

Pr.113 Restart Method after Fault (oc, ov, BB)			Factory Setting: 01
Settings	00	None speed search	

01 Continue operation after fault speed search from speed reference

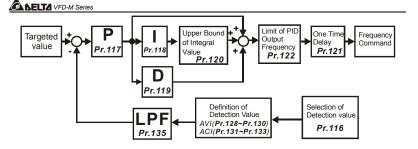
02 Continue operation after fault speed search from Minimum speed

I This parameter is used to select the restart method after certain faults.

Pr. 114	Pr. 114 Cooling Fan Control		ontrol	Factory Setting: 02
	Settings 00 Fan Off when the drive stop after 1 Min			
	01 AC Drive Runs and Fan On, AC		AC Drive Runs and Fan On, AC Drive Stop	s and Fan Off
		02	Always Run	
		03	Reserved	

Pr. 115 PID Set Point Selection

- Settings 00 Disable
 - 01 Keypad (based on Pr.00 setting)
 - 02 AVI (external 0-10V)
 - 03 ACI (external 4-20mA)
 - 04 PID set point (Pr.125)



Pr. 116 PID Feedback Terminal Selection	Factory Setting: 00
---	---------------------

Settings 00 Input positive PID feedback, PV from AVI (0 to 10V)

- 01 Input negative PID feedback, PV from AVI (0 to 10V)
 - 02 Input positive PID feedback, PV from ACI (4 to 20mA)
 - 03 Input negative PID feedback, PV from ACI (4 to 20mA)
- Select an input terminal to be the PID feedback. Please verify the PID feedback position is different from the Frequency Set Point position.
- Negative feedback = positive targeted value detective value. Positive feedback = negative targeted value + detective value.

Pr. 117 Proportional Gain	(P)
---------------------------	----	---

Factory Setting: 1.0

Settings 0.0 to 10.0

- This parameter determines the feedback loop Gain. If the gain is large, the response will be strong and immediate (If the gain is too large, vibration may occur). If the gain is small, the response will be weak and slow.
- When I=0.0 and D=0.0, it is only used for proportional control.

Pr. 118 Integral Time (I)	Factory Setting: 1.00
Settings 0.01 to 100.00 sec	Unit: 0.01sec
0.00 disable	

This parameter determines the speed of response for the PID feedback loop. If the integral time is long, the response will be slow. If the integral time is short, the response will be quick. Be careful not to set (I) too small, since a rapid response may cause oscillation in the PID loop.

SELTA VFD-M Series

Pr. 119 Differential Time (D)	Factory Setting: 0.00
Settings 0.00 to 1.00 sec	Unit: 0.01sec

This parameter determines the damping effect for the PID feedback loop. If the differential time is long, any oscillation will quickly subside. If the differential time is short, the oscillation will subside slowly.

Pr. 120	Integration's Upper Bound Frequency	Factory Setting: 100 %

Settings 00 to 100 %

□ This parameter determines the integration's upper frequency limit while operating in the PID feedback loop. (Limit = Pr.03×Pr.120). During a fast Integration response, it is possible for the frequency to surpass a reasonable point. This parameter will help limit this frequency spike.

Pr. 121 One-Tim	e Delay	Factory Setting: 0.0
Settings	0.0 to 2.5 sec	Unit: 0.1sec

0.0 disable

- PI Control: When controlled by P action only, deviations cannot be eliminated entirely. To eliminate residual deviations, the P + I control is generally utilized. If PI is used, it could eliminate the deviation caused by set-point changes and external interferences. However, if the I-action is excessively powerful, it will delay the response to the variation. The P-action could solely be used on a loading system that possesses integral components.
- PD Control: when a deviation occurs, the system immediately generates some operational load that is greater than the single load generated by the D-action in order to restrain the increment of the deviation. If the deviation is small, the effectiveness of the P-action decreases as well. In some cases, control systems include integral component loads, which are controlled by the P action only, and sometimes, if the integral component is functioning, the whole system will be vibrating. In such cases, a PD control could be used to lower the P-action's vibration and to stabilize the system. In other words, this control is good for use if the loads have no braking functions over the process.
- PID Control: Uses the I-action to eliminate the deviation and the D-action to restrain the vibration, and combine with the P action to construct the PID control. The PID control method normally determines a control process with no deviations, high accuracy and very stable.

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Pr. 122 PID Frequency Output Command limit

Factory Setting: 00

Settings 00 to 110 %

This parameter sets a limit of the PID Command frequency. If this parameter is set to 20%, then the maximum output frequency for the PID operation will be (20% x Pr.01-00).

Pr. 123 Feedback Signal Detection Time	Factory Setting: 60.0
Settings 0.1 to 3600 sec	Unit: 0.1sec

0.0 disable

This parameter defines the detection time for the loss of a feedback analog signal. The drive will follow the operating procedure programmed in Pr.124 if the feedback signal is lost for more than the time set in Pr.123.

Pr. 124 Feedback Signal Fault Treatment			Factory Setting: 00
Settings 00 Warning and RAMP to stop		Warning and RAMP to stop	
	01	Warning and keep operating	

This parameter selects the operation of the drive upon a loss of the PID feedback signal.

Settings 0.00 to 400.0Hz

This parameter is used in conjunction with Pr.115 (04) to input a set point in Hz.

Pr. 126 PI	ID Offse	t Level	Factory Setting: 10.0
Se	ettings	1.0 to 50.0 %	

This parameter is used to set the offset between set point and feedback.

Settings 0.1 to 300.0 sec

This parameter is used to set the detection time of PID offset.

Pr. 128 Minimum Reference Value	÷
---------------------------------	---

Factory Setting: 0.0 Unit: 0.1V

Settings 0.0 to 10.0 V

This parameter is used to set the AVI input voltage that corresponds to minimum frequency.

Pr. 129 Maximum Reference Value	Factory Setting: 10.0

Settings 0.0 to 10.0 V

This parameter is used to set the AVI input voltage that corresponds to maximum frequency.

Pr.	. 130 Invert Reference Signal AVI (0-10V)		ce Signal AVI (0-10V)	Factory Setting: 00
	Settings	00	Not Inverted	
		01	Inverted	
Ш	If this param	eter is	s set to 01, the reference	signal is inverted: 0V corresponds to 60Hz in

If this parameter is set to 01, the reference signal is inverted: 0V corresponds to 60Hz in Pr.128 and 10V corresponds to 0Hz in Pr.129.

Pr. 131 Minimum	n Reference Value (0-20mA)	Factory Setting: 4.0
Settings	0.0 to 20.0mA	Unit: 0.1mA

This parameter is used to set the ACI input frequency that corresponds to minimum frequency.

Pr. 132 Maximum Reference Value (0-20mA)	Factory Setting: 20.0
Settings 0.0 to 20.0mA	Unit: 0.1mA

This parameter is used to set the ACI input frequency that corresponds to maximum frequency.

rationy Setting. 00	Pr. 133 Inverts Reference Signal (0-20mA)	Factory Setting: 00
---------------------	---	---------------------

Settings 00 Not Inverted

01 Inverted

- If this parameter is set to 01, 4mA corresponds to 0Hz in Pr.132, and 0mA corresponds to 60Hz in Pr.131.
- The main purpose for Pr.128-Pr.133 is to allow changes in the output frequency when setting the analog frequency or PID feedback control per the feedback sensor. For example, if the feedback sensor inputs 4mA-20mA but the output frequency from drive that user needs is 5mA-18mA, then user could set Pr.131 to 5mA and Pr.132 to 18mA.

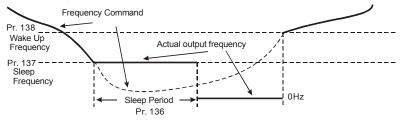
Series

Pr. 134 Analog Input Delay Filter for Set Point	Factory Setting: 50
Settings 00 to 9999	Unit: 2ms
Pr. 135 Analog Input Delay Filter for Feedback Signal	Factory Setting: 5
Settings 00 to 9999	Unit: 2ms

These two parameters are used to set the analog input delay filter in set point or feedback signal.

Pr. 136 Sleep Period	Factory Setting: 0.0
Settings 0.0 to 6550.0 sec	Unit: 0.1sec
Pr. 137 Sleep Frequency	Factory Setting: 0.0
Settings 0.00 to 400.0 Hz	Unit: 0.10Hz
Pr. 138 Wake Up Frequency	Factory Setting: 0.0
Settings 0.00 to 400.0 Hz	Unit: 0.10Hz

These parameters determine the sleep functions of the AC drive. If the command frequency falls below the sleep frequency, for the specified time in Pr.136, then drive output is turned off until the command frequency rises above Pr.138. Please see the below diagram.



Pr. 139 Treatment for Counter Attained

Factory Setting: 00

Settings 00 Continue Operation

01 Stop Immediately and display E.F.

This parameter sets the procedure for the AC drive to follow once the internal counter attains the setting value in Pr.96.

Pr.	140 External	Up/Do	own Selection	Factory Setting: 00
	Settings	00	Fixed Mode (keypad)	
		01	By Accel or Decel Time	
		02	Reserved	
Ш	This parameter is used to change the Master Frequency externally with the Multifuction			
	Input Terminals. If any two parameters in the group Pr.39-Pr.42 are set to 14 and 15, and			
	Pr.140 is set	to 01	, the up/down frequency operation	is initiated as the contact closes and

Pr.	141 Save Fre				Fa	ry Setting: 01	g: 01			
	Settings	00	Not Save							
		01	Save							
~				 -						

This parameter is used to save the frequency setting before powering off.

according to the time of acceleration/deceleration.

Pr.	142 Second S	Source	e of Frequency Command	Factory Setting: 00
	Settings	00	Keypad Up/Down	
		01	AVI (0-10V)	
02			ACI (4-20mA)	
		03	RS485	
		04	Keypad Potentiometer	
0	T 1.1.			

This parameter changes the source for frequency command by using any Multifunction Input (Pr.39-Pr.42, setting= 28).

Pr. 143	Software	Braking Level		Unit: 0.1V
	Settings	115V/230V series	370 to 450 Vdc	Factory setting: 380.0
460V series		460V series	740 to 900 Vdc	Factory setting: 760.0
		575V series	925 to 1075 Vdc	Factory setting: 950.0

This parameter sets the level for the dynamic braking to operate. The setting value must be higher than the steady-state DC BUS Voltage to prevent the braking transistor from having a 100%-duty. At 100% duty the transistor and resistor will most likely fail.

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Selta VFD-M Series

Pr. 144 Accumulativ	e Motor Operation Day	Read Only
Settings 00)-65535 Days	
Pr. 145 Accumulativ	e Motor Operation Time (Min.)	Read Only

Settings 00-1440 Minutes

These parameters display accumulative time of motor operation. They will not reset to zero due to parameter reset to factory and will not re-calculate if the 65535 days limit is exceeded.

Pr. 146 Line Star	t Lock	out	Factory Setting: 00
Settings	00	Disable	

01 Enable

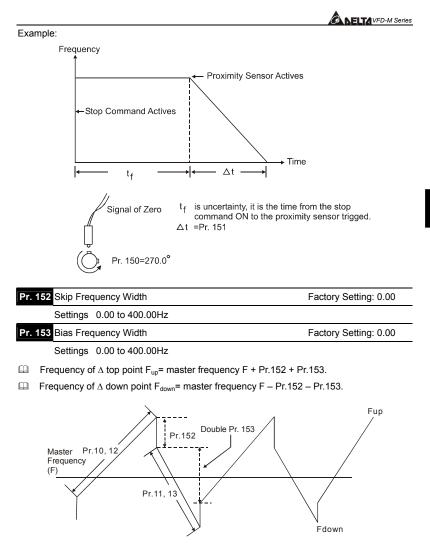
When Line Start Lockout is disabled (also known as Auto-Start), the drive will start when powered-up with run commands applied. To start in Line Start Lockout mode, the AC drive must see the run command go from stop to run after power up. When enabled, the AC drive will not start when powered up if run commands were applied.

Pr. 147 Decimal N	lumb	er of Accel / Decel Time	Factory Setting: 00
Settings	00	One Decimal	

01 Two Decimals

It sets the number of decimals in the accel/decel time. It can be used for Acceleration / Deceleration Time 1, Acceleration / Deceleration Time 2 and JOG Acceleration / Deceleration Time.

Pr. 148 Number of Motor Poles	Factory Setting: 04
Settings 02 to 20	
Pr. 149 Gear Ratio for Simple Index Function	Factory Setting: 200
Settings 4 to 1000	
Pr. 150 Index Angle for Simple Index Function	Factory Setting: 180.0
Settings 00.0 to 360.0	
Pr. 151 Deceleration Time for Simple Index Function	Factory Setting: 0.00
Settings 0.00 to 100.00 sec	0.00 Disable
This parameter should be used with Pr. 39-Pr.42 (setting 3	1).



Series

Pr. 154 Reserved

Pr.155 Compensation Coefficient for Motor Instability	*	Factory Setting: 0.0

Settings 0.1 to 5.0 (recommended setting 2.0)

0.0 Disable

This parameter is used to improve a condition of unstable current in any specific area. For higher frequencies, you can adjust this parameter to 0.0, and increase the setting value in Pr.155 for 30HP and above (a setting of 2.0 is recommended).

Pr.156 Communication Response Delay Time	*	Factory Setting: 0
0.111.000 (.500)		

Settings 0 to 200 (x500µs)

□ This parameter is used to set communication response delay time. If you set Pr. 156 to 1 the communication response delay time will be 1 X 500µs=500µs, set Pr. 156 to 2 the communication response delay time will be 2 X 500µs=1000µs.

Pr.157 Communication Mode Selection	*	Factory Setting: 1
Settings 0: Delta ASCII		

1: MODBUS

This parameter is to select the communication mode, 0 is the existed Delta ASCII communication mode, whereas 1 is to select MODBUS mode.

CHAPTER 6 MAINTENANCE AND INSPECTIONS

Modern AC drives are based on solid state electronics technology. Preventive maintenance is required to operate this AC drive in its optimal condition, and to ensure a long life. It is recommended to perform a monthly check-up of the AC drive by a qualified technician. Before the check-up, always turn off the AC Input Power to the unit. *Wait at least 2 minutes after all display lamps have gone out, and then confirm that the capacitors have fully discharged by measuring the voltage between B1 and Ground using a multi meter set to measure DC.*

Periodic Inspection:

Basic check-up items to detect if there were any abnormality during operation are:

- 1. Whether the motors are operating as expected.
- 2. Whether the installation environment is abnormal.
- 3. Whether the cooling system is operating as expected.
- 4. Whether any irregular vibration or sound occurred during operation.
- 5. Whether the motors are overheating during operation.
- 6. Always check the input voltage of the AC drive with Voltmeter.

Periodic Maintenance

WARNING! Disconnect AC power before processing!

- Tighten and reinforce any screws of the AC drive if necessary because they might loose due to vibration or temperature changes.
- 2. Check the conductors or insulators for corrosion and any physical damages.
- 3. Check the resistance of the insulation with Mega-ohm meters.
- 4. Frequently or regularly check the capacitors, relays and change if necessary.
- 5. If use of the AC drive is discontinued for a long period of time, turn the power on at least once every two years and confirm that it still functions properly. To confirm functionality, disconnect the motor and energize the AC drive for 5 hours or more before attempting to run a motor with it.
- Clean off any dust and dirt with a vacuum cleaner. Place special emphasis on cleaning the ventilation ports and PCBs. Always keep these areas clean, as accumulation of dust and dirt can cause unforeseen failures.

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CHAPTER 7 TROUBLESHOOTING AND FAULT INFORMATION

The AC drive has a comprehensive fault diagnostic system that includes several different alarms and fault messages. Once a fault is detected, the corresponding protective functions will be activated. The following faults are displayed as shown on the AC drive digital keypad display. The three most recent faults can be read on the digital keypad display by viewing Pr.73 to Pr.75

NOTE: faults can be cleared by resetting at the keypad or with Input Terminal.

Fault Name	Fault Descriptions	Corrective Actions
oc	The AC drive detects an abnormal increase in current.	 Check whether the motors horsepower corresponds to the AC drive output power. Check the wiring connections between the AC drive and motor for possible short circuits. Increase the Acceleration time (Pr.10, Pr.12). Check for possible excessive loading conditions at the motor. If there are any abnormal conditions when operating the AC drive after short-circuit being removed, it should be sent back to manufacturer.
ou	The AC drive detects that the DC bus voltage has exceeded its maximum allowable value.	 Check whether the input voltage falls within the rated AC drive input voltage. Check for possible voltage transients. Bus over-voltage may also be caused by motor regeneration. Either increase the decel time or add an optional braking resistor. Check whether the required braking power is within the specified limits.

Common Problems and Solutions:

A DELTA	VFD-M Se	ries

Fault Name	Fault Descriptions	Corrective Actions		
οН	The AC drive temperature sensor detects excessive heat.	 Ensure that the ambient temperature falls within the specified temperature range. Make sure that the ventilation holes are not obstructed. Remove any foreign objects on the heat sinks and check for possible dirty heat sink fins. Provide enough spacing for adequate ventilation. 		
Lu	The AC drive detects that the DC bus voltage has fallen below its minimum value.	W Check whether the input voltage falls within the rated AC drive's input voltage.		
οί	The AC drive detects excessive drive output current. Note: The AC drive can withstand up to 150% of the rated current for a maximum of 60 seconds.	 Check whether the motor is overloaded. Reduce torque compensation setting as set in Pr.54. Increase the AC drive's output capacity. 		
ol I	Internal electronic overload trip	 Check for possible motor overload. Check electronic thermal overload setting. Increase motor capacity. Reduce the current level so that the drive output current does not exceed the value set by the Motor Rated Current Pr.52. 		
٥٢5	Motor overload. Check the parameter settings (Pr.60 to Pr.62)	 Reduce the motor load. Adjust the over-torque detection setting to an appropriate setting. 		



Fault Name	Fault Descriptions	Corrective Actions
oc 8	 Over-current during acceleration: 1. Short-circuit at motor output. 2. Torque boost too high. 3. Acceleration time too short. 4. AC drive output capacity is too small. 	 Check for possible poor insulation at the output line. Decrease the torque boost setting in Pr.54. Increase the acceleration time. Replace with the AC drive with one that has a higher output capacity (next HP size).
ocd	Over-current during deceleration: 1. Short-circuit at motor output. 2. Deceleration time too short. 3. AC drive output capacity is too small.	 Check for possible poor insulation at the output line. Increase the deceleration time. Replace with the AC drive with one that has a higher output capacity (next HP size).
000	 Over-current during steady state operation: 1. Short-circuit at motor output. 2. Sudden increase in motor loading. 3. AC drive output capacity is too small. 	 Check for possible poor insulation at the output line. Check for possible motor stall. Replace with the AC drive with one that has a higher output capacity (next HP size).
د₽⊧	Internal memory IC can not be programmed.	 Switch off power supply. Check whether the input voltage falls within the rated AC drive input voltage. Switch the AC drive back on.
۶7ء	Internal memory IC can not be read.	 Check the connections between the main control board and the power board. Reset drive to factory defaults.
۶۶	The external terminal EF-GND goes from OFF to ON.	When external terminal EF-GND is closed, the output will be turned off (under N.O. E.F.).
c۶8	Auto accel/decel failure	Don't use the function of auto acceleration/ deceleration.

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Aneltz	VFD-M Series	NELTA VFD-M Series					
Fault Name	Fault Descriptions	Corrective Actions					
GFF	Ground fault : The AC drive output is abnormal. When the output terminal is grounded (short circuit current is 50% more than the AC drive rated current), the AC drive power module may be damaged. The short circuit protection is provided for AC drive protection, not user protection.	Ground fault :1. Check whether the IGBT power module is damaged.2. Check for possible poor insulation at the output line.					
c£ ;	Communication Error Please refer to Pr.92.	 Check the connection between the AC drive and computer for loose wires. Check if the communication protocol is properly set. 					
ხხ	External Base Block. AC drive output is turned off.	 When the external input terminal (base-block) is active, the AC drive output will be turned off. Disable this connection and the AC drive will begin to work again. 					
XPF	OC hardware error						
HPF.	CC (current clamp)						
HŖF	OV hardware error	Return to the factory.					
HP,F,	GFF hardware error						
cF3	OV or LV						
cF <u>3</u>	Current sensor error						

Fault Name	Fault Descriptions	Corrective Actions		
с£.З	U-phase error	Return to the factory.		
c.F3	W-phase error			
PHL	Phase Loss	Check input phase wiring for loose contacts.		
codE	Software protection failure	Return to the factory.		
FbE	PID feedback signal error	 Check parameter settings (Pr.116) and AVI/ACI wiring. Check for possible fault between system response time and the PID feedback signal detection time (Pr.123) 		

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CHAPTER 8 SUMMARY OF PARAMETER SETTINGS

✓: The parameter can be set during operation

	Parameter	Explanation	Settings	Factory Setting	Customer
~	Pr.00	Source of Frequency Command	 00: Master frequency determined by digital keypad (LC-M02E) 01: Master frequency determined by 0 to +10 V input on AVI terminal with jumpers 02: Master frequency determined by 4 to 20mA input on ACI terminal with jumpers 03: Master frequency determined by RS-485 Communication port 04: Master frequency determined by potentiometer on digital keypad 	00	
×	Pr.01	Source of Operation command	 00: Operation determined by digital keypad 01: Operation determined by external control terminals, keypad STOP is effective 02: Operation determined by external control terminals, keypad STOP is ineffective 03: Operation determined by RS-485 communication port, keypad STOP is effective 04: Operation determined by RS-485 communication port, keypad STOP is ineffective 	00	
	Pr.02	Stop Method	00: Ramp stop 01: Coast Stop	00	
	Pr.03	Maximum Output Frequency	50.00 to 400.0 Hz	60.00	
	Pr.04	Maximum Voltage Frequency (Base Frequency)	10.00 to 400.0Hz	60.00	
	Pr.05	Maximum Output Voltage (Vmax)	115V/230V: 0.1 to 255.0V 460V: 0.1 to 510.0V 575V: 0.1 to 637.0V	220.0 440.0 575.0	
	Pr.06	Mid-point Frequency	0.10 to 400.0Hz	1.50	
	Pr.07	Mid-point Voltage	115V/230V: 0.1 to 255.0V 460V: 0.1 to 510.0V 575V: 0.1 to 637.0V	10.0 20.0 26.1	
	Pr.08	Minimum Output Freq	0.10 to 20.00Hz	1.50	

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	Parameter	Explanation	Settings	Factory Setting	Customer
		Minimum Output	115V/230V: 0.1 to 255.0V	10.0	
	Pr.09	Voltage	460V: 0.1 to 510.0V	20.0	
			575V: 0.1 to 637.0V	26.1	
×	Pr.10	Acceleration Time 1	0.1 to 600.0 sec or 0.01 to 600.0 sec	10.0	
×	Pr.11	Deceleration Time 1	0.1 to 600.0 sec or 0.01 to 600.0 sec	10.0	
×	Pr.12	Acceleration Time 2	0.1 to 600.0 sec or 0.01 to 600.0 sec	10.0	
×	Pr.13	Deceleration Time 2	0.1 to 600.0 sec or 0.01 to 600.0 sec	10.0	
	Pr.14	Accel S-curve	00 to 07	00	
*	Pr.15	Jog Accel/Decel Time	0.1 to 600.0 sec or 0.01 to 600.0 sec	1.0	
×	Pr.16	Jog Frequency	0.00 to 400.0 Hz	6.00	
*	Pr.17	1st Step Speed Freq.	0.00 to 400.0Hz	0.00	
*	Pr.18	2nd Step Speed Freq.	0.00 to 400.0Hz	0.00	
*	Pr.19	3rd Step Speed Freq.	0.00 to 400.0Hz	0.00	
*	Pr.20	4th Step Speed Freq.	0.00 to 400.0Hz	0.00	
×	Pr.21	5th Step Speed Freq.	0.00 to 400.0Hz	0.00	
×	Pr.22	6th Step Speed Freq.	0.00 to 400.0Hz	0.00	
*	Pr.23	7th Step Speed Freq.	0.00 to 400.0Hz	0.00	
	Pr.24	Reserve Operation Inhibition	00: Enable REV operation 01: Disable REV operation	00	
	Pr.25	Over-Voltage Stall Prevention	00: Disable 115V/230V: 330 to 450 Vdc 460V: 660 to 900 Vdc 575V: 825 to 1025 Vdc	390 780 975	
	Pr.26	Over-current Stall Prevention during Acceleration	00: Disable 20% to 200%	150	
	Pr.27	Over-current Stall Prevention during Operation	00: Disable 20% to 200%	150	
	Pr.28	DC Braking Current Level	00 to 100 %	00	
	Pr.29	DC Braking during Start-up	0.0 to 5.0 sec	0.0	
	Pr.30	DC Braking during Stopping	0.0 to 25.0 sec	0.0	
	Pr.31	Start-point for DC Braking	0.00 to 60.00 Hz	0.00	



1	Parameter	Explanation	Settings	Factory	Customer
┢	arameter	Explanation	00: Stop operation after momentary	Setting	
	Pr.32	Momentary Power Loss Operation Selection	 power loss 01: Continues after momentary power loss, speed search starts with Master Frequency 02: Continues after momentary power loss, speed search starts with Minimum output Frequency 	00	
	Pr.33	Maximum Allowable Power Loss Time	0.3 to 5.0 sec	2.0	
	Pr.34	Base-Block Time for Speed Search	0.3 to 5.0 sec	0.5	
	Pr.35	Maximum Current Level for Speed Search	30 to 200 %	150	
	Pr.36	Upper Bound of Output Frequency	0.10 Hz to 400.0 Hz	400.0	
	Pr.37	Lower Bound of Output Frequency	0.00 Hz to 400.0 Hz	0.00	
	Pr.38	Multi-function Input Terminal (M0,M1)	00: M0: FWD/STOP, M1: REV/STOP 01: M0: RUN/STOP, M1: REV/FWD 02: M0, M1, M2: 3-wire operation control mode	00	
	Pr.39 Pr.40 Pr.41 Pr.42	Multi-function Input Terminal (M2) Multi-function Input Terminal (M3) Multi-function Input Terminal (M4) Multi-function Input Terminal (M5)	 00: No Function 01: Output OFF (N.O.) (enabled when running) 02: Output OFF (N.C.) (enabled when running) 03: External Fault (normally open) N.O. 04: External Fault (normally close) N.C 05: RESET 06: Multi-Step Speed Command 1 07: Multi-Step Speed Command 2 08: Multi-Step Speed Command 3 09: Jog Operation 10: Accel/Decel Speed Inhibit 11: First or Second Accel/Decel Time 12: Base-block (B.B.) (N.C) 13: Base-block (B.B.) (N.C) 14: Increase Master Frequency 15: Decrease Master Frequency 16: Run PLC Program 17: Pause PLC 18: Counter Trigger Signal 19: Counter Reset 	05 06 07 08	

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	Parameter	Explanation	Settings	Factory Setting	Customer
			 20: No function 21: RESET command (N.C) 22: Control source: External Terminal 23: Control source: Keypad 24: Control source: Communication 25: Parameter Lock (Write disable, Read is always 0) 26: PID Disable (N.C.) 27: PID Disable (N.C.) 28: Second Source for Frequency Command 29: Forward (contact is open) / Reverse (contact is close) 30: One-Shot PLC Run 31: Index input signal 32: Counter Incremented by Drive Output Frequency 		
*	Pr.43	Analog Output Signal	 00: Analog Frequency Meter (0 to Maximum Output Frequency) 01: Analog Current Meter (0 to 250% of the rated AC drive current) 02: Feedback signal (0 - 100%) 03: Output power (0 - 100%) 	00	
×	Pr.44	Analog Output Gain	00 to 200 %	100	
	Pr.45 Pr.46	Multi-Function Output Terminal 1 (Photocoupler output) Multi-function Output Terminal 2 (Relay Output)	 00: AC Drive Operational 01: Maximum Output Frequency Attained 02: Zero Speed 03: Over-Torque Detection 04: Base-Block (B.B) Indication 05: Low Voltage Indication 06: AC Drive Operation Mode 07: Fault Indication 08: Desired Frequency Attained 09: PLC Program Running 10: PLC Program Step Completed 11: PLC Operation Paused 13: Top Count Value Attained 15: Warning (PID feedback loss, communication error) 16: Below the Desired Frequency 17: PID supervision 18: Over Voltage supervision 20: Over Current stall supervision 	00	

			âne		-M Series
ĺ	Parameter	Explanation	Settings	Factory Setting	Customer
			21: Over Voltage stall supervision22: Forward command23: Reverse command24: Zero Speed (Includes Drive Stop)	00	
×	Pr.47	Desired Frequency Attained	0.00 to 400.0 Hz	0.00	
×	Pr.48	Adjust Bias of External Input Frequency	0.00 to 200.0%	0.00	
*	Pr.49	Potentiometer Bias Polarity	00: Positive Bias 01: Negative Bias	00	
×	Pr.50	Potentiometer Frequency Gain	0.10 to 200.0%	100.0	
	Pr.51	Potentiometer Reverse Motion Enable	00: Reverse Motion Disabled in negative bias01: Reverse Motion Enabled in negative bias	00	
×	Pr.52	Motor Rated Current	30.0% FLA to 120.0% FLA	FLA	
×	Pr.53	Motor No-Load Current	00%FLA to 99%FLA	0.4*F LA	
*	Pr.54	Torque Compensation	00 to 10	00	
×	Pr.55	Slip Compensation	0.00 to 10.00	0.00	
	Pr.56	Reserved			
	Pr.57	AC Drive Rated Curr	ent Display (unit: 0.1A)	##.#	
	Pr.58	Electronic Thermal Overload Relay	00: Standard Motor (self cool motor)01: Inverter Motor (auxiliary cool fan on motor)02: Inactive	02	
×	Pr.59	Electronic Thermal Motor Overload	30 to 300 sec	60	
	Pr.60	Over-Torque Detection Mode	 00: Over-Torque Detection Disable 01: Enabled during constant speed operation until the allowable time for detection (Pr.62) elapses. 02: Enabled during constant speed operation and halted after detection. 03: Enabled during acceleration until the allowable time for detection (Pr.62) elapses. 04: Enabled during acceleration and halted after detection. 	00	

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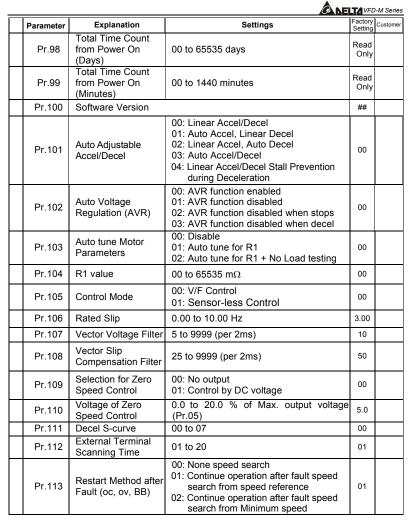
	Parameter	Explanation	Settings	Factory Setting	Customer
	Pr.61	Over-Torque Detection Level	30 to 200 %	150	
	Pr.62	Over-Torque Detection Time	0.0 to 10.0 seconds	0.1	
	Pr.63	Loss of ACI (4-20mA)	00: Decelerate to 0 Hz01: Stop immediately and display "EF"02: Continue operation by last frequency command	00	
×	Pr.64	User Defined Function for Display	 00: Display AC drive output Frequency (Hz) 01: Display User-defined output Frequency (H*Pr.65) 02: Output Voltage (E) 03: DC Bus Voltage (u_) 04: PV (i) 05: Display the value of internal counter (c) 06: Display the setting frequency (F or o=%) 07: Display the parameter setting (Pr.00) 08: Reserved 09: Output Current (A) 10: Display program operation (0.xxx), Fwd, or Rev 	06	
*	Pr.65	Coefficient K	0.01 to 160.0	1.00	
*	Pr.66	Communication Frequency	0.00 to 400.0 Hz	0.00	
	Pr.67	Skip Frequency 1	0.00 to 400.0 Hz	0.00	
	Pr.68	Skip Frequency 2	0.00 to 400.0 Hz	0.00	
	Pr.69	Skip Frequency 3	0.00 to 400.0 Hz	0.00	
	Pr.70	Skip Frequency Band	0.00 to 20.00 Hz	0.00	
	Pr.71	PWM Carrier Frequency	115V/230V/460V series: 01 to 15 (The factory setting of VFD075M43A is 10)	15	
			575V series: 01 to 10	6	
	Pr.72	Auto Restart Attempts after Fault	00 to 10	00	

		ANE		D-M Series
Parameter	Explanation	Settings	Factory Setting	Customer
Pr.73	Present Fault Record	00: No fault occurred 01: Over-current (oc) 02: Over-voltage (ov) 03: Overheat (oH) 04: Overload (oL) 05: Overload 1 (oL1)	00	
Pr.74	Second Most Recent Fault Record	06: External Fault (EF) 07: CPU failure 1 (CF1) 08: CPU failure 3 (CF3) 09: Hardware Protection Failure (HPF) 10: Over-current during acceleration (oca) 11: Over-current during deceleration (ocd) 12: Over-current during steady state	00	
Pr.75	Third Most Recent Fault Record	operation (ocn) 13: Ground fault or fuse failure(GFF) 14: Low Voltage (not record) 15: 3 Phase Input Power Loss 16: EPROM failure (CF2) 17: External interrupt allowance(bb) 18: Overload (oL2) 19: Auto Adjustable accel/decel failure (CFA) 20: CPU self detection failure (codE)	00	
Pr.76	Parameter Lock and Configuration	 00: All parameters can be set/read 01: All parameters are read-only 02-08: Reserved 09: Resets all parameters to 50Hz factory defaults 10: Resets all parameters to 60Hz factory defaults 	00	
Pr.77	Time for Auto Reset the Restart Times in Abnormality	0.1 to 6000.0 sec	60.0	
Pr.78	PLC Operation Mode	 00: Disable PLC operation 01: Execute one program cycle 02: Continuously execute program cycles 03: Execute one program cycle step by step 04: Continuously execute one program cycle step by step 	00	
Pr.79	PLC FWD/REV Motion	00 to 127	00	
Pr.80	Identity Code of the AC Motor Drive	Read only	##	
Pr.81	Time Duration of 1st Step Speed	00 to 9999 sec	00	

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Parameter	Explanation	Settings		Customer
Pr.82	Time Duration of 2nd Step Speed	00 to 9999 sec		
Pr.83	Time Duration of 3rd Step Speed	00 to 9999 sec		
Pr.84	Time Duration of 4th Step Speed	00 to 9999 sec		
Pr.85	Time Duration of 5th Step Speed	00 to 9999 sec		
Pr.86	Time Duration of 6th Step Speed	00 to 9999 sec	00	
Pr.87	Time Duration of 7th Step Speed	00 to 9999 sec		
Pr.88	Communication Address	01 to 254		
Pr.89	Transmission Speed	00: 4800 bps 01: 9600 bps 02: 19200 bps 03: 38400 bps		
Pr.90	Transmission Fault Treatment	00: Warn and Continue Operating 01: Warn and RAMP to Stop 02: Warn and COAST to Stop 03: Keep Operation without Warning		
Pr.91	Time Out Detection	0.0: Disable 0.1 to 120.0 sec		
Pr.92	Communication Protocol	00: MODBUS ASCII mode, <7,N,2> 01: MODBUS ASCII mode, <7,E,1> 02: MODBUS ASCII mode, <7,O,1> 03: MODBUS RTU mode, <8,N,2> 04: MODBUS RTU mode, <8,E,1> 05: MODBUS RTU mode, <8,0,1>		
Pr.93	Accel 1 to Accel 2 Frequency Transition	0.01 to 400.0 0.00: Disable		
Pr.94	Decel 1 to Decel 2 Frequency Transition	0.01 to 400.0 0.00: Disable		
Pr.95	Auto Energy Saving	00: Disable auto energy saving 01: Enable auto energy saving		
Pr.96	Counter Countdown Complete	00 to 9999		
Pr.97	Preset counter countdown	00 to 9999	00	



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Parameter	Explanation	Settings		Customer
Pr.114	Cooling Fan Control	 00: Fan Off when the drive stop after 1 Min. 01: AC Drive Runs and Fan On, AC Drive Stops and Fan Off 02: Always Run 03: Reserved 		
Pr.115	PID Set Point Selection	00: Disable 01: Keypad (based on Pr.00 setting) 02: AVI (external 0-10V) 03: ACI (external 4-20mA) 04: PID set point (Pr.125)		
Pr.116	PID Feedback Terminal Selection	 00: Input positive PID feedback, PV from AVI (0 to 10V) 01: Input negative PID feedback, PV from AVI (0 to 10V) 02: Input positive PID feedback, PV from ACI (4 to 20mA) 03: Input negative PID feedback, PV from ACI (4 to 20mA) 	00	
Pr.117	Proportional Gain (P)	0.0 to 10.0		
Pr.118	Integral Time (I)	0.00: Disable 0.01 to 100.0 sec		
Pr.119	Differential Time (D)	0.00 to 1.00 sec		
Pr.120	Integration's Upper Bound Frequency	00 to 100 %	100 %	
Pr.121	One-Time Delay	0.0 to 2.5 sec		
Pr.122	PID Frequency Output Command Limit	00 to 110 %	100	
Pr.123	Feedback Signal Detection Time	0.0: Disable 0.1 to 3600 sec	60.0	
Pr.124	Feedback Signal Fault Treatment	00: Warning and RAMP to stop 01: Warning and keep operating	00	
Pr.125	Source of PID Set Point	0.00 to 400.0Hz	0.00	
Pr.126	PID Offset Level	1.0 to 50.0 %		
Pr.127	Detection Time of PID Offset	0.1 to 300.0 sec	5.0	
Pr.128	Minimum Reference Value	0.0 to 10.0 V	0.0	
Pr.129	Maximum Reference Value	0.0 to 10.0 V	10.0	

				à)-M Series
Param	neter	Explanation		Settings	Factory Setting	Customer
Pr.1	130	Invert Reference Signal AVI (0-10V)	00: Not inverted 01: Inverted		00	
Pr.1	131	Minimum Reference Value (4-20mA)	0.0 to 20.0mA		4.0	
Pr.1	132	Maximum Reference Value (4-20mA)	0.0 to 20.0mA		20.0	
Pr.1	133	Invert Reference Signal (4-20mA)	00: Not inverted 01: Inverted		00	
Pr.1	134	Analog Input Delay Filter for Set Point	00 to 9999 (per 2ms)		50	
Pr.1	135	Analog Input Delay Filter for Feedback Signal	00 to 9999 (per 2ms)		5	
Pr.1	136	Sleep Period	0.0 to 6550.0 sec		0.0	
Pr.1	137	Sleep Frequency	0.00 to 400.0 Hz		0.00	
Pr.1	138	Wake Up Frequency	0.00 to 400.0 Hz		0.00	
Pr.1	139	Treatment for Counter Attained	00: Continue operation 01: Stop Immediately and display E.F.		00	
Pr.1	140	External Up/Down Selection	00: Fixed Mode (keypad) 01: By Accel or Decel Time 02: Reserved		00	
Pr.1	141	Save Frequency Set Point	00: Not Save 01: Save		01	
Pr.1	142	Second Source of Frequency Command	00: Keypad Up/Down 01: AVI (0-10V) 02: ACI (4-20mA) 03: Communication 04: Keypad potentiometer		00	
	Pr.143	43 Software Braking Level	115V/230V	370-450 Vdc	380.0	
Pr.1			460V	740-900 Vdc	760.0	
			575V	925-1075 Vdc	950.0	
Pr.1	144	(Day)	Read Only			
Pr.1	145	Total operation time (Minutes)	Read Only			
Pr.1	146	Line start Lockout	00: Disable 01: Enable		00	
Pr.1	147	Decimal Number of Accel / Decel Time	00: One dec 01: Two dec	00		
Pr.1	148	Number of Motor Poles	02 to 20	04		

	Parameter	Explanation	Settings	Factory Setting	Customer
	Pr.149	Gear Ratio for Simple Index Function	4 to 1000	200	
	Pr.150	Index Angle for Simple Index Function	00.0 to 360.0	180.0	
	Pr.151	Deceleration Time for Simple Index Function	0.00 to 100.00 sec	0.00	
	Pr.152	Skip Frequency Width	0.00 to 400.0Hz	0.00	
	Pr.153	Bias Frequency Width	0.00 to 400.0Hz	0.00	
	Pr.154	Reserved			
×	Pr.155	Compensation Coefficient for Motor Instability	0.0: Disable 0.1 to 5.0 (recommended setting d2.0)	0.0	
×	Pr.156	Communication Response Delay Time	0 to 200 (x500us)	0	
*	Pr.157	Communication Mode Selection	0: Delta ASCII 1: Modbus	1	



STANDARD SPECIFICATIONS

	Voltage Class	115V Class							
	Model Number VFD-XXXM	00	02	004 007					
	ax. Applicable Motor Output W)	0.2		0.4		0.75			
	ax. Applicable Motor Output	0.	25	0	.5	1.0			
		0	.6	1	.0	1	.6		
Rating.	Rated Output Current (A)	-	.6		.5		.0		
E H	Maximum Output Voltage (V)				twice the inpu				
Output	Output Frequency (Hz)			0.1~4	00 Hz	0			
0	Carrier Frequency (kHz)	1-15							
Rating	Rated Input Current (A)	(6		phase 9	1	6		
ñ	Rated Voltage, Frequency	Single phase	e, 100-120 VA	C, 50/60Hz					
Input	Voltage Tolerance			± 10% (90	0-132VAC)				
	Frequency Tolerance				(47~63Hz)				
	oling Method				Cooled				
We	eight (kg)	1	.5	1	.5	1	.5		
	Voltage Class			230V	Class				
	Model Number VFD-XXXM	004	007	015	022	037	055		
	ax. Applicable Motor Output W)	0.4	0.75	1.5	2.2	3.7	5.5		
(h	ax. Applicable Motor Output	0.5	1.0	2.0	3.0	5.0	7.5		
Rating	Rated Output Capacity (kVA)	1.0	1.9	2.7	3.8	6.5	9.5		
Rati	Rated Output Current (A)	2.5	5.0	7.0	10	17	25		
Ť	Maximum Output Voltage (V)	3-Phase proportional to input voltage							
Output	Output Frequency (Hz)	0.1~400 Hz							
õ	Carrier Frequency (kHz)	1-15							
	Rated Input Current (A)	Single/3-pha				3-phase			
	land Operation 1 also a	6.3/2.9	11.5/7.6	15.7/8.8	27/12.5	19.6	28		
Input Rating	Input Current for 1-phase Models when Using 3-phase Power	3.2	6.3	9.0	12.5				
Input		Single/3-phase 3-phase 200-240 VAC, 50/60Hz 200-240VAC, 50/60H							
	Voltage Tolerance			- (80~264 VAC)			
_	Frequency Tolerance				(47~63 Hz)				
	oling Method	0.044 5	0.044.5		Cooled				
We	eight (kg)	2.2/1.5	2.2/1.5	2.2/1.5	3.2/2.2	3.2	3.2		
	Voltage Class				0V Class				
	Model Number VFD-XXXM	007	015	022	037	055	075		
Max. Applicable Motor Output (kW)		0.75	1.5	2.2	3.7	5.5	7.5		
M (h		1.0	2.0	3.0	5.0	7.5	10		
gu	Rated Output Capacity (kVA)	2.3	3.1	3.8	6.2	9.9	13.7		
Ratii	Rated Output Current (A)	3.0	4.0	5.0	8.2	13	18		
μF	Maximum Output Voltage (V)		3-pha		hal to Input Vo	oltage	·		
Dutput	Output Frequency (Hz)				00 Hz				
2	Carrier Frequency (kHz)	1-15							

Revision December 2007, ME12, SW V3.04

VFD-M Series

	Voltage Class	460V Class								
б	Rated Input Current (A)			3-pł	nase					
Rating	Rated input Current (A)	4.2	5.7	6.0	8.5	14	23			
Ř	Rated Voltage, Frequency	3-phase 380-480 VAC, 50/60Hz								
put	Voltage Tolerance	± 10% (342~528 VAC)								
드	Frequency Tolerance	<u>+</u> 5% (47~63 Hz)								
Co	ooling Method	Fan Cooled								
W	eight (kg)	1.5	1.5	2.0	3.2	3.2	3.3			

	Voltage Class	575V Class								
1	Model Number VFD-XXXM	007	015	022	037	055	075			
Ma (kV	x. Applicable Motor Output V)	0.75	0.75 1.5 2.2 3.7				7.5			
Ma (hp	x. Applicable Motor Output	1.0	2.0	3.0	5.0	7.5	10			
Ę,	Rated Output Capacity (kVA)	1.7	3.0	4.2	6.6	9.9	12.2			
atin	Rated Output Current (A)	1.7	3.0	4.2	6.6	9.9	12.2			
Output Rating	Maximum Output Voltage (V)	3-phase Proportional to Input Voltage								
Out	Output Frequency (Hz)	0.1~400 Hz								
-	Carrier Frequency (kHz)	1-10								
g	Rated Input Current (A)	3-phase								
Rating	1 ()	2.4	4.2	5.9	7.0	10.5	12.9			
ñ	Rated Voltage, Frequency	3-phase 500-600 VAC, 50/60Hz								
Input	Voltage Tolerance	-15% ~ +10% (425~660 V)								
드	Frequency Tolerance	± 5% (47~63 Hz)								
Co	oling Method	Fan Cooled								
We	eight (kg)	1.5	1.5	2.0	3.2	3.2	3.3			

	General Specifications							
	Control System	SPWM (Sinusoidal Pulse Width Modulation) control (V/F or sensorless vector control)						
	Freq. Setting Resolution	0.1Hz						
s	Output Frequency Resolution	0.1Hz						
haracteristics	Torque Characteristics	Including the auto-torque, auto-slip compensation; starting torque can be 150% at 5.0Hz						
act	Överload Endurance 150% of rated current for 1 minute							
Jan	Skip Frequency	Three zones, settings range 0.1-400Hz						
Ċ	Accel/Decel Time	0.1 to 600 seconds (4 Independent settings for Accel/Decel Time)						
Control	Stall Prevention Level Frequency Setting	20 to 200%, Setting of Rated Current						
ŏ	DC Injection Braking	Operation frequency 0-60Hz, output 0-100% rated current Start time 0-5 seconds, stop time 0-25 seconds						
	Braking Torque	Approx. 20% (up to 125% possible with option braking resistor or braking unit externally mounted, 1-15HP braking transistor built-in)						
	V/F Pattern	Adjustable V/F pattern						

	Frequency Keypad		Setting by ()						
	Setting	External	Potentiometer-5KΩ/0.5W, 0 to +10VDC, 4 to 20mA RS-485 interface; Multi-Function						
ics	Setting	Signal	puts 0 to 5 (7 steps, Jog, up/down)						
risti	Operation	Keypad	Set by RUN, STOP						
cter	Setting	External	M0 to M5 can be combined to offer various modes of operation, RS-485 serial						
Irac	Signal	Signal	interface (MODBUS).						
Operating Characteristics	Multi-Functic Signal	on Input	Multi-step selection 0 to 7, Jog, accel/decel inhibit, first to forth accel/decel switches, counter, PLC operation, external Base Block (NC, NO), auxiliary motor control is invalid, selections, driver reset, UP/DOWN key settings, sink/source selection						
Opera	Multi-Functio	on Output	AC drive operating, frequency attained, non-zero, base block, fault indication, local/remote indication, PLC operation indication, auxiliary motor output, driver is ready, overheat alarm, emergency stop						
	Analog Outp	ut Signal	Analog frequency/current signal output.						
Α	larm Output (Contact	1 Form C contact or open collector output						
(Operation Functions		AVR, S-Curve, over-voltage, over-current stall prevention, fault records, adjustable carrier frequency, DC braking, momentary power loss restart, auto tuning, frequency limits, parameter Lock/Reset, vector control, counter, PID Control, PLC, MODBUS communication, reverse Inhibition, abnormal reset, abnormal re-start, digital frequency output, sleep/revival function, 1st/2nd frequency source selections						
F	Protection Fur	nctions	Self-testing, over voltage, over current, under voltage, overload, overheating, external fault, electronic thermal, ground fault.						
	Display Key	pads	6-key, 4-digit, 7-segment LED, 4 status LEDs, master frequency, output frequency, output current, custom units, parameter values for setup, review and faults, RUN, STOP, RESET, FWD/REV						
s	Protection L	.evel	IP20						
ü	Pollution De	egree	2						
diti	Installation I	Location	Altitude 1,000 m or lower, keep from corrosive gasses, liquid and dust						
I Con	Ambient Temperature	е	$-10^\circ C$ to $40^\circ C$ (-10°C to $50^\circ C$ without blind plate) Non-Condensing and not frozen						
romenta	Policitan Degree 2 Installation Location Altitude 1,000 m or lower, keep from corrosive gasses, liquid and dust Ambient -10°C to 40°C (-10°C to 50°C without blind plate) Non-Condensing and not Transportation -20°C to 60°C Transportation -20°C to 60°C Temperature Ambient Humidity Below 90% RH (non-condensing)								
Z	Ambient Humidity Below 90% RH (non-condensing)								
ш	^{III} Vibration 9.80665m/s ² (1G) less than 20Hz, 5.88m/s ² (0.6G) at 20 to 50Hz								
Ap	provals								

Note: Do not attempt to connect a single-phase power source to a three-phase models drive. However it is acceptable to connect two wires of a three-phase power source to a single-phase drive.

ELTA VFD-M Series

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ACCESSORIES B.1 Non-fuse Circuit Breaker Chart

The fuse should comply with UL248 and the breaker should comply with UL489. (Note: Please select enough current capacity of NFB.)

1-р	hase	3-phase		
Model Name	Recommended	Model Name	Recommended	
Model Name	non-fuse breaker (A)	would hame	non-fuse breaker (A)	
VFD002M11A	15	VFD004M23A	5	
VFD004M11A	20	VFD007M23A	10	
VFD007M11A	30	VFD015M23A	20	
VFD004M21A	15	VFD007M43B	5	
VFD007M21A	20	VFD007M53A	5	
VFD015M21A	30	VFD015M43B	10	
VFD004M21B	15	VFD015M53A	5	
VFD007M21B	20	VFD022M23B	30	
VFD015M21B	30	VFD022M43B	15	
VFD022M21A	50	VFD022M53A	10	
		VFD037M23A	40	
		VFD037M43A	20	
		VFD037M53A	20	
		VFD055M23A	50	

VFD055M43A

VFD055M53A

VFD075M43A

VFD075M53A

Sector VFD-M Series

B.2 Fuse Specification Chart

Smaller fuses than those shown in the table are permitted.

Model	Innut Current (A)	Output Current (A)	Line Fuse			
woder	input Current (A)	Output Current (A)	I (A)	Bussmann P/N		
VFD002M11A	6	1.6	15	JJN-15		
VFD004M11A	9	2.5	20	JJN-20		
VFD007M11A	16	4.2	30	JJN-30		
VFD004M21A	6.3	2.5	15	JJN-15		
VFD004M21B	6.3	2.5	15	JJN-15		
VFD007M21A	11.5	5.0	20	JJN-20		
VFD007M21B	11.5	5.0	20	JJN-20		
VFD015M21A	15.7	7.0	30	JJN-30		
VFD015M21B	15.7	7.0	30	JJN-30		
VFD022M21A	27	10	50	JJN-50		
VFD004M23A	2.9	2.5	5	JJN-6		
VFD007M23A	7.6	5.0	15	JJN-15		
VFD015M23A	8.8	7.0	20	JJN-20		
VFD022M23B	12.5	10.0	30	JJN-30		
VFD037M23A	19.6	17	40	JJN-40		
VFD055M23A	28	25	50	JJN-50		
VFD007M43B	4.2	3.0	5	JJS-6		
VFD015M43B	5.7	4.0	10	JJS-10		
VFD022M43B	6.0	5.0	15	JJS-15		
VFD037M43A	8.5	8.2	20	JJS-20		
VFD055M43A	14	13	30	JJS-30		
VFD075M43A	23	18	50	JJS-50		
VFD007M53A	2.4	1.7	5	JJS-6		
VFD015M53A	4.2	3.0	10	JJS-10		
VFD022M53A	5.9	4.2	15	JJS-15		
VFD037M53A	7.0	6.6	15	JJS-15		
VFD055M53A	10.5	9.9	20	JJS-20		
VFD075M53A	12.9	12.2	30	JJS-50		

B.3 All Braking Resistors & Braking Units Use in AC Drives

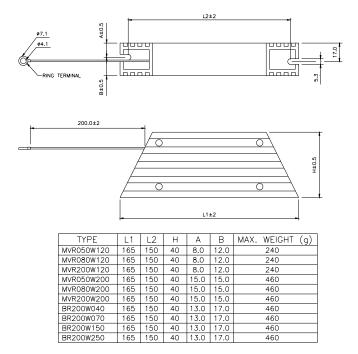
Note:Please only use DELTA resistors and recommended values. Other resistors and values will void Delta's warranty. Please contact the nearest Delta representative near you for use of the special resistors. There should be at least 10 cm away from AC drive to avoid possible noise.

Voltage	HP kW ¹		Load Specification		Braking Resis Model No of U		Braking Torque	Minimum Resistance
Volt			Torque kgf-m	Resistors	Used		10%ED%	Rates
_ s	1/4	0.2	0.110	80W 200 Ω	BR080W200	1	400	80 Ω
115V Series	1/2	0.4	0.216	80W 200 Ω	BR080W200	1	220	80 Ω
. 00	1	0.75	0.427	80W 200 Ω	BR080W200	1	125	80 Ω
	1/2	0.4	0.216	80W 200 Ω	BR080W200	1	220	200 Ω
ŝ	1	0.75	0.427	80W 200 Ω	BR080W200	1	125	80 Ω
Serie	2	1.5	0.849	300W 100 Ω	BR300W100	1	125	55 Ω
230V Series	3	2.2	1.262	300W 70 Ω	BR300W070	1	125	35 Ω
53	5	3.7	2.080	400W 40 Ω	BR400W040	1	125	25 Ω
	7.5	5.5	3.111	500W 30 Ω	BR500W030	1	125	16 Ω
	1	0.75	0.427	80W 750 Ω	BR080W750	1	125	260 Ω
ŝ	2	1.5	0.849	300W 400 Ω	BR300W400	1	125	190 Ω
460V Series	3	2.2	1.262	300W 250 Ω	BR300W250	1	125	145 Ω
>00	5	3.7	2.080	400W 150 Ω	BR400W150	1	125	95 Ω
46	7.5	5.5	3.111	500W 100 Ω	BR500W100	1	125	60 Ω
	10	7.5	4.148	1000W 75 Ω	BR1K0W075	1	125	45 Ω
	1	0.75	0.427	300W 400 Ω	BR300W400	1	125	315.3 Ω
ŝ	2	1.5	0.849	300W 400 Ω	BR300W400	1	125	315.3 Ω
575V Series	3	2.2	1.262	300W 250 Ω	BR300W250	2	125	210.0 Ω
57	5	3.7	2.080	500W 100 Ω	BR500W100	2	125	210.0 Ω
57	7.5	5.5	3.111	300W 100 Ω	BR300W100	2	125	126.1 Ω
	10	7.5	4.148	1000W 75 Ω	BR1K0W075	2	117.2	126.1 Ω

Note: Braking Torque 10%ED% : braking torque at 10% duty cycle in (%).

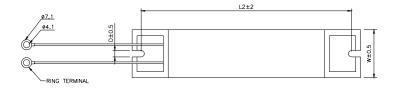
Series

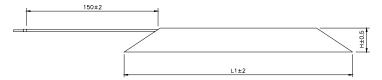
Braking Resistors & Braking Units





Braking Resistors & Braking Units

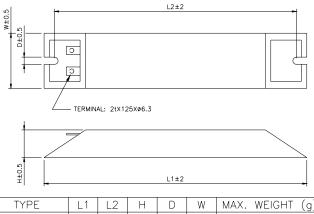




TYPE	L1	L2	Н	D	W	MAX. WEIGHT (g)
MHR200W120	165	150	20	5.3	40	240
MHR400W120	165	150	20	5.3	40	240
BR080W200	140	125	20	5.3	60	160
BR080W750	140	125	20	5.3	60	160
BR300W070	215	200	30	5.3	60	750
BR300W100	215	200	30	5.3	60	750
BR300W250	215	200	30	5.3	60	750
BR300W400	215	200	30	5.3	60	750
BR400W150	265	250	30	5.3	60	930
BR400W040	265	250	30	5.3	60	930

Series

Braking Resistors & Braking Units



TYPE	L1	L2	Н	D	W	MAX. WEIGHT (g)
MHR025W500	335	320	30	5.3	60	1100
MHR050W500	335	320	30	5.3	60	1100
MHR100W500	335	320	30	5.3	60	1100
BR500W030	335	320	30	5.3	60	1100
BR500W100	335	320	30	5.3	60	1100
BR1K0W020	400	385	50	5.3	100	2800
BR1K0W075	400	385	50	5.3	100	2800



B.4 AMD - EMI FILTER CROSS REFERENCE

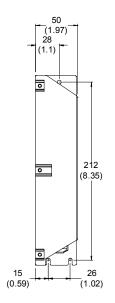
Model of AC Drive	EMI Filter
VFD002M11A, VFD004M11A, VFD007M11A, VFD004M21B, VFD007M21B, VFD015M21B	RF015M21AA
VFD007M43B, VFD015M43B, VFD022M43B	RF022M43AA
VFD022M21A	RF022M21BA
VFD037M43A, VFD055M43A, VFD075M43A	RF075M43BA
VFD037M23A, VFD055M23A	40TDS4W4B
VFD022M23B, VFD004M23A, VFD007M23A, VFD015M23A	16TDT1W4S

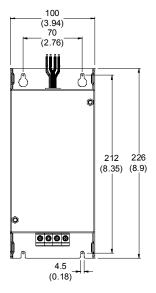
If users are to operate the AC motor drive in coordination with the EMI filters manufactured by DELTA, consult the above chart for the appropriate I/O terminals' of the applicable filters.

The filter will cause high leakage current. We recommend the grounding is required.

SELTA VFD-M Series

EMI Filter (RF015M21AA / RF022M43AA)

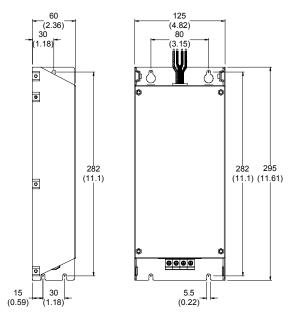








EMI Filter (RF022M21BA / RF075M43BA)

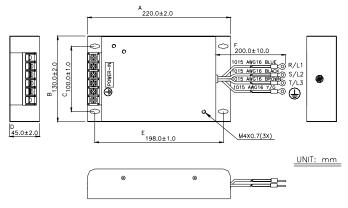




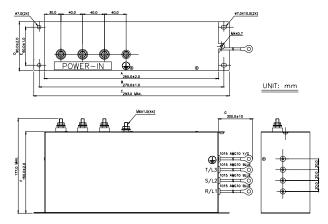
В

Sector VFD-M Series

EMI Filter (16TDT1W4S) Used on 0.5-3 HP/230V Three Phase Models.



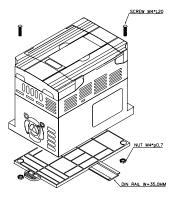
EMI Filter (40TDS4W4B) Used on 5-7.5 HP/230V Three Phase Models.

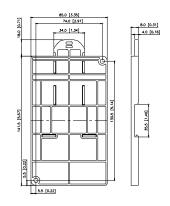


B.5 Din Rail-DR01 Adapter Units: mm (inch)

Models VFD004M21A/23A, VFD007M21A/23A, VFD015M21A/23A

To mount the drive on a Din Rail adapter, place the drive and mounting plate on the rail and push the lever toward the rail.

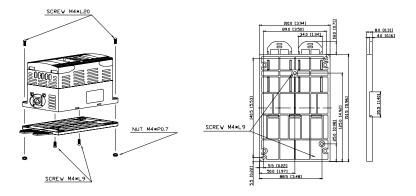




Din Rail-DR02 Adapter Units: mm (inch)

Models VFD002M11A, VFD004M11A/21B, VFD007M11A/21B/43B/53A, VFD015M21B/43B/53A, VFD022M23B/43B/53A

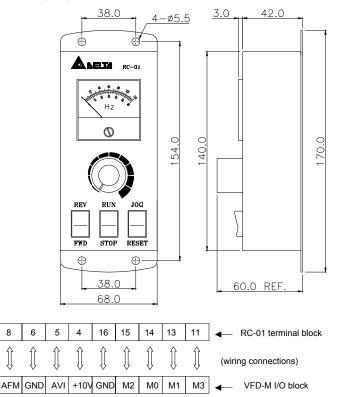
To mount the drive on a Din Rail adapter, place the drive and mounting plate on the rail and push the lever toward the rail.





B.6 Remote Controller RC-01

Unit: mm (inch)



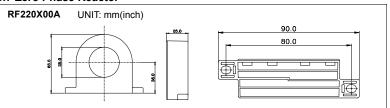
VFD-M Programming

8

Pr.00 set to d01 (jumper #5 must be across pins 2&3) Pr.01 set to d01 (external controls) Pr.38 set to d01 (M0, M1 set as run/stop and fwd/rev) Pr.39 set to d05 (M2 set for reset) Pr.40 set to d09 (M3 set for jog select)

SELTA VFD-M Series

B.7 Zero Phase Reactor



Cable type	Recommended Wire Size				
(600V Insulated unshielded Cable)	AWG	mm ²	Nominal (mm2)	Qty.	Wiring Method
Single-core	≦10	≦5.3	\leq 5.5	1	Diagram A
	≦2	≦33.6	≦38	4	Diagram B
Three-core	≦12	≦3.3	≦3.5	1	Diagram A
	≦1	≦42.4	≦50	4	Diagram B

Diagram A

Please wind each wire **4 times** around the core. The reactor must be put at inverter side as close as possible.

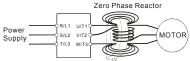
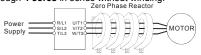


Diagram B

Please put all wires through 4 cores in series without winding.



Note 1: The table above gives approximate wire size for the zero phase reactors but the selection is ultimately governed by the type and diameter of cable fitted i.e. the cable must fit through the center hole of zero phase reactors.

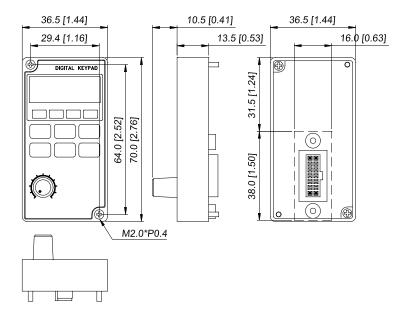
Note 2: Only the phase conductors should pass through, not the earth core or screen.

Note 3: When long motor output cables are used, an output zero phase reactor may be required to reduce radiated emissions from the cable.



DIMENSIONS

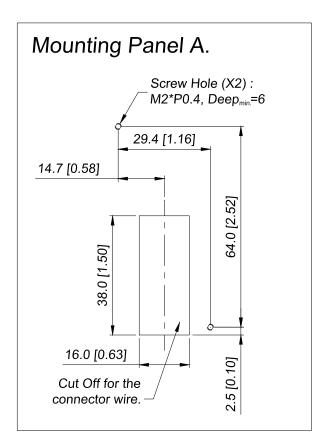
Digital Keypad Unit: mm [inches]



С

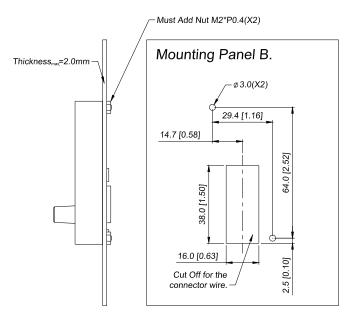
SELTA VFD-M Series

Digital Keypad – Mounting Panel A Unit: mm [inches]





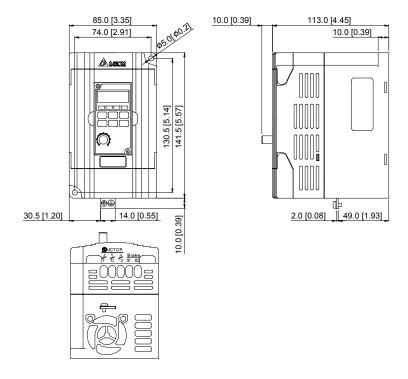
Digital Keypad – Mounting Panel B Unit: mm [inches]





VFD004M21A	0.4 kW (0.5 HP)	230V / 1-phase or 3-phase
VFD004M23A	0.4 kW (0.5 HP)	230V / 3-phase
VFD007M21A	0.75 kW (1.0 HP)	230V / 1-phase or 3-phase
VFD007M23A	0.75 kW (1.0 HP)	230V / 3-phase
VFD015M21A	1.5 kW (2.0 HP)	230V / 1-phase or 3-phase
VFD015M23A	1.5 kW (2.0 HP)	230V / 3-phase

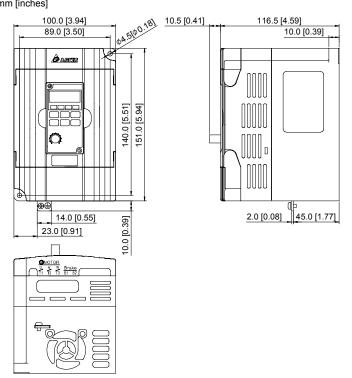
Unit: mm [inches]





VFD002M11A VFD004M11A VFD004M21B VFD007M11A VFD007M43B VFD007M53A VFD015M21B VFD015M21B VFD015M43B VFD015M53A VFD015M53A VFD022M23B	0.2 kW (0.25 HP) 0.4 kW (0.5 HP) 0.75 kW (1.0 HP) 0.75 kW (1.0 HP) 0.75 kW (1.0 HP) 0.75 kW (1.0 HP) 1.5 kW (2.0 HP) 1.5 kW (2.0 HP) 1.5 kW (2.0 HP) 2.2 kW (3.0 HP)	115V / 1-phase 115V / 1-phase 230V / 1-phase or 3-phase 115V / 1-phase 230V / 1-phase or 3-phase 460V / 3-phase 230V / 1-phase or 3-phase 460V / 3-phase 575V / 3-phase 230V / 3-phase 230V / 3-phase
VFD022M23B VFD022M43B VFD022M53A	2.2 kW (3.0 HP) 2.2 kW (3.0 HP) 2.2 kW (3.0 HP)	230V / 3-phase 460V / 3-phase 575V / 3-phase

Unit: mm [inches]

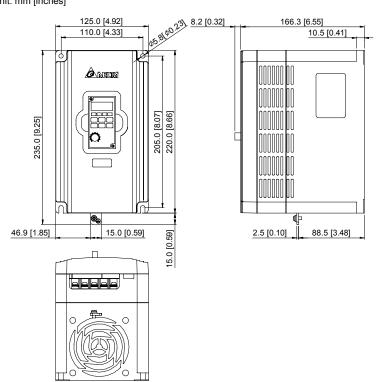


С

Series

2.2 kW (3.0 HP) 230V / 1-phase or 3-phase
3.7 kW (5.0 HP) 230V / 3-phase
3.7 kW (5.0 HP) 460V / 3-phase
3.7 kW (5.0 HP) 575V / 3-phase
5.5 kW (7.5 HP) 230V / 3-phase
5.5 kW (7.5 HP) 460V / 3-phase
5.5 kW (7.5 HP) 575V / 3-phase
7.5 kW (10 HP) 460V / 3-phase
7.5 kW (10 HP) 575V / 3-phase

Unit: mm [inches]





EC Declaration of Conformity According to the Low Voltage Directive 73/23/EEC and the Amendment Directive 93/68/EEC

For the following equipment:

AC Motor Drive

(Product Name)

VFD002M11A, VFD004M11A, VFD007M11A, VFD004M21B, VFD004M23A, VFD007M21B, VFD007M23A, VFD007M43B, VFD015M21B, VFD015M23A, VFD015M43B, VFD022M21A, VFD022M23B, VFD022M43B, VFD037M23A, VFD037M43A, VFD055M23A, VFD055M43A, VFD075M43A

(Model Name)

is herewith confirmed to comply with the requirements set out in the Council Directive 73/23/EEC for electrical equipment used within certain voltage limits and the Amendment Directive 93/68/EEC. For the evaluation of the compliance with this Directive, the following standard was applied:

EN 50178

The following manufacturer/importer is responsible for this declaration:

Delta Electronics, Inc.	
(Company Name)	

<u>31-1, Shien Pan Road, Kuei San Industrial Zone, Taoyuan Shien, Taiwan 333</u> (Company Address)



DELTA ELECTRONICS, INC.

EC Declaration of Conformity According to the Electromagnetic Compatibility 89/336/EEC and the Amendment Directive 93/68/EEC

For the following equipment:

AC Motor Drive

(Product Name)

VFD002M11A, VFD004M11A, VFD007M11A, VFD004M21B, VFD004M23A, VFD007M21B, VFD007M23A, VFD007M43B, VFD015M21B, VFD015M23A, VFD015M43B, VFD022M21A, VFD022M23B, VFD022M43B, VFD037M23A, VFD037M43A, VFD055M23A, VFD055M43A, VFD075M43A

(Model Designation)

is herewith confirmed to comply with the requirements set out in the Council Directive 89/336/EEC for electromagnetic compatibility and the Amendment Directive 93/68/EEC. For the evaluation of the compliance with this Directive, the following standard was applied:

EN61800-3, EN55011, EN50081-2, EN50082-2, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8 The following manufacturer/importer is responsible for this declaration:

Delta Electronics, Inc. (Company Name)

<u>31-1, Shien Pan Road, Kuei San Industrial Zone, Taoyuan Shien, Taiwan 333</u> (Company Address)