

Foreword

Thanks for your choosing HD300 solar pump inverter from HEDY company.

HD300 special pump inverter is developed for the supply of PV water pumps based on HD700, which has the maximum power tracking ability, dormant at weak light, wake up at strong light, high water level dormant, underload pre-warning and other control protection functions can ensure normal operation of water pumps according to the customers' requirements to switch to grid power supply .

When commissioning this product, please refer to this manual. For more information, please refer HD700 user manual.

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Please read the information carefully, and keep the manual, please make sure that the end customer has the manual.

Warnings, Cautions and Notes

Warning:

A **Warning** contains information, which is essential for avoiding a safety hazard.

Caution:

A **Caution** contains information, which is necessary for avoiding a risk of damage to the product or other equipment.

NOTE

A **Note** contains information, which helps to ensure correct operation of the product.

 WARNING
<ul style="list-style-type: none">• The HD300 Solar pump inverter should ONLY be installed by a qualified electrician.• Install the inverter far away from the inflaming materials like metal sheet in case of fire.• Do not install the inverter in environment with explosive gas.• Even when the motor is stopped, dangerous voltage is present at the Power Circuit terminals L1, L2, L3 and U, V, W and, depending on the frame size, DC+ and DC-, or BR.• Dangerous voltage is present when input power supply is connected to the inverter. After disconnecting the supply, wait at least 10 minutes (to let the intermediate circuit capacitors discharge) before removing the cover.• PE terminals must be earthed very well.

 CAUTION
<ul style="list-style-type: none">• The HD300 is not a field repairable unit. Never attempt to repair a malfunctioning unit; contact the factory or your local Authorized Service Center for replacement.• The HD300 will start up automatically after an input voltage interruption if the external run command is on.• Prior to measurements on the motor or the motor cable, disconnect the motor cable from the solar inverter.• Before connecting the solar pump inverter to mains, make sure that the HD300's front and cable covers are closed.

1 Technical specification

1.1 Model reference

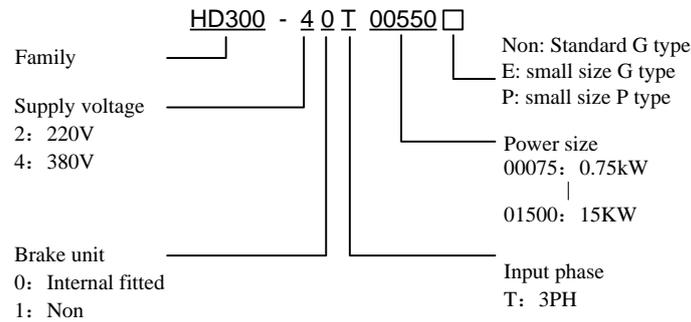


Figure1-1 HD300 model description

1.2 Rating Label

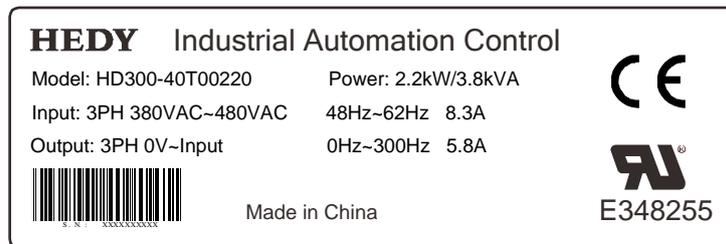


Figure1-2 HD300 Rating label

1.3 Power degree

Power size of HD300 refers to the standard 4 poles induction motor at rated voltage.

Overload: 150% rated output current, 1 minute

Table 1-1 380V rating data

Inverter model	Max DC input current (A)	Rated output current (A)	Applicable water pump (KW)
HD300-40T00075	4.2	2.5	0.75
HD300-40T00150	6.1	3.7	1.5
HD300-40T00220	7.1	5	2.2
HD300-40T00400	16.5	9.5	4
HD300-40T00550	23.9	14	5.5
HD300-40T00750	30.6	18.5	7.5
HD300-40T01100	39.2	25	11
HD300-40T01500	49.0	32	15

Noted: when the output voltage is 380V, the output current will be rated value; when the output voltage is 400V, 415V or 440V, the output current will be calculated according to power

Table 1-2 220V rating data

Inverter model	Max DC input current (A)	Rated output current (A)	Applicable water pump (KW)
HD300-20T00075	6.7	4.5	0.75
HD300-20T00150	9.9	7	1.5
HD300-20T00220	14.1	10	2.2
HD300-20T00400	22.6	16	4
HD300-40T01500	49.0	32	15

Noted: when the output voltage is 220V, the output current will be rated value

1.4 Electrical Specifications

Table 1-3 Electrical Specifications

	220v	380v
Max input DC voltage	410v	800V
Recommended MPPT voltage range	270~400VDC	350~750VDC
Recommended input voltage	310V	513V
MPPT efficiency	99.9%	
Input channel	1	
Rated output voltage	3-phase 220VAC	3-phase 380VAC
Output frequency range	0~60Hz	
Max efficiency of the machine	97%	
Ambient temperature range	-10 ℃~50 ℃, derating if the temperature is above 40 ℃	
Cooling method	Air cooling	
Protection degree	IP20	
Altitude	Below 1000m; above 1% for every additional 100m.	
Standard	CE	

1.5 Recommended solar array configuration

Table 1-4 recommended solar array configuration

Inverter model	Max DC input current (A)	Open-circuit voltage degree of solar module											
		20±3V		30±3V		36±3V				42±3V			
		Module Power ±5Wp	Module Per string *string	Module Power ±5Wp	Module Per string *string	Module Power ±5Wp	Module Per string *string	Module Power ±5Wp	Module Per string *string	Module Power ±5Wp	Module Per string *string	Module Power ±5Wp	Module Per string *string
HD300-20T00075	6.7	50	16*1	-	-	-	-	-	-	-	-	-	-
HD300-20T00150	9.9	110	16*1	165	11*1	-	-	-	-	-	-	-	-
HD300-20T00220	14.1	-	-	120	11*2	150	9*2	-	-	330	8*1	-	-
HD300-20T00400	22.6	-	-	220	11*2	135	9*4	-	-	300	8*2	-	-
HD300-40T00075	4.2	30	29*1	-	-	-	-	-	-	-	-	-	-
HD300-40T00150	6.1	60	30*1	-	-	-	-	-	-	-	-	-	-
HD300-40T00220	7.1	90	30*1	-	-	145	18*1	-	-	175	15*1	-	-
HD300-40T00400	16.5	85	28*2	220	22*1	140	17*2	-	-	160	15*2	-	-
HD300-40T00550	23.9	-	-	-	-	195	17*2	-	-	220	15*2	-	-
HD300-40T00750	30.6	-	-	215	21*2	175	17*3	-	-	200	15*3	300	15*2
HD300-40T01100	39.2	-	-	200	22*3	195	17*4	-	-	220	15*3	-	-
HD300-40T01500	49	-	-	205	22*4	175	17*6	200	18*5	240	15*5	300	15*4

2 Installation and cabling

2.1 Dimension

2.1.1 Parts of drive

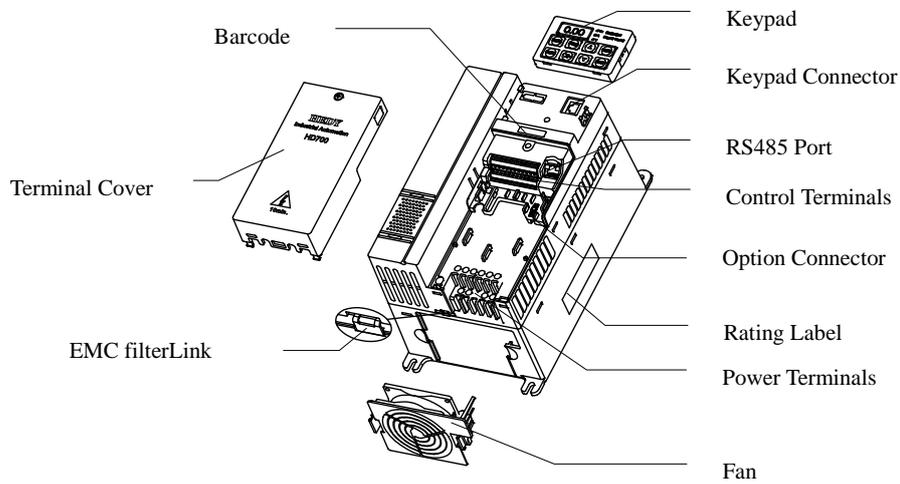


Figure 2-1 Parts of HD300 drive

2.1.2 Diagram of mounting

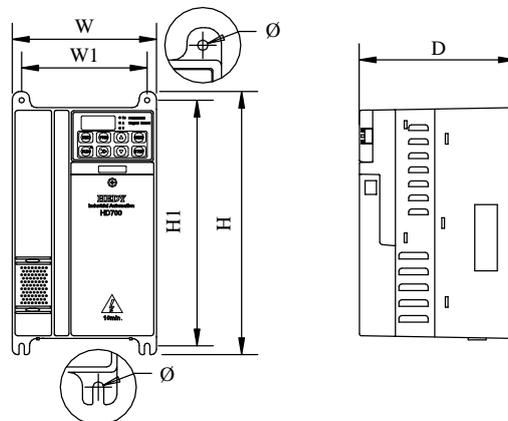


Figure 2-2 Mechanical dimensions and mounting (Size A, B, C)

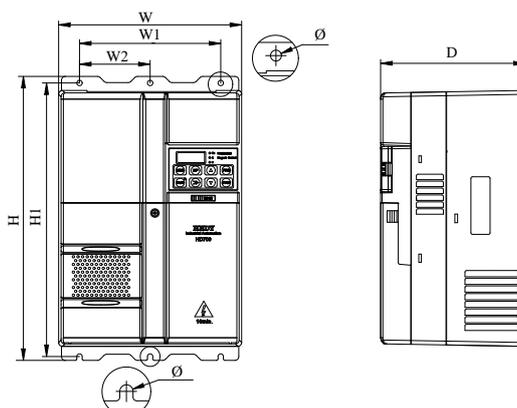


Figure 2-3 Mechanical dimensions and mounting (Size D)

Table 2-1 Mechanical dimensions

Size	Model Name	W (mm)	W1 (mm)	W2 (mm)	H (mm)	H1 (mm)	D (mm)	D1 (mm)	Mounting Hole Ø	Weight (kg)
A	HD300-20D00075	97.4	80		202.4	190	148.8		5	1.4
	HD300-20D00150									
	HD300-40T00075									
	HD300-40T00150									
B	HD300-20D00220	142.4	123.5	-	220.4	208	155.5	-	5	2.2
	HD300-40T00220									
	HD300-40T00400									
C	HD300-20D00400	163.1	142	-	300	280	176.8	-	6	4.5
	HD300-40T00550									
	HD300-40T00750									
D	HD300-40T01100	238.5	184	92	370	356.5	189	-	7	8.8
	HD300-40T01500									

2.2 Mechanical installation

2.2.1 Drive installation diagram

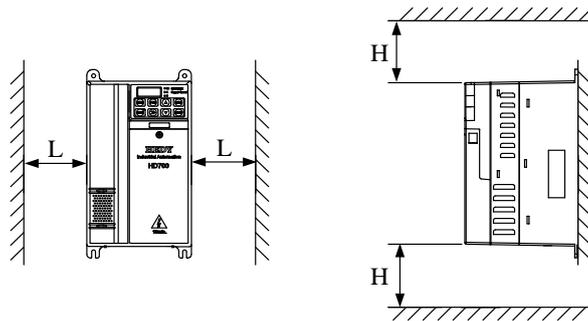


Figure 2-4 Ingle drive installation

Recommending: $L \geq 50\text{mm}$, $H \geq 50\text{mm}$

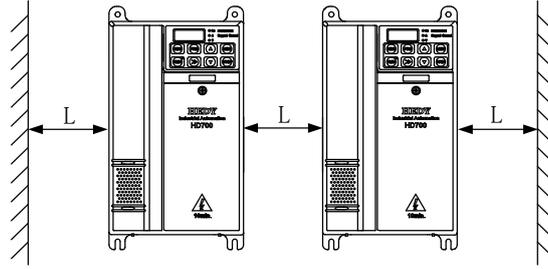
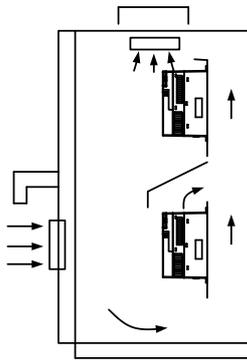


Figure 2-5 Multi-drives installation

Recommending: $L \geq 50\text{mm}$



NOTE :In vertical installations where drives are mounted above each other, there should be suitable air flow to keep the drives cool. Air flow should be drawn in and expelled as illustrated in the left picture.

Figure 2-6 Multi drives vertical installation

2.2.2 Fit and remove the terminal cover

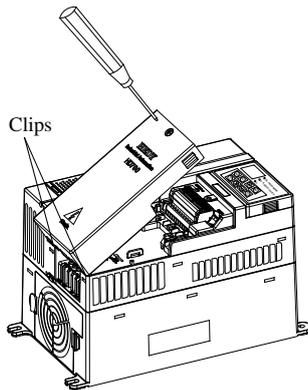


Figure 2-7 Terminal cover fitting and removing

Remove: Unscrew, loose the clip then take off the cover.

Fit: by a suitable angle, put the clips into the slots on the middle cover, push the cover on, tighten the screw $M4 \times 10$ (Torque $1\text{N} \cdot \text{m}$).

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2.2.3 How to fit and remove the keypad

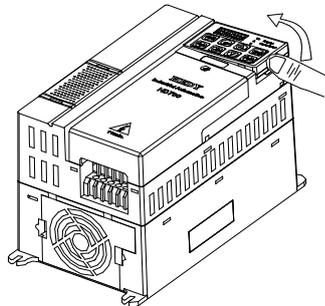


Figure 2-8 Diagram of the keypad fitting

Remove: push the spring clip, and then pull up the keypad.

Fit: fit the left two clips (correct angle) into the slots on the control pod, and then push down the keypad.

HD300 keypad is removable, and can be linked to the drive with a standard net cable -,shown as below:

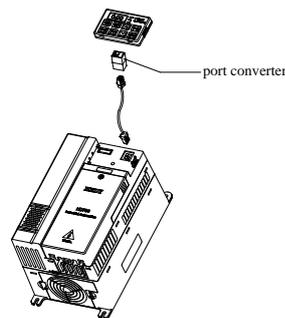


Figure 2-9 Keypad cable link

NOTE: The maximum length of cable is 10m.

2.3 Electrical installation

2.3.1 Power terminals

◆ Models of size A, B, C: HD300-20D00040~HD300-40T00750

L1	L2	L3/N	U	V	W
PE	+DC	+DC1	BR	-DC	PE

Figure 2-10SizeA, B power terminals layout

L1	L2	L3	U	V	W
PE	+DC		BR	-DC	PE

Figure 2- 11SizeC power terminals layout

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Table 2- 2Power terminal functions of sizeA, B, C

Terminals	Functions
L1, L2, L3/N	AC power supply.For single phase supply,we suggest to use L1, L3/N
+DC, +DC1	For DC choke, linked by terminal
BR	Brake resistor, another end is +DC1
-DC	Negative DC bus
U, V, W	Output terminals(Motor terminals)
PE	Protective earth terminal

NOTE:

- Size C has DC choke inside, +DC1 is not used.
- For size C, the brake resistor is connected to BR and +DC.

◆ Models of size D: HD300-40T01100~HD300-40T02200

+DC	BR	-DC	L1	L2	L3	PE	PE	U	V	W
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Figure 2-12SizeD, E power terminals layout

Table 2- 3Power terminal functions of sized, E

Terminals	Functions
L1, L2, L3	AC power supply
+DC, -DC	Positive and negative DC bus
BR	Brake resistor, another end is +DC
U, V, W	Output terminals(Motor terminals)
PE	Protective earth terminal

2.3.2 Power connections

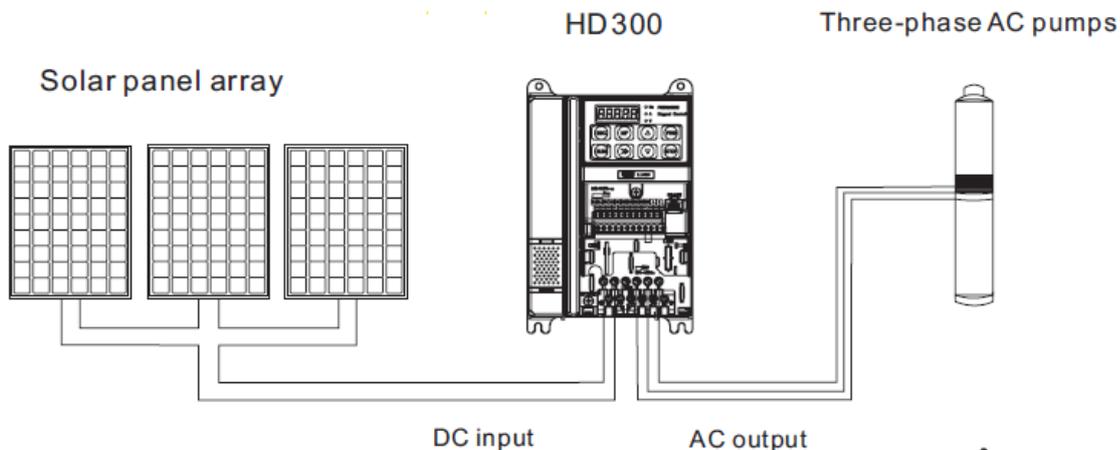


Figure 2- 13Typical power connection

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NOTE:

- The selection of fuse and switch refers to table 2-14.
- Do not suggest using the power contactor to control the RUN/STOP of the drive.
- In default carrier frequency, the maximum motor cable length is 100 meters. When the motor cable is longer than 100m, recommend to use output reactor.
- For safety, drive and motor must be earthed, and the earth contacting resistance must be less than 10Ω, the earthing conductor must meet the requirements in table 2-15.

• Table 2-4 Recommended fuse, power cable and control cable

Model	Fuse				Power				Control cable (mm ²)
	IEC gG (A)		<30A, CC class >30A, T class (A)		Input current (A)	Supply cable (mm ²)		Motor cable (mm ²)	
	1PH	3PH	1PH	3PH	1/3PH	1PH	3PH	3PH	
HD300-20D00075	16	10	15	10	12.8/7.1	2.5	1.0	1.0	≥0.5
HD300-20D00150	25	16	25	15	20.5/11.3	2.5	1.5	1.0	≥0.5
HD300-20D00220	32	20	32	20	24/14.5	4.0	2.5	1.5	≥0.5
HD300-20D00400	20		20		16.5	2.5		2.5	≥0.5
HD300-40T00075	8		8		3.6	1.0		1.0	≥0.5
HD300-40T00150	10		10		5.7	1.0		1.0	≥0.5
HD300-40T00220	16		15		8.3	1.5		1.0	≥0.5
HD300-40T00400	20		20		13.2	2.5		1.5	≥0.5
HD300-40T00550	20		20		12.4	2.5		2.5	≥0.5
HD300-40T00750	25		25		16.1	2.5		2.5	≥0.5
HD300-40T01100	40		40		31	4.0		4.0	≥0.5
HD300-40T01500	50		45		36	6.0		6.0	≥0.5

Table2- 5Earth conductor cross sectional area

Power cable cross sectional area-S (mm ²)	Earth conductor cross sectional area-Sp (mm ²)
S≤16	S
16<S≤35	16
35<S	S/2

NOTE: The data in the table2-12 is base on that they are same metal material; otherwise the area value should be modified by the conductor factor between the different metal material.

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2.3.3 Typical cabling

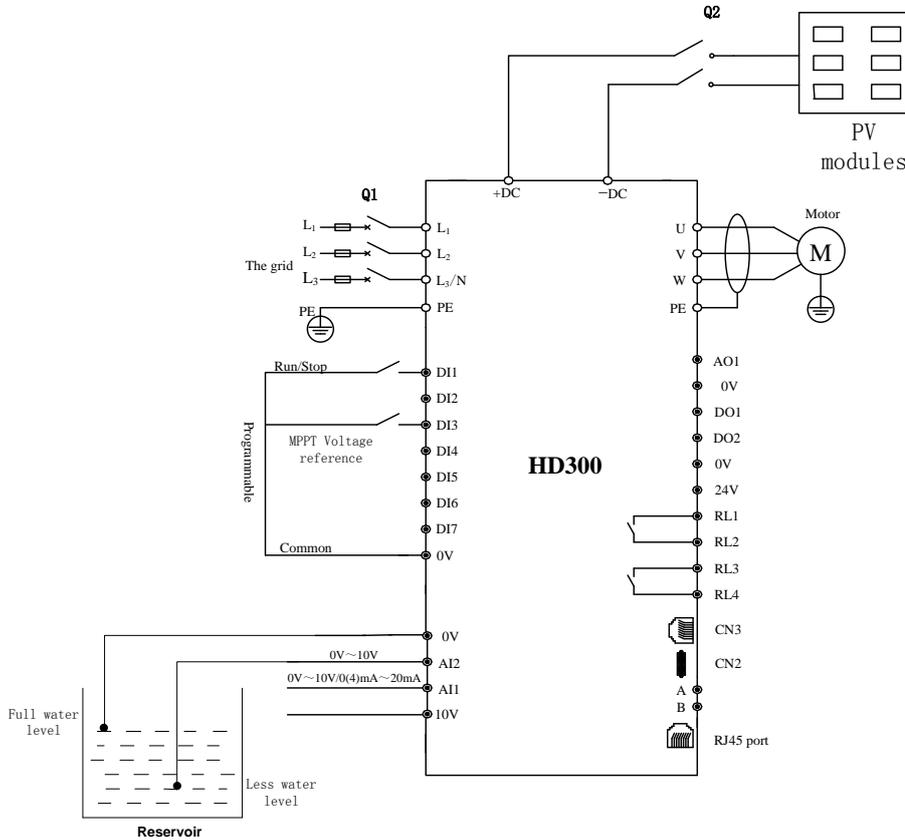


Figure 2- 14Typical cabling

NOTE:

- All the programmable control terminal functions are factory default set.
- For control wire, recommend using unshielded twisted pair, shielded cable or shielded twisted pair.
- 5.5kW~15kW models (including 220V/4kW), internal DC Choke is fitted.

2.3.4Control terminals specification

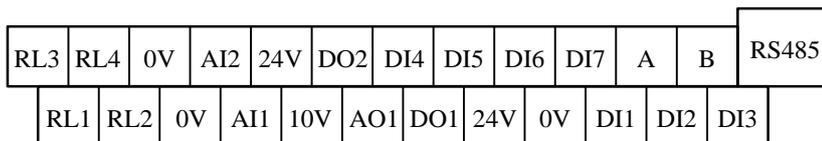


Figure 2-15Control terminal diagram

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Table 2-6 Control terminal and comms.port

Type	Terminal Name	Function	Technical Specifications
Serial comms.	RS485	RJ45port	Two lines, Modbus RTU protocol
	A	485 plus signal	Same function with RJ45 port, mainly for multi network
	B	485 minus signal	
Digital input	DI1~DI5	Programmable digital input terminals	The common can be 0V or 24V by setting the P09.21(default is 0V) Input resistance: 10 kΩ High, low logic threshold:10V±1V Sample time: 1ms
	DI6	Normal digital input Length counting Number counting	<ul style="list-style-type: none"> • Same as DI1~DI5 • Length counting by input pulse Sample time: 5ms • Number counting by input pulse Sample time: 5ms Note: pulse frequency range is 0Hz~60Hz.
	DI7	Normal digital input High frequency pulse input Motor thermister input	<ul style="list-style-type: none"> • Same as DI1~DI5, but Input resistance is 5kΩ • High frequency pulse input Frequency range: 1kHz~50kHz • Only when P09.21=1 input can be thermister Trip resistance: 3kΩ Reset resistance: 1.8kΩ Sample time: 5ms
Digital output	DO1	Programmable digital output terminal1	Output: 24V/0V Max. output current: 50mA Updating rate: 20ms
	DO2	Programmable digital output terminal1	<ul style="list-style-type: none"> • same with DO1 • High frequency pulse output(0.1kHz to 50kHz) • PWM output(10kHz)
Analogue input and output	AI1	Programmable analogue input 1	0V~10V Input resistance: 100kΩ 0 (4) mA~20mA Load resistance:188Ω Min. Potentiometer resistance: 0.5kΩ Resolution: 0.1% Accuracy: 2% Sampling period: 5ms
	AI2	Programmable analogue input 1	0V~10V Input resistance: 30kΩ Min. Potentiometer resistance: 0.5kΩ Resolution: 0.1% Accuracy: 2% Sampling period: 5ms
	AO1	Programmable analogue output	0V~10V Max. output current: 5mA Resolution: 0.4% Accuracy:±5% Updating rate: 5ms
Rail supply and Relay	10V	Analogue reference rail	Accuracy: 2% Max. output current: 20mA

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Type	Terminal Name	Function	Technical Specifications
	24V	User supply (2)	Accuracy: $\pm 15\%$ Maximum output current: 100mA
	0V	Common (3)	Common reference point for control signal
Rail supply and Relay	RL1,RL2	Programmable relay1 output contactors	Type: normal open Updating rate: 5ms Contactor rating: 250VAC/2A(cos ϕ =1) 250VAC/1A(cos ϕ =0.4) 30VDC/1A Default: Relay1: closed when powered and healthy. Relay2: closed when drive is active.
	RL3,RL4	Programmable relay2 output contactors	

- Digital input terminal basic function

There are 7 programmable digital input terminals.

P09.01=0(default), only basic function for digital input

P09.01=1, advanced functions are available for digital input.

This manual only introduces the basic function of digital input.

The basic function list is as the following table:

Table 2-7 HD700 digital input basic function list

Terminal	Parameter	Range	Default
D11	P09.02	0: Preset select bit0 1: Preset select bit1	3
D12	P09.03	2: Run 3: Run forward 4: Run reverse	4
D13	P09.04	5: 3-wire enable 6: FWD/REV	7
D14	P09.05	7: Jog forward 8: E Pot (UP) 9: E Pot (DOWN)	0
D15	P09.06	10: Enable 11: Reset	1
D16	P09.07	12: Switch to terminal control 13: Reset of length counting	10
D17	P09.08	16: Preset select bit2 17: Preset select bit3 18: PLC reset indicator 19: No function 99: Advanced function	11

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		Release Scope			

3 Operation and display

3.1 Keypad

There are a 5-digit LED display of 8 segment, 3 unit lights, and a RUN light on the HD300 drive keypad as shown below:



Figure 3-1 LED keypad

3.1.1 LED lights

LED display can show the drive status, parameters and value, trip, warning information, etc.

Run light is on the upper right corner of the switch of , when drive is active, the light is on.

Table 3-1 Unit light

Unit	Function	Color
Hz	On: output frequency Flash: Reference frequency	Green
A	On: Output current	Green
V	On: Output voltage(RMS) Flash: DC bus voltage	Green

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3.1.2 Key function

Table 3-2 Switch function

Switches	Function Description
	In different level display, press the switch will return the last level; long press on the switch, will display the value of normal display parameter decided by P05.01. When the keypad is locked, 5 seconds pressing on the switch will unlock.
	Programmable switch, it can be function of Jog, Fwd./Rev., Coasting stop by setting P05.07. Default function is Jog.
	Enter next level of the keypad display.
	When it is keypad control mode (P00.03 or P10.07=0), press the switch will make the drive run.
	<ul style="list-style-type: none"> Stop, the switch will stop the drive unless the keypad is locked totally. Reset the drive if the keypad is not locked totally.
	Are used to select parameters and edit their values. In keypad mode, they are used to increase and decrease the speed of the motor.
	<ul style="list-style-type: none"> Under Run/Stop mode, press the switch the LED display will be output frequency, reference frequency, output current, output voltage, DC bus voltage in turn Under the edit of parameter value mode, press the switch will change the bite of the value.

NOTE: If there is a conflict on the content of parameter, pressing "PRG" switch cannot enter the next parameter.

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		Secret Level		模板版本 Temp. Ver	V1.0
		Release Scope			

3.1.3 Keypad operation

Keypad can control the running of the drive, or monitor the status of the drive, details as below:

- LED Display

- If P05.02 is set to 0

Normal display is the value of the parameter which is selected by the P05.01; default is output frequency(value of P05.11).

HD300 has a quick display group, switchover value is: output frequency, reference frequency, output current, output voltage, DC bus voltage. Operation procedure is as figure 3-2:

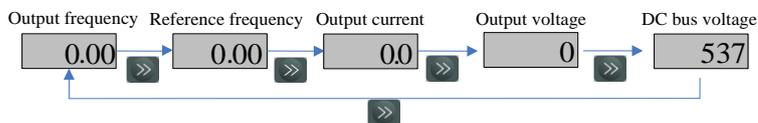


Figure3-2 Display switchover flow

- If P05.02 is set to 1

On standby mode, normal display is reference frequency. Operation procedure is as figure 3-3:

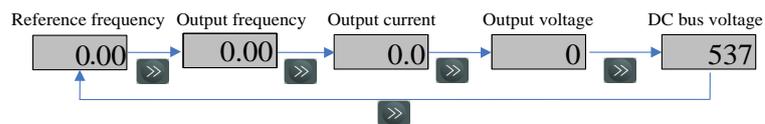


Figure 3-3 Display switchover flow

In running mode, normal display is output frequency. Operation procedure is as figure 3-4:

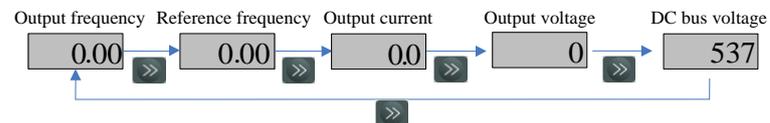


Figure 3-4 Display switchover flow

NOTE:

- ✧ Normal display can be the value of any parameter selected by P05.01. For example, if set P05.01=5.08, then the normal LED display will be motor speed.
- ✧ During the switchover process, press the switch of ESC, the LED display will return to the normal display content.

- The view of the parameter and the edit of parameter value

For HD300 family, there are three levels about parameter view and edit.

Level1: menu group

Level2: parameter

Level3: parameter content

Operation flow is described in figure3-5:

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		Release Scope			

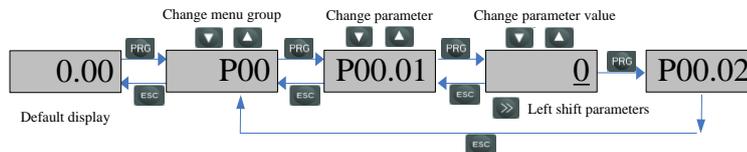


Figure 3-5 parameter view and edit flow

NOTE:

- ✧ In level3, user can turn the display to level2 by pressing switch PRG or switch ESC, the difference among them is:
Press PRG will save the change of the value and return level2 (next parameter), press PRG again, will display the value of next parameter.
Press ESC will not save the change and return the level2 (current parameter), ESC again will return the level1 display.
- ✧ Only after press PRG, the change can be active
- ✧ If there's no bite of parameter value is flashing, means the value of the parameter cannot be changed, the reasons maybe:
 - It is an actual parameter, cannot be changed
 - Drive is running, and the parameter cannot be changed at running
- ✧ If more than one parameters are being set to same value(function), will happen following phenomena:
 - Keypad set up, the change will not be activable after pressing PRG, and the display can not enter the next parameter
 - PC Tools set up, the drive will trip at F021

Table 3-3 List of parameters with conflict setup

Analogue input	Digit input	PID output source	Logic output source	Threshold and selector output source
P08.03, P08.08	P09.02~P09.08	P15.15	P16.07, P16.14, P16.19	P17.05, P17.10, P17.17, P17.24, P17.31

For example:

The default function of digit input terminal are:

P09.02=3 DI1 function is Run forward.

P09.03=4 DI2 function is Run reverse.

If change the setup of DI2, like setP09.03=3 (DI2 function is forward running also), press PRG, the value of P09.03is still "4", and the Display can not enter the next parameter P09.04.

• Example of editing parameter

The example is to change the value of P04.01 from 5.00Hz to 40.50Hz, as the following figure 3-6. The number with underline is flashing.

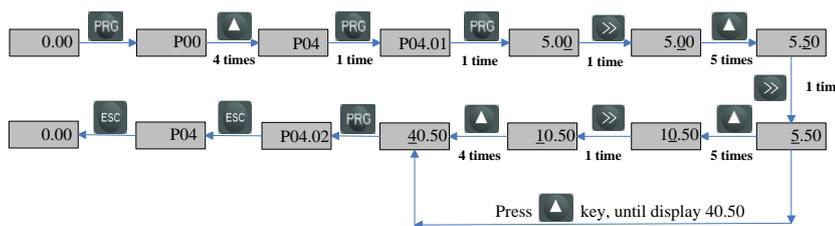


Figure 3-6 Editing parameter flo

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		Release Scope			

- Lock and unlock the keypad

To avoid wrong keypad option, HD300 has the function of keypad lock through the setup of P05.06, if the value of P05.06 is:

0: all the keys are activable

1: all the keys are locked

2: except RUN and STOP keys, other keys are locked.

Keypad unlocked operation: press ESC over 5 seconds and the value of P05.06 will become to be "0", the keypad is unlocked.

- User code

To protect the secrets of customer parameter setup, HD300 designs the function of user code. Once the user code is set, if can not enter the correct PIN in the P00.01, the keypad can only display normal display and parameter P10.06, and its value is "0".

- Set the user code

Default value of P00.01 is "0", and user code function is disabled. If set P10.06a non "0" value (1~9999) and press PRG once and press ESC twice, it will enable the user code function. The example of setting the user code to 4 showed as below figure 3-7:



Figure 3-7 User code setting flow

- Verify the user code(PIN)

When the user code is enabling, only after entering the correct PIN into P10.06 and press PRG, customer can view and edit all the parameters. After verifying user code successfully, if there's no any action on any switch on the keypad in two minutes, the value of P10.06 will be changed to "0" automatically, the user code function is enable again, and the keypad will show the normal display(selected by P05.01).

If the PIN is "8", and the user code function as on Enable stage, following figure 3-8 shows how to pass the PIN verifying.

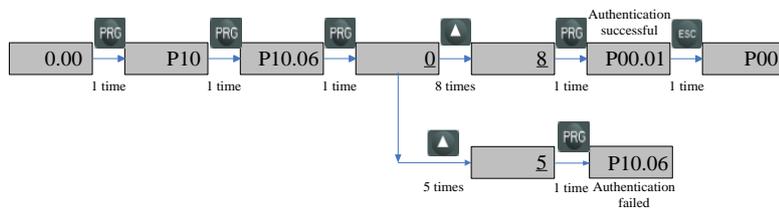


Figure 3-8 PIN verifying procedure

- Remove the user code

There are two methods to remove the user code:

- Software remove

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After verifying the PIN successfully, change the content of P10.06 to "0", then press PRG, disable the user code function.

➤ Hardware remove

During the drive power off process, press the switches of    at the same time, then loosen the switches after power up. Change the content of P10.06 to "0", disable the user code function.

3.2 Drive control

3.2.1 Drive status

HD300 drive status is defined as: Ready (Stop), Running, Editing, Trip, and Alarming.

Stop: After powered up and reset process, if there is no RUN action, the drive will keep the stop status, RUN light is off.

Running: The drive is activate, RUN light is on.

Editing: Through keypad or PC Tools, program the parameters.

Trip: Because of internal fault, external fault or wrong operation, the drive will trip and display relative fault code.

Alarm: When drive is under alarm status, keypad will display relative alarm code (Hxxx). The alarm code will keep flashing for 3 seconds and then turn over to the normal display(selected by P05.01). The normal display will flash for 3 seconds then back to flash alarm code, will keep this cycle until the alarm is removed or trip.

The parameter P12.13 can be set to decide if display the alarm information or not.

3.2.2 Control modes

Through P00.03 (P10.07), there are 3 control modes:

0: Keypad

1: Terminal

2: Serial comms.

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4. Parameter

4.1 Property of parameter

The following parameter description includes:

Parameter ID: code of parameter.

Parameter name: simple explanation of the parameter.

Parameter range: the range of the parameters content, in **【】** is the default value.

Change mode: to define if the parameter can be modified, and under what condition can change the parameter.

Run&Stop Write &Read can be done at running and stop.

Stop Only Write &Read can be done only at stop.

Actual Read only

4.2 Parameters list

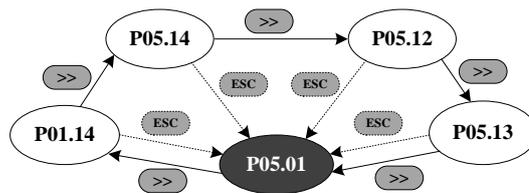
For more parameter description please refer HD700 user manual V1.4.

Menu P00

Code	Name	Range	Min unit	Default	Change
P00.01 (P05.02)	Keypad cycle display mode	0~2	1	0	Run&Stop

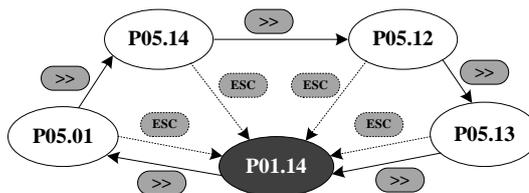
0: Fixed mode

Keypad cycle display order: on standby or running state, the order of keypad cycle display will not be changed.



1: Auto switch mode in running state

Keypad cycle display order: the order as shown in the figure below when the drive is on standby; when the drive is running, it will automatically switch to the circular order of fixed mode.



2: Reserved

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Code	Name	Range	Min unit	Default	Change
P00.02 (P05.03)	Parameter display selection	0~2	1	1	Run&Stop

0: Only menu P00

1: All menus

2: Only parameters which have different value with the defaults set

Code	Name	Range	Min unit	Default	Change
P00.03 (P10.07)	Control Mode	0~2 【0】	1	0	Stop Only

0: Keypad

1: Terminal

2: Serial comms.

Code	Name	Range	Min unit	Default	Change
P00.04 (P01.01)	Reference source selector	0~8	1	0	Run&Stop

0: Keypad

Through adjusting ▲ or ▼ switches to change the frequency reference, and the Power up value is decided by parameter P00.12 (P01.11).

1: E-Pot

Through the two terminals which are defined as UP, DOWN function to change the reference.

For example:

Define the DI4 and DI5 as UP and DOWN function, and the setup is as below:

P09.05=8 DI4 function is UP

P09.06=9 DI5 function is DOWN

2: Preset

Controlled by terminals, the reference is the value of P04.01 (preset1)~P04.16 (preset16).

Use the default setup as an example:

P09.05=0 DI4 is preset select bit0

P09.06=1 DI5 is preset select bit 1

There are tow operation modes:

- When the reference source is preset, terminal status as shown below:

Table 4-1Preset and preset terminal status corresponding table 1

DI5 Status (bit 1)	DI4 Status (bit 0)	Speed
OFF	OFF	Preset1 (P04.01)
OFF	ON	Preset2 (P04.02)
ON	OFF	Preset3 (P04.03)
ON	ON	Preset4 (P04.04)

- When the reference source is not preset, terminal status as shown below:

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Table 4-2 Preset and preset terminal status corresponding table 2

DI5 Status (bit 1)	DI4 Status (bit 0)	Speed
OFF	OFF	Keep the frequency setting
OFF	ON	Preset2 (P04.02)
ON	OFF	Preset3 (P04.03)
ON	ON	Preset4 (P04.04)

About 16 presets (P04.01~P04.16) control, please refer to MenuP04.

3: AI1

There are two analogue input terminals:AI1, AI2.

In this User manual, only AI1 is introduced.

According to parameter P08.03, AI1has three functions:

P08.03=0, AI1 is speed reference

P08.03=1, AI1 is the speed limit under Torque control mode

P08.03=2, AI1is the Torque error

About AI1signal mode, there are current mode and voltage mode, details please refer to the explanation of parameter P00.05 (P08.02).

4: AI2

AI2 function is decided by the parameter P08.08, it is same with AI1, and the default function is frequency reference.

AI2 has only voltage mode.

AI2detail setup please refer to Menu P08

5: Serial comms.

Under this mode, user can change the value of P04.01 (Preset1) for the reference. Details please refer to the appendix1.

6: DI7 Pulse input

When P09.24=2, DI7 function is reference channel (by input pulse)

For example:

The maximum frequency of input pulse (P09.27) is 20.0kHz, actual input pulse is 10.0kHz.

The percentage of DI7 pulse input (P09.38) is 50.0%. Then the reference is:

Reference=DI7 input percentage(P09.38)×maximum reference(P00.07)

=50.0%×50.00Hz

=25.00Hz

7: Optional card (By option modules)

8: User program

By destination and source control, user can define the reference channel freely.For example through Menu P17, user can define the reference source. About actual application guide, please refer to the **HD700 Advanced User Manual**.

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Code	Name	Range	Min unit	Default	Change
P00.05 (P08.02)	AI1 mode selector	0~6	1	6	Stop Only

AI1 signal can be voltage or current mode.

0: 0mA~20mA

1: 20mA~0mA

2: 4mA~20mA (current loosing with trip)

3: 20mA~4mA (current loosing with trip)

4: 4 mA~20mA (current loosing without trip)

5: 20mA~4mA (current loosing without trip)

6: 0V~10V

When the AI mode selection is "0~5", if the input current is over 26mA, the drive will trip at F012, the drive will stop as the mode decided by P03.10, then turn off the IGBTs.

When this parameter is set to 2 or 3, if the input current is less than 3mA, then the drive will trip at F013, the drive will stop as the mode decided by P03.10, then turn off the IGBTs.

NOTE: If the selection is "2~5", once the current is less than 3mA, P08.16 (current loosing indicator) is 1.

Code	Name	Range	Min unit	Default	Change
P00.06 (P04.01)	Preset1	±Max. reference	0.01Hz	5.00Hz	Run&Stop

Code	Name	Range	Min unit	Default	Change
P00.07 (P01.02)	Max. reference	0.00Hz~300.0Hz	0.00 Hz	50.00 Hz	Stop Only
P00.08 (P01.03)	Min. reference	0.00Hz~max. reference	0.00 Hz	0.00 Hz	Stop Only

If P03.01=0 (reverse is enabled), then the P00.08 is fixed at 0.00Hz.

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Code	Name	Range	Min unit	Default	Change
P00.09 (P02.04)	Acceleration rate1	0.0s~3600.0	0.1	10.0	Run&Stop
P00.10 (P02.05)	Deceleration rate 1	0.0s~3600.0	0.1	20.0	Run&Stop

Acceleration rate is the time from 0Hz to maximum reference.

Deceleration rate is the time from maximum reference to 0Hz.

For example:

P00.07 (P01.02) =100.00Hz, set up the maximum reference

P00.09 (P02.04) =10.0s

After starting, the drive output frequency is from 0.00Hz ramp to 50.00Hz and the acceleration rate is:10.0s×

(50.00Hz/100.00Hz) =5.0s

Code	Name	Range	Min unit	Default	Change
P00.11 (P03.10)	Stop mode	0~3 【0】	1	0	Stop mode

0: Ramp stop

1: Coasting

2: Ramp +DC injection

3: Coasting +DC injection

Code	Name	Range	Min unit	Default	Change
P00.12 (P01.11)	Keypad power up reference	0~2	1	0	Run&Stop

When the reference source is keypad, the reference when powered up is decided as below:

0: Starting reference is "0"

1: Starting reference is the output frequency before powered off

2: Starting reference is preset1 (P04.01)

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Code	Name	Range	Min unit	Default	Change
P00.13 (P13.06)	Motor1 rated voltage	200V: 0V~240V 400V: 0V~480V 690V: 0V~690V	1V	200V: 220V 400V: 380V 690V: 660V	Stop Only
P00.14 (P13.07)	Motor1 rated current	G or P type: 0.1A~rated current ×1.2 GP type: 0.1A ~ P type rated current	0.1A	By model	Stop Only
P00.15 (P13.08)	Motor1 rated frequency	1.00Hz~300.0Hz	0.1Hz	50.00Hz	Stop Only
P00.16 (P13.10)	Motor1 rated RPM	1rpm~60000rpm	1rpm	0rpm	Stop Only
P00.17 (P13.02)	Autotune selector	0~3	1	0	Stop Only

0: No action

1: Static autotune1 (first run)

When P00.17=1, press PRG make sure the change and return the ready stage, once there is a run order, the drive will do the static auto-tune, after finished, P00.17=0, and the drive will be at ready status.

2: Static autotune2 (every run)

When P0.17=2, every run order received, the drive will do the autotune, after the static autotune, save the result into the EEPROM, and P0.17=2, and the drive is running.

3: Reserved

NOTE: If the auto-tune is working without load motor, the drive will trip at F016.

Code	Name	Range	Min unit	Default	Change
P00.18 (P13.11)	Motor1 stator resistance	0.000~60.000Ω	0.001Ω	0	Stop Only

After auto-tune finished, this parameter will be updated. If the resistance value is out of the range, trip F016 will happen.

Code	Name	Range	Min unit	Default	Change
P00.19 (P13.05)	Motor1 power factor	0.00~1.00	0.01	0.85	Stop Only

PF and motor rated current (P00.14) are used to calculate the motor torque current and magnetizing current.

Code	Name	Range	Min unit	Default	Change
P00.20 (P13.01)	Motor voltage control mode	0~2	1	0	Stop Only

0: V/F control

1: Open loop vector control 1

2: Open loop vector control 2

Note: To use open loop vector control mode 1 or 2, you need to set up motor parameters correctly (nominal voltage, current, pole pairs, rated speed) and finish auto-tune.

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Code	Name	Range	Min unit	Default	Change
P00.21 (P10.10)	Switch frequency	1kHz~15kHz	1KHz	By model	Run&Stop

Switch frequency can affect the motor noise and drive power loss, higher switch frequency, lower motor noise but bigger IGBT power loss.

Code	Name	Range	Min unit	Default	Change
P00.22 (P06.08)	Voltage boost level	0.0%~30.0%	0.1%	by mode	Run&Stop

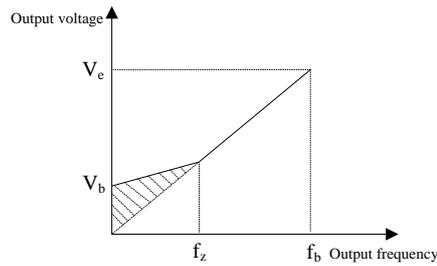


Figure 4-1 Voltage boost

V_e : motor rated voltage

V_b : Boost voltage= $V_e \times P00.22$

f_z : boost close frequency (P06.09)

f_b : rated frequency

Code	Name	Range	Min unit	Default	Change
P00.23 (P06.01)	V/F mode setup	0~3	1	0	Stop Only

Different V/F characteristic is defined by P00.23 to meet the demanding from different load.

There are three kinds of fixed curve and one user programmed line

When P00.23 (P06.01) is 0, user can define the different fold lines by the setting of P06.02~P06.07, add (V1, F1)、(V2, F2)、(V3, F3) three points to define the V/F lines mode.

- The default V/F is a straight line, as the line0 in Figure 4-2.
- When P00.23 (P06.01) is set to 1, it is a 2.0 law ramp, curve1 in figure 4-2.
- When P00.23 (P06.01) is set to 2, it is a 1.7 law ramp, curve2 in figure 4-2.
- When P00.23 (P06.01) is set to 3, it is a 1.2 law ramp, curve3 in figure 4-2.

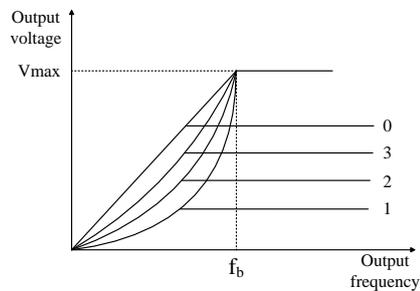


Figure 4-2 Motor V/F curve

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Code	Name	Range	Min unit	Default	Change
P00.24 (P10.08)	Load default	0~1	1	0	Stop Only

0: No action

1: Load default

When P00.24=1, and press PRG switch, parameters are loaded default setup and save into the EEPROM,

P00.24=0.

NOTE:

- After loading default, except motor parameters, all other parameters are recovered to factory setup;
- After loading default, P00.01 is 0, means User Code is disable;
- Recommend to upload the parameter setup to the keypad's EEPROM before loading default.

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Solar water pump special Parameters

Code	Name	Range	Min unit	Default	Change
P01.03	Minimum frequency set	0.0 Hz~Max frequency	0.01Hz	20.00Hz	Stop Only

This parameter is used to define drive minimum frequency reference.

Code	Name	Range	Min unit	Default	Change
P03.03	Auto-start after power off	0: off 1: Mode1 2: Mode2	1	2	Stop Only

0: auto-start after power off disabled

The drive will not start automatically after power up.

1 Mode 1

Drive status before power off		stop	start
Drive status after power on			
Run command status			
Keypad	No run command	Keep stop	Auto start
Serial communications	No run command	Keep stop	Auto start
Three-wire system 1/2	No run command	Keep stop	Auto start
	Run command	Keep stop	Auto start
Two-wire system	No run command	Keep stop	Keep stop
	Run command	Keep stop	Auto start

2 Mode 2

Drive status before power off		stop	start
Drive status after power on			
Run command status			
Keypad	No run command	Keep stop	Auto start
Serial communications	No run command	Keep stop	Auto start
Three-wire system 1/2	No run command	Keep stop	Auto start
	Run command	Auto start	Auto start
Two-wire system	No run command	Keep stop	Keep stop
	Run command	Auto start	Auto start

When power up the drive will start automatically after time defined by P03.04 (wait time for auto-start) if satisfy the start conditions. When P03.03=1or 2, in different operation command channels, the drive will respond differently after power up.

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Code	Name	Range	Min unit	Default	Change
03.05	Start mode select	0: Start directly 1: First brake then start 2: Catch a spinning motor start 3: Backup 4: Backup	1	2	Stop Only

0: Start directly

Start with the set start frequency (P03.06) and start frequency hold time (P03.07).

1: First brake then start

First DC injection brake (Refer to P03.08、P03.09), then start with mode 0.

2: Catch a spinning motor start

Automatic tracking the motor speed and direction, the running motor can start smoothly without impact.

3: backup

4: backup

Code	Name	Range	Min unit	Default	Change
P10.22	Stop mode at Power off	0~1	1	1	Stop Only

Power off stop mode logic

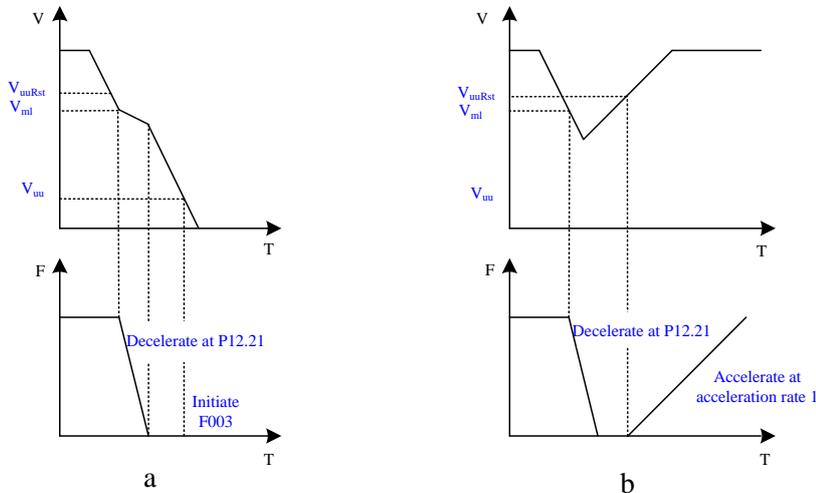
Enable this mode could allow the drive could track the DC link very quickly, especially useful the low solar power.

How it works is shown below:

If the DC bus voltage is below V_{ml} , the drive will decelerate according to deceleration rate (P12.21). When the running frequency is zero, block IGBT.

If the DC bus voltage falls to V_{uu} , the drive will initiate a F003 trip, as shown in the following figure a.

If the DC bus voltage is over V_{uuRst} , the drive will accelerate to the reference frequency according to the setting acceleration rate, as shown in the following figure b.



The way shown above allow the drive put it to regenerate state quickly before DC voltage fall down again

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Code	Name	Range	Min unit	Default	Change
P10.26	MPPT Enable	0~2	1	2	Run&Stop

0:disable the MPPT

1: MPPT mode 1

2: MPPT mode 2

The Drive is designed for Solar Water Pumping System application which is based on HD700 with V207 user firmware. The Parameter P10.26 is used to enable the solar water pumping system function.

With the default parameter setting and the drive shown below:

Size A, 0.75kw, 220V voltage rating drive

- Rated Voltage: 220V
- Rated Frequency: 50Hz
- Max frequency set up: 50Hz
- Min Frequency set up: 0Hz

The customers need to set P13.06~P13.10 correctly based on the nameplate of the motor before starting to run the motor

Based on the motor rated voltage, the firmware will come out the normal DC Link voltage

automatically in the following way:

220V drive: $220 * \sqrt{2} = 310$ VDC

380V drive: $380 * \sqrt{2} = 537$ VDC

MPPT Mode

There are two MPPT modes which is determined by P10.26.

P10.26 = 0: MPPT mode disabled

The drive setup reference is determined by P01.01.

P10.26 = 1: MPPT mode 1

The customer may need to set the sleep mode parameters if needed, for example:

P15.23 = 1 to enable the sleep mode

P15.24 = 5.13: the judging channel is the DC link voltage

P15.25 = 50.0%: Threshold of sleep is $410V * 50.0\% = 208V$, corresponds with the frequency is $208V * 50Hz / 310V = 33.54Hz$. That is, the drive will go to sleep mode if the DC link voltage is below than 208V when the output frequency should be 33.54Hz

If with 380V rating drive, then threshold of sleep is $830V * 50.0\% = 415V$, that is, the drive will go to sleep if the DC link voltage is below than 415V when the output frequency should be 415

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* $50\text{Hz} / (380\text{v} * \sqrt{3}) = 38.64$.

P15.28 = 5.13: Wakeup back feed channel

P15.29 = 74.0%: Threshold of wakeup

For 220V Rating drive, the DC Link should be $415 * 0.74 = 307\text{V}$

For 380V Rating drive, the DC Link should be $830 * 0.64 = 531\text{V}$

Then with the parameter set up shown above, how the drive is working?

A: If the DC link voltage is above the normal DC Link voltage, the output frequency will be max frequency set up

B: If the DC link voltage is below the normal DC Link voltage, the output frequency will be decrease automatically based on the actual DC link voltage, for instance, with 300V DC Link voltage, output frequency will be $300 * \frac{50}{310} = 48.38$, If the DC link voltage is below the sleep mode threshold, the output frequency will be 0

and the drive should go to sleep mode.

C: If the DC link voltage is above the sleep mode wake up threshold, the output frequency will ramp to the point will be based on the actual DC Link vol. DC Braking will be used at start up which is used to design whether the drive will go out of sleep mode or not.

The Algorithm shown above is designed to implement Maximum Power Point Tracking

P10.26 = 2: MPPT mode 2

This mode is allow the drive to maintain the DC voltage at the MPPT set up point (P10.41, default value is 530V, for 220V drive, should decrease this value, 305V for example.

For example:

For 380V drive, P10.41 = 530V

Then if the sun light is high, the DC voltage is bigger than the set up point (530V in this example), the output frequency will increase to the max set up speed (P01.02)

If the sun light is low, then the output frequency will be determined by the DC vol. That is, if the DC voltage is bigger than the setup point, the output frequency will increase to the maximum value, if the DC voltage is lower than set up point, then the output frequency will decrease to the minimum value. However, if the DC link voltage is very low, then the DC link voltage could not maintain the drive run at the minimum set up frequency then the drive will fall into sleep.

The PID controller is used for MPPT mode 2. The reference of the PID controller is the P10.41 while the feedback of the PID controller is P5.13 (DC link voltage) and the PID output is the output frequency which is limited by the max set up speed (P01.02) and the minimum set up speed(P01.03).

Parameter P10.42 to P10.45 is used for MPPT mode 2.

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Code	Name	Range	Min unit	Default	Change
P10.27	Unload detection enable	0: Disable 1: Enable	1	1	Run&Stop

0: disable unload detection

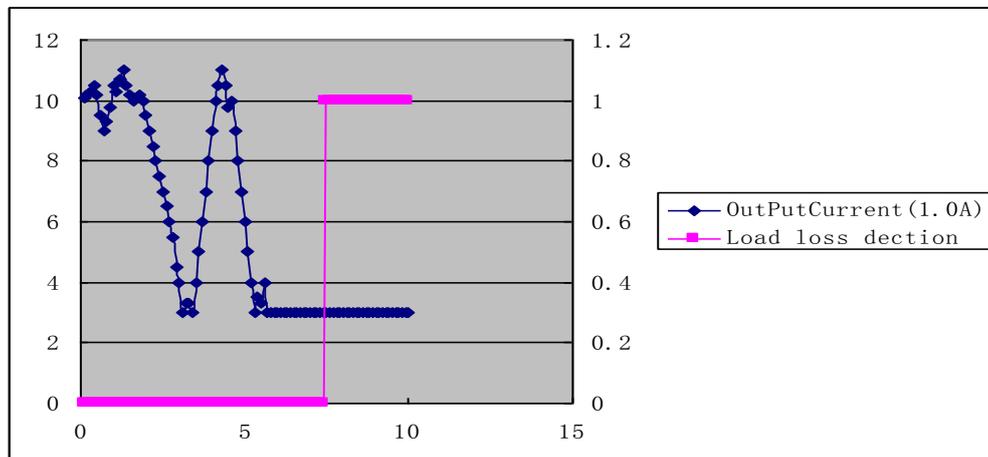
1: enable unload detection

Code	Name	Range	Min unit	Default	Change
P10.28	Unload detection level	0.0%~100.0%	0.1%	45.0%	Run&Stop
P10.29	Unload detection time	0.0 s~3000.0s	0.1S	10.0S	Run&Stop
P10.30	Unload detection mode	0: no action 1: Coast stop	1	1	Run&Stop

Dry run logic

The drive provide unload detection mode, P10.27 is used to enable this mode.

Saying P10.27 = 1, P10.28 = 40.0%, P10.29 = 3.0s, then the diagram is shown below.



Seen from the diagram shown above, if the output current is fall down to 40.0% of the max output current and the status last for P10.29 then the drive will set the alarm H008. If with P10.30 is set, then the drive will coast stop while if P10.30 is disabled, then the drive will keep on running with H008 alarm.

Code	Name	Range	Min unit	Default	Change
P10.31	Sleep alarm times	1~20	1	5	Run&Stop

When the DC link voltage go down to the sleep level(P15.24) and after the delay for the sleeping (P15.25), the drive will set the alarm H007 and coast stop immediately, the drive will keep setting the alarm 5 times(default value, could be settable by P10.31) if the DC link is still lower than the threshold and after 7 times the drive will go to sleep for 20 minutes (P15.26, settable) even if the sun light is little improving.

Code	Name	Range	Min unit	Default	Change
P10.32	Water level control mode	0: No action 1: AI1 2: AI2	1	0	Stop Only
P10.33	Full water threshold	0.0%~100.0%	0.1%	25.0%	Run&Stop
P10.34	Full water detection delay	0~1000s	1	60s	Run&Stop
P10.35	Empty water detection delay	0~1000s	1	600s	Run&Stop

Setting P10.32= zero, to disable the function.

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If the water level feedback via AI1 or AI2 is lower than this parameter and last the time determined by P10.34, then the drive will set the alarm H009.

When the drive is alarming H009, if the water level feedback is bigger than the value that determined by P10.33 and last the time determined by P10.35 then the warning will disappear.

Code	Name	Range	Min unit	Default	Change
P10.36	Probe damage level	0.0%~100.0%	0.1%	0	Run&Stop

Setting 0.0% to disable this function

When setting not zero, then if the water level signal feedback is bigger than the level, the drive will be tripped at F025.

Code	Name	Range	Min unit	Default	Change
P10.37	Solar power Dc vol sample channel	0: No action 1: AI1 2: AI2	1	0	Stop Only
P10.38	Switch to mains level	0.0%~P10.38	0.1%	5.0%	Run&Stop
P10.39	Switch to Solar power level	P10.38~100.0%	0.1%	10.0%	Run&Stop
P10.40	Switch to Mains indication	0~1	1	Actual	Actual

Setting P10.37 to zero to disable the function and the P10.40 is always zero, otherwise, if the solar power DC voltage feedback via AI1 or AI2 is lower than **P10.38 value, then P10.40** is one.

If the customer wants to use this function, Program logic Menus may be used to do this. For more information, Please contact the drive company service.

Code	Name	Range	Min unit	Default	Change
P10.41	MPPT Voltage Reference	0~1000VDC	1VDC	530V	Stop Only
P10.42	PID proportional gain	0.000~10.000	0.001	0.002	Run&Stop
P10.43	PID integral gain	0.000~10.000	0.001	0.020	Run&Stop
P10.44	PID error level	-1000~+1000	1	Actual	Actual
P10.45	PID output level	-1000~+1000	1	Actual	Actual

When set P10.26 = 2: MPPT mode 2

This mode is allow the drive to maintain the DC voltage at the MPPT set up point (P10.41, default value is 530V, for 220V drive, should decrease this value, 305V for example.

For example:

For 380V drive, P10.41 = 530V

Then if the sun light is high, the DC voltage is bigger than the set up point (530V in this example), the output frequency will increase to the max set up speed (P01.02)

If the sun light is low, then the output frequency will be determined by the DC vol. That is, if the DC voltage is bigger than the setup point, the output frequency will increase to the maximum value, if the DC voltage is lower than set up point, then the output frequency will decrease to the minimum value. However, if the DC link voltage is very low, then the DC link voltage may could not maintain the drive run at the minimum set up frequency then the drive will fall into sleep.

The PID controller is used for MPPT mode 2. The reference of the PID controller is the P10.41 while the feedback of the PID controller is P5.13 (DC link voltage) and the PID output is the output frequency which is limited by the max set up speed (P01.02) and the minimum set up speed (P01.03).

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Parameter P10.42 to P10.45 is used for MPPT mode 2.

Code	Name	Range	Min unit	Default	Change
P10.46	Switch to mains mode	0~1 0: Manually 1: automatically	1	0	Stop Only

P10.46 is a master switch,

In manual mode, assign a terminal to P10.40, can make switching instruction.

In automatic mode, with P10.37 and P10.38 and P10.39, do switch to mains instruction

Code	Name	Range	Min unit	Default	Change
P10.47	MPPT Voltage Reference 2	0~1000V DC	1VDC	200Vdrive: 210V 400Vdrive: 350V	Stop Only
P10.48	MPPT Voltage Reference 1	0~1000V DC	1VDC	200Vdrive: 305V 400Vdrive: 530V	Stop Only

P10.41 only shows current MPPT reference voltage, and cannot be modified.

P10.47 MPPT reference voltage 2, default as a low value, for 380V drive, 350V is set as default, and for 220V drive, 210V is set as default.

When DI3 enable(short circuit to 0V), P10.47 will be mapped to P10.41 for Grid power application.

P10.48 MPPT reference voltage 1, default as a normal value, for 380V drive, 530V is set as default, and for 220V drive, 305V is set as default.

When DI3 disable, P10.48 will be mapped to P10.41 for normal solar pump application.

Code	Name	Range	Min unit	Default	Change
P12.20	Power off mode level	0~1.00 (for 400Vdrive , 423V , 200Vdrive , 212V) .	0.01	0.51	Stop Only
P12.21	deceleration of Power off mode	0.0s~ 3600.0S	0.1s	0.5s	Run&Stop

For 400V driver, $P12.20=0.51*830V=423V$

For 200Vdriver, $P12.20=0.51*415V=212V$

When the dc voltage is fall down below P12.20 the drive will ramp down to zero at the rate of P12.21. enable this mode could put the drive to the regenerate state and the Dc link could be improved

Code	Name	Range	Min unit	Default	Change
P15.09	PID proportional gain	0.000~4.000	0.001	0.200	Run&Stop

This is the proportional gain applied to the PID error.

Proportional gain depends on the present error. Proportional adjustment immediately responds to error. Once error generates, the PID controller is enabled. It makes the error of controlled variable reduced and the proportional gain increase for reducing the error.

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A high proportional gain results in a large change in the output for a given change in the error. If the proportional gain is too high, the system can become unstable. In contrast, a small gain results in a small output response to a large input error, and a less responsive or less sensitive controller.

NOTE: If 15.09 is set to zero then the proportional action is disabled.

Code	Name	Range	Min unit	Default	Change
P15.10	PID integral gain	0.000~4.000	0.001	0.020	Run&Stop

This is the gain applied to the PID error before being integrated.

As long as the error is not zero, the integrator attempts to minimize the error by adjusting the process control inputs. The control action will not change until the error is zero. The system is stable and the error is disappeared. The integral action is controlled by the integral gain. If integral gain is high, the integral action is better and dynamic response is fast. If not, the integral action is weak and the dynamic response is slow. If P15.10 is set to zero then the integral action is disabled.

Code	Name	Range	Min unit	Default	Change
P15.11	PID derivative gain	0.000~4.000	0.001	0.000	Run&Stop

This is the gain applied to the PID error before being differentiated.

PID derivative gain is a prediction of future errors and based on current rate of change. If the PID derivative gain is set correctly; the overshoot and adjusting time will be reduced. Derivative action cannot be used independently. It is used with proportional action or integral action together.

NOTE:

- If the parameter is set too big then the derivative action is too strong. It may be cause oscillating and the PID output with a “peak” or “sudden jump”.
- If P15.11 is set to zero then the derivative action is disabled.

Code	Name	Range	Min unit	Default	Change
P15.23	Sleep mode enable	0~1	1	1	Stop Only

0: Sleep mode disabled enabled

1: Sleep mode enabled

Code	Name	Range	Min unit	Default	Change
P15.24	Sleep mode judging channel	P00.00~P18.08	0.01	P05.13	Stop Only

The parameter is used to select the sleep channel. The default parameter is DC voltage

Code	Name	Range	Min unit	Default	Change
P15.25	Threshold of sleeping	0.00Hz~P01.02(P15.24 = P05.11) 0.0%~100.0% (P15.24 = others)	0.01Hz 0.1%	0.00Hz 47.0%	Stop Only

When the DC link voltage go down to the sleep level(P15.24) and after the delay for the sleeping (P15.25), the drive will set the alarm H007 and coast stop immediately, the drive will keep setting the alarm 5 times(default value, could be settable by P10.31) if the DC link is still lower than the threshold and after 7 times the drive will go to sleep for 20 minutes (P15.26, settable) even if the sun light is little improving.

Code	Name	Range	Min unit	Default	Change
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P15.26	Delay for sleeping	0.0s~3000.0s	0.1s	0.2s	Stop Only
P15.27	Wakeup mode selector	0~1	1	1	Stop Only
P15.28	Wakeup back feed channel	P00.00~P18.08	0.01	P05.13	Stop Only
P15.29	Threshold of wakeup	0.0%~100.0%	0.1%	220V:74.0% 380V:64.0%	Stop Only
P15.30	Delay for wakeup	0.0s~3000.0s	0.1s	600.0s	Stop Only

When P15.27 = 0, the absolute value of the setup parameter of P15.28 (wakeup channel) is less than P15.29 (wakeup threshold) and it keeps over wakeup delay time (P15.30), then the drive will access wakeup mode from sleep mode and according to the previous setup parameters to run.

When P15.27 = 1, the absolute value of the setup parameter of P15.28 (wakeup channel) is more than P15.29 (wakeup threshold) and it keeps over wakeup delay time (P15.30), then the drive will access wakeup mode from sleep mode and according to the previous setup parameters to run.

Code	Name	Range	Min unit	Default	Change
P15.31	Backup				
P15.32	Backup				
P15.33	Backup				

Code	Name	Range	Min unit	Default	Change
P15.34	Sleeping state indicator	0~1	1	Actual	Actual

If P15.34 = 1, it indicates that the drive is in the sleep status and the drive will alarm 'H007'.

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5. Trouble shooting

5.1 Faults and corrective actions

When a drive trip(fault) happens, the keypad will display the corresponding trip code and drive output is disabled. HD300 trip list is in the table 6-1. The range is F001 to F043. If there is a trip happens, please check according the guide in table 6-1 and record the fault phenomena carefully. If you need service support, please contact the local distributor or supply factory.

Table5-1 Faults and corrective actions

Trip Code	Trip Description	Possible Reasons	Corrective Actions
F001	Over current Turn off the IGBTs, can reset after 10s when trip removed	Output shortage	Check the motor cable and electric connection
		Acceleration or deceleration rate is too short	Use appropriate ramp time
		When the motor axis is not static, run the drive	By P03.05, set the start mode is spinning
		Internal fault	Contact service
F002	Over voltage Turn off the IGBTs, can reset after 1s when trip removed	Supply voltage is too high	Make sure the power supply is in the spec. arrange
		Load change suddenly	Avoid to change load suddenly
		Deceleration rate is too short	Increase the deceleration rate and add a suitable brake resistor
		Internal fault	Contact service
F003	Under voltage Turn off the IGBTs, can auto reset after trip removed	Supply voltage is low	Check the power supply
		During drive power off	Normal, and not log in the trip tracking
		Internal fault	Contact service
F004	Input phase loss Stop the drive according to the stop mode, turn off the IGBTs, can reset after 1s when trip removed	Power supply phase loss	Check the power supply and cabling
F005	Output phase loss Stop the drive according to the stop mode, turn off the IGBTs, can reset after 1s when trip removed	Output phase loss	Check the output voltage and motor cabling
		Internal fault	Contact service
F006	Brake unit shorted Turn off the IGBTs, can reset after 10s when trip removed	Brake resistor trouble	Check the brake resistance and the cabling
		Internal fault	Contact service
F007	Heatsink1 over heat, turn off the IGBTs, can reset after 1s when trip removed	Environmental temperature is high	Reduce the environmental temperature
		Air flow channel blocked	Clean the air flow channel
		Fan failed	Replace the fan
		Internal fault	Contact service
F008	Heatsink2 over heat(45KW and over), turn off the IGBTs, can reset after 1s when trip removed	Environment temperature is high	Reduce the environmental temperature
		Air flow channel blocked	Clean the air flow channel
		Fan failed	Replace the fan

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Trip Code	Trip Description	Possible Reasons	Corrective Actions
		Internal fault	Contact service
F009	IGBT junction over heat turn off the IGBTs, can reset after 1s when trip removed	Switch frequency is higher	Reduce the switch frequency
		Frequently accelerating and decelerating under heavy load condition	Replaced by a larger drive; increase the ramp time; enable the auto adjust function on switch frequency
		Internal fault	Contact service
F010	Motor overload Stop the drive according to the stop mode, turn off the IGBTs, can reset after 1s when trip removed	V/F is not right	Setup V/F and boost correctly
		Supply voltage is lower	Check the power supply and cabling
		Motor axis is stocked or the load changing is too big	Check the load
		The factor for motor overload protecting(P12.12) is lower	Correct the factor (P12.12)
F011	Motor overheat Stop the drive according to the stop mode, turn off the IGBTs, can reset after 1s when trip removed	Load is too big	Check the load and current
		Motor heat dissipation channel is stocked	Check the motor
		Motor fan is not working	Change the motor fan
		Motor thermistor abnormal	Check the thermistor resistance and replace it
F012	All over current Stop the drive according to the stop mode, turn off the IGBTs, can reset after 1s when trip removed	All input current is over 26mA	Check All input
F013	All input losing Stop the drive according to the stop mode, turn off the IGBTs, can reset after 1s when trip removed	All input current is smaller than 3mA	Check All input
F014	User 24V overload Stop the drive according to the Stop mode, turn off the IGBTs, can reset after 1s when trip removed	Output current of 24V and DO1 is over 100mA	Check if there is shortage on the output of DO and 24V
F015	Parameter cloning wrong can reset after 1s when trip removed	Keypad cloning is abnormal	Power up again
		Keypad EEPROM is empty, and download the parameter setup to the drive	Upload the parameter setup to the keypad, then do the download
		Inner fault	Contact service
F016	Auto-tune wrong can reset after 1s when trip removed	The drive size can't match the motor power size	Change the drive
		Set the wrong motor data	Resetup the motor data by motor nameplate
		Before the auto-tune finished, stop the drive	Wait until finished
F017	Output terminal short circuit when power up	output terminal short circuit	Check wiring and motor insulation
		Current detection fault	Contact service
F018	External fault Stop the drive according to the Stop mode, turn off the IGBTs, can reset after 1s when trip removed	An external fault input from one of the DI terminals	Check the external equipments
F019	communication fault turn off the IGBTs, can reset after 1s when	linkage fault between the drive and remote keypad or other external options	check the cabling

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Trip Code	Trip Description	Possible Reasons	Corrective Actions
	fault removed	communication fault between the drive and remote keypad or other external options	Contact service
F020	EEPROM read and write failure	Wrong happens when read & write the control word	Press STOP switch to reset the drive and try again; contact service
		Internal fault	Contact service
F021	Destination fault can reset after 1s when trip removed	Wrong parameter destination	<ul style="list-style-type: none"> ● Check if there parameters are set to the same function, correct it, press STOP switch to reset. ● Load default, and reset the drive
F022	Option fault can reset after 1s when trip removed	Option wrong fitting	Fit the correct option module, try again
		Option failure	Contact service
F023	Reserved	-	-
F024	internal logic fault turn off the IGBTs, can reset after 1s when fault removed	internal logic fault	Contact service
F025	Empty water failure	Water shortage	Wait until the water is enough
F026~F029	Reserved	—	—
F030	Soft start circuit fault Turn off IGBTs, can not reset	Soft start circuit failed	Contact service
F031	Main fan fault Turn off IGBTs, cannot reset	Fan blade rotating abnormal	Check the fan blades
		Wiring is wrong	Check fan wiring
F032	Control fan fault (30kW and above) Turn off IGBTs, can not reset	Fan blade rotating abnormal	Check the fan blades
		Wiring is wrong	Check fan wiring; Contact service
F033	Current sense fault Turn off IGBTs, can not reset	Internal fault	Contact service
F034	Power DSP fault Turn off IGBTs, can not reset	Software overflow	Power off and up
		Internal fault	Contact service
F035	MCU can not receive the data from DSP Turn off IGBTs, can not reset	Software abnormal	Contact service
		MCU or DSP failed	Contact service
F036	MCU receives wrong data from DSP Turn off IGBTs, can not reset	External disturbance	Proper cable layout
		Internal fault	Contact service
F037	Over current during power up Turn off IGBTs, can not reset	Earth fault or current sense circuit failure	Check the output cabling and motor; Contact service
F038	Wrong drive model Turn off IGBTs, can not reset	Internal fault	Contact service
F039	Inner thermister failed Turn off IGBTs, can not reset	IGBT damaged	Contact service
F040	Software abnormal Turn off IGBTs, can not reset	Software running wrong	Contact service
		MCU or DSP failed	Contact service
F041	Watchdog failure Turn off IGBTs, can not reset	Software wrong	Contact service
		MCU or DSP failed	Contact service

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Trip Code	Trip Description	Possible Reasons	Corrective Actions
F042	Reserved	—	—
F043	EEPROM internal fault Turn off IGBTs, can not reset	MCU or DSP failed	Contact service
		EEPROM failed	Contact service

All above trips can be categorized into 4 types, details in table6-2:

Table 5-2 Fault category

Type	Trips	Description
Auto reset	F003	F003 (under voltage), can auto reset the drive base on the actual DC bus voltage
Can not reset	≥F030	Fault from inner failure (except external disturbance).
EEPROM read & write	F020	When the trip happens, can load default, and then reset the drive.
Ordinary trip	F001, F006	can reset after 10s when trip removed
	Other trips	can reset after 1s when trip removed

NOTE:

- F003 can be auto-reset, the under voltage threshold level and hysteresis is different with different rated voltage level.
- When F003 happens, drive starts to save the parameters.
- Only when the drive is active, the trip F003 will be recorded in the fault tracking log.
- Menu P11 is for trip tracking.

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5.2 Alarms

When drive is alarming, the drive will keep running, and the keypad will display relative alarm code(Hxxx), and the alarm code will keep flashing for 3 seconds then turn over to the normal display(selected byP05.01). The normal display will flash for 3 seconds then back to flash alarm code, will keep this cycle until the alarm is removed. The parameter P12.13can be set to decide if to display the warning information or not.

Table 5-3 Alarm codes and treatments

Codes	Descriptions	Possibilities	Treatments
H001	Current limit is working	Output current is limited at: P7.03×P00.14 (P13.07Motor1 rated current)	Checking the motor cable
			Properly increase the acceleration and deceleration rate
			Set P03.05to be the correct start mode(spinning)
H002	Motor overload is in integrating	Output current is bigger than the value of P13.07 (P13.19), until overload trip	Use bigger motor and drive
H003	Heatsink is hot	Environment temperature is higher	Reduce the environment temperature
		Air flow channel stocked	Clean the flow channel
		Fan failed	Replace the fan
H004	IGBT junction temperature is high	Frequently accelerating and decelerating	Modify the parameter setup
			Use bigger drive
H005	Low DC bus operation (only for 400V models)	Power supply voltage is low	Checking the power supply
dr	Dry run	the output current is fall down to 45.0% (P10.28)of the max output current and the status last for P10.29	Check the water level
Sleep	Sleep mode	The drive is in sleep mode	After the drive quits sleep mode, the alarm is removed
H009	Full water	Water is enough	Please see P10.33

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5.3 Other issues

During the drive operation, maybe some other issues can happen but not caused by drive itself, so the drive will not display trip or alarm code. Customer can check the issues following the suggestion in below table 6-4.

Table 5-4 Other issues

Issues	Reasons	Check And Treatments
Motor does not start	Power issue	Check input voltage, output voltage and unbalance level
		If the motor connection is correct?
		If the bus bar link between +DC and +DC1 is fitted correctly?
	Control part	Run order input active?
		If both FWD and REV active same time?
		If the reference is 0?
		If the reference source is analogue, is there correct analogue input signal?
		If set P09.21 correctly? (correct common point)
	Parameter setup issue	If the control channel is set correctly? (P00.03)
		If the reference source is selected correctly?(P00.04)
		If the enable (P03.19) is "1"? And under default setup, check the DI6 is connected to the common?
	Load issue	If the load is too big?
If the mechanical part is stuck?		
Motor torque is not enough	Check if the setup about menu P06 and P07 correctly?	
Motor makes abnormal noise	Drive output voltage unbalance	Check the motor connection
	Mechanical issue	Check the motor and related mechanical parts
	Wrong setup	Check the parameter setup
Motor running direction abnormal	Motor cabling issue	Check the output U, V, W if matches U, V, W of motor
	Control signal issue	Check if the correct direction order is enabled
Motor ramp motion is not stable	Acce. or dece. rate is too short	Try suitable values for P00.09 and P00.10
	Too big load	Adjust the load condition
After ramp operating, speed is not stable	Load issue	Check if the mechanical load keeps changing
	No auto-tune	Do the motor auto-tune
	Motor data setup issue	Check if set the motor data according to the motor nameplate
Cannot write the parameter	Change is limited	Only can change at stop
		The parameter property is "actual"
	Keypad is locked	Press ESC switch for 5s to disable the keypad lock
	Parameter is not displayed	Set the value of P00.02 to be 1 to display all the parameters
	Enable the user code	Disable the user code
No display on the keypad	Conflicts on parameter setup	Load default and set the parameters correctly
	Link issue	Check the link between the keypad and drive, if the keypad is fixed well?
	DC bus bus bar link issue	Check the link between +DC and +DC1 fitted well

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Appendix

parameter list

Menu P00

Code	Name	Range	Min unit	Default	Change
P00.01	Keypad cycle display mode (P05.02)	0: Fixed mode 1: Auto switch mode in running state 2: Reserved	1	0	Run&Stop
P00.02	Parameter display control (P05.03)	0: Only P00 parameters 1: All menu parameters 2: Only parameters which are different with the default setup	1	1	Run&Stop
P00.03	Control mode (P10.07)	0: Keypad 1: Control terminal 2: Comms.	1	0	Stop Only
P00.04	Reference source selector (P01.01)	0: Keypad 1: E-pot 2: Preset 3: AI1 4: AI2 5: Serial comms. 6: DI7 pulse 7: Optional card 8: User programmed	1	0	Run&Stop
P00.05	AI1 mode selector (P08.02)	0: 0mA~20mA 1: 20mA~0mA 2: 4mA~20mA(current loosing with trip) 3: 20mA~4mA(current loosing with trip) 4: 4mA~20mA(current loosing without trip) 5: 20mA~4mA(current loosing without trip) 6: 0V~10V	1	6	Stop Only
P00.06	Preset1 (P04.01)	Min. frequency~ 300.0Hz	0.01Hz	5.00Hz	Run&Stop
P00.07	Max. frequency (P01.02)	0.00Hz~300.0Hz	0.01Hz	50.00Hz	Stop Only
P00.08	Min. frequency (P01.03)	0.00Hz~Max. frequency	0.01Hz	0.00Hz	Stop Only
P00.09	Accel. rate1 (P02.04)	0.0~3600.0	0.1	10.0	Run&Stop
P00.10	Decel. rate1 (P02.05)	0.0~3600.0	0.1	20.0	Run&Stop
P00.11	Stop mode (P03.10)	0: Ramp 1: Coast 2: Ramp+ DC injection 3: Ramp +coast	1	0	Stop Only
P00.12	Power up Keypad reference (P01.11)	0: 0.00Hz 1: The running frequency when last powered off 2: Preset1	1	0	Run&Stop
P00.13	Motor1 rated voltage (P13.06)	0V~240V 0V~480V 0V~690V	1V	200V: 220V 400V: 380V 690V: 660V	Stop Only
P00.14	Motor1 rated current (P13.07)	G or P type: 0.1A~rated current× 1.2	0.1A	By model	Stop Only

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		GP type: 0.1A~P type rated current			
P00.15	Motor1 rated frequency (P13.08)	1.00Hz~300.0Hz	0.01Hz	50.00Hz	Stop Only
P00.16	Motor1 rated speed (P13.10)	1rpm~6000rpm	1rpm	0rpm	Stop Only
P00.17	Auto-tune (P13.02)	0: No action 1: Static Auto-tune1 2: Static Auto-tune2 3: Reserved	1	0	Stop Only
P00.18	Motor1 stator resistance (P13.11)	0.000Ω~60.000Ω	0.001Ω	0	Stop Only
P00.19	Motor1 Power factor (P13.05)	0.00~1.00	0.01	0.85	Stop Only
P00.20	Motor voltage control mode (P13.01)	0: V/F 1: Open loop vector control 1 2: Open loop vector control 2	1	0	Stop Only
P00.21	Switch frequency (P10.10)	1kHz~15kHz	1kHz	By model	Run&Stop
P00.22	Voltage boost (P06.08)	0.0%~30.0%	0.1%	By model	Run&Stop
P00.23	V/F mode (P06.01)	0: User define V/F 1: 2 law 2: 1.7 law 3: 1.2 law	1	0	Stop Only
P00.24	Load default (P10.08)	0: No action 1: Load default	1	0	Stop Only

Solar water pump special Parameters

Code	Name	Range	Min unit	Default	Change
P01.03	Minimum frequency set	0.0 Hz~Max frequency	0.01Hz	20.00Hz	Stop Only
P03.03	Auto-start after power off	0: off 1: Mode1 2: Mode2	1	2	Stop Only
P03.05	Start mode select	0: Start directly 1: First brake then start 2: Catch a spinning motor start 3 Backup 4 Backup	1	2	Stop Only
P10.22	Stop mode at Power off	0~1	1	1	Stop Only
P10.26	MPPT Enable	0~2	1	2	Run&Stop
P10.27	Unload detection enable	0: Disable 1: Enable	1	1	Run&Stop
P10.28	Unload detection level	0.0%~100.0%(rated current)	0.1%	45.0%	Run&Stop
P10.29	Unload detection time	0.0 s~3000.0s	0.1S	10.0S	Run&Stop
P10.30	Unload detection mode	0: no action 1: Coast stop	1	1	Run&Stop
P10.31	Sleep alarm times	1~20	1	5	Run&Stop
P10.32	Water level control mode	0: No action 1: AI1 2: AI2.	1	0	Stop Only
P10.33	Full water threshold	0.0%~100.0%	0.1%	25.0%	Run&Stop
P10.34	Full water detection delay	0~1000s	1	60s	Run&Stop
P10.35	Empty water detection delay	0~1000s	1	600s	Run&Stop
P10.36	Probe damage level	0.0%~100.0%	0.1%	0	Run&Stop
P10.37	Solar power Dc vol sample channel	0: No action	1	0	Stop Only

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		1: AI1 2: AI2			
P10.38	Switch to mains level	0.0%~P10.38	0.1%	5.0%	Run&Stop
P10.39	Switch to Solar power level	P10.38~100.0%	0.1%	10.0%	Run&Stop
P10.40	Switch to Mains indication	0~1	1	Actual	Actual
P10.41	MPPT Voltage Reference	0~1000VDC	1VDC	530V	Stop Only
P10.42	PID proportional gain	0.000~10.000	0.001	0.002	Run&Stop
P10.43	PID integral gain	0.000~10.000	0.001	0.020	Run&Stop
P10.44	PID error level	-1000~+1000	1	Actual	Actual
P10.45	PID output level	-1000~+1000	1	Actual	Actual
P10.46	Switch to mains mode	0~1 0: Manually 1: automatically	1	0	Stop Only
P10.47	MPPT Voltage Reference 2	200Vdrive: 0~1000VDC 400Vdrive: 0~1000VDC	1VDC	200Vdrive : 210V 400Vdrive : 350V	Stop Only
P10.48	MPPT Voltage Reference 1	200Vdrive: 0~1000VDC 400Vdrive: 0~1000VDC	1VDC	200Vdrive : 305V 400Vdrive : 530V	Stop Only
P12.20	Power off mode level	0~1.00 (for 400Vdrive, 423V, 200Vdrive, 212V)	0.01	0.51	Stop Only
P12.21	deceleration of Power off mode	0.0s~ 3600.0s	0.1s	0.5s	Run&Stop
P15.09	PID proportional gain	0.000~4.000	0.001	0.200	Run&Stop
P15.10	PID integral gain	0.000~4.000	0.001	0.020	Run&Stop
P15.11	PID derivative gain	0.000~4.000	0.001	0.000	Run&Stop
P15.23	Sleep mode enable	0~1	1	1	Stop Only
P15.24	Sleep mode judging channel	P00.00~P18.08	0.01	P05.13	Stop Only
P15.25	Threshold of sleeping	0.00Hz~P01.02(P15.24 = P05.11) 0.0%~100.0% (P15.24 = others)	0.01Hz 0.1%	0.00Hz 47.0%	Stop Only
P15.26	Delay for sleeping	0.0s~3000.0s	0.1s	0.2s	Stop Only
P15.27	Wakeup mode selector	0~1	1	1	Stop Only
P15.28	Wakeup back feed channel	P00.00~P18.08	0.01	P05.13	Stop Only
P15.29	Threshold of wake up	0.0%~100.0%	0.1%	220V:74.0 % 380V:64.0 %	Stop Only
P15.30	Delay for wakeup	0.0s~3000.0s	0.1s	60.0s	Stop Only
P15.31	Backup				
P15.32	Backup				
P15.33	Backup				
P15.34	Sleeping state indicator	0~1	1	Actual	Actual

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HEDY® Drive Repair Card

User information	User corporation:	
	Address:	
	Post code:	Contractor:
	Tel. no.:	Fax no.:
Product information	Drive Family:	
	Power size(kW):	S.N.:
	Contract no.:	Purchase date:
Repair record	Service engineer:	Tel. no.:
	Fixed date:	
	Fault information:	
Complaints and demanding on our products:		
User signature: year month date		
Return visit record:		
Service signature: year month date		

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Service Agreement

1. HD300 Guarantee Free-service period is 12 months from the HEDY factory delivery date, and the factory delivery date is defined at the serial number on the drive rating label.
2. Failure or trouble caused by our product quality issues, service is free in 12 months.
3. Exceeding Guarantee time or failure not caused by drive quality issues, the service is out of the free range, like below situations:
 - From inappropriate, negligent or incorrect installation or adjustment of the optional operating parameters of the equipment or from mismatching the drive with the motor;
 - Not permitted by the factory supplier, modified the drive devices;
 - Out of the HD300 product specification application;
 - Failure consequences by fire, flooding, earthquake etc., un-foresee natural disasters;
 - Without drive's serial number or the S.N. can not be identified clearly.
4. Technical support hotline: -4007-000-885