User's Manual

DC MOTOR SPEED CONTROLLER

1 PHASE 2 QUADRANT(Non-regeneration)

type : HN 1200 SERIES

(Ver:1.2B)

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HANA POWER ELECTRONICS CO.,LTD.

contents

1. General Specification

This DC motor speed controller HN1200 series has power input voltage of AC 220/380[V] and uses frequencies of 50 and 60[Hz].
This controller is widely used for controlling variable constant speed, constant torque of DC motors within the scope of motor capacity 0.2~11[KW].

The characteristics of HN1200 unit are as follows.
1) It is a thyristor speed controller for single phase full wave separately exited DC motor, and it operates on the first quadrant and second quadrant of the speed, torque characteristics diagram. The unit is of one body type with the field built in.
2) Soft start and soft stop and highly sensitive response characteristics are ensured by adopting soft start(accel)/soft stop(decel) and direct operation method.
3) Sufficient control current is secured to load by adopting PID feedback method of speed/current loop and voltage control method for the speed control of DC motor.
4) Sufficient consideration is given to the detection of abnormality and protection of this devices and DC motor.
- Detection of field loss
- Detection of abnormality of tacho-generator for speed feedback(CUT TG)
- Detection of overload of motor(Imax)
- Triple protection method for abnormality voltage and current

5) This device has applied input/output terminal that allows compatible configuration with winding control unit(winder), interlocking control unit, current control unit, tension control unit, proportional control unit and other peripheral control unit that are produced by our company.
6) This device has reliability because it has high resistance to noise from external power shock.
When taco-generator using without in armature voltage feedback control method, electronic circuit power supply voltage and it is insulated.
7) The structure of the device is easy for installation, check-out, and repair.

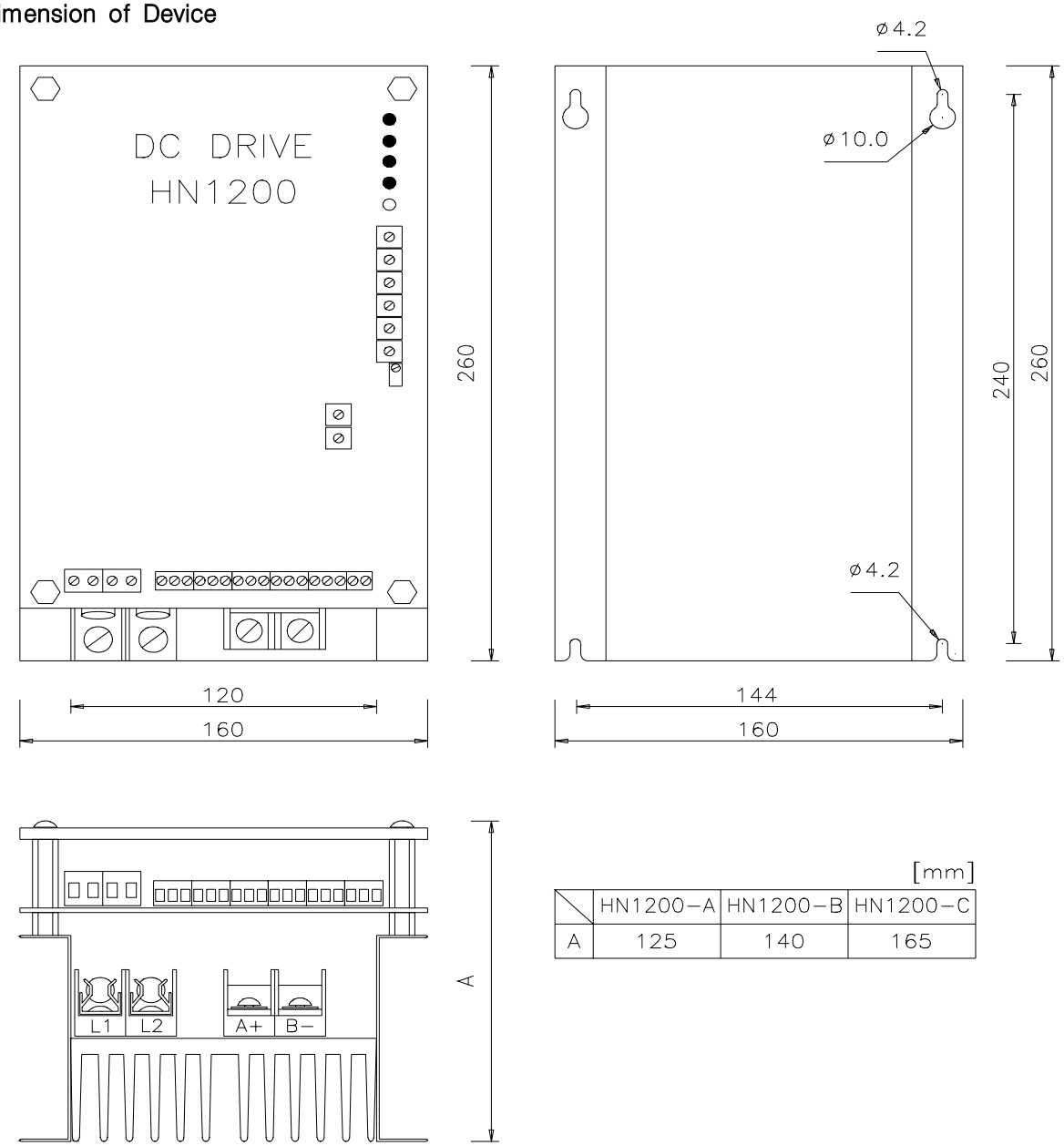
2. Standard Specification of Device

[table 2-1]

HN type		HN1200-A		HN1200-B		HN1200-C	
Input AC power supply voltage[v]		220	380	220	380	220	380
Recommended maximum capacity of motor[kw]		2.2	3.7	3.7	5.5	7.5	11.0
DC output voltage of Armature[v]		0-220	0-380	0-220	0-380	0-220	0-380
DC output current of Armature[A]		16	16	30	30	41	41
output voltage of field [v]	when used input power supply	100/200	170/340	100/200	170/340	100/200	170/340
	when used private transformer of field voltage	transformer output AC voltage x 0.9					
DC output current of field[A]		3	3	3	3	6	6
Main power supply fuse[A]		30	30	50	50	50	50
Field power supply fuse[A]		4	4	4	4	6	6
Control power supply fuse[A]		1	1	1	1	1	1
Setting VR for setting value		10 [kΩ] 1 [w]					
Ambient temperature		+ 45 [℃]					

☞ Motors with capacity over these are produced on order.

3. Dimension of Device



[mm]

	HN1200-A	HN1200-B	HN1200-C
A	125	140	165

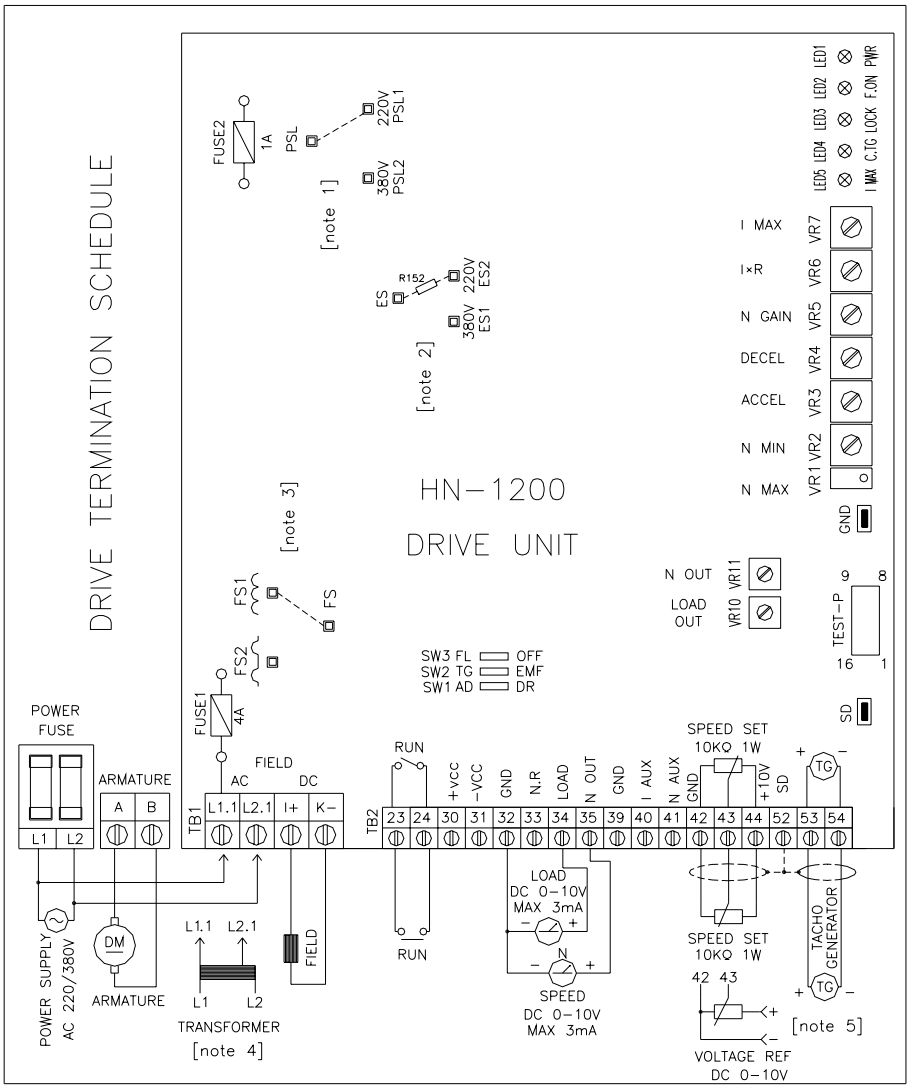
☞ Dimension can be changed to improve the product.

4. Installation

When establishing the unit, set it toward the terminal board lower part, and environmental condition should not go over +45℃ ambient temperatures. Also must be a place where there is not a dust and moisture. The control signal wire must use the shield line, only one end of the shield it controls.

5. Wiring Diagram of Device

5.1 Standard wiring Diagram



[note 1] Selects the PSL1 and PSL2 in order to be same in power supply voltage.

[note 2] EMF voltage selects ES1 and ES2 in order to be the same between the rated armature voltage DC motor and power supply voltage.

[note 3] After confirming a field AC voltage and a motor field DC rated voltage, select the FS1 and the FS2.

[note4] Supply the output voltage of the autotransformer in the L2.1 terminal in the case where the autotransformer and power supply voltage will be supplied in a separate way from outside.

Field AC power supply voltage(L1.1/L2.1) = Motor field DC rated voltage(I+/K-)÷0.9[V]

[note 5] When being taco-generator by the DC motor, it wires in 53/54(TB2) and selects a selection PIP S/W SW2 in the TG. If not taco-generator by the DC motor, it selects a selection DIP S/W SW2 with the EMF and does not wire 53/54(TB2).

5.2 Explanation on the function of terminal panel.

[table 5-2]

Terminal Number	Terminal Name	Function and Electric specifications
L1 L2	Single phase main power supply	AC voltage imput terminal for single phase main power supply
A+ B-	Armature voltage	Motor armature DC voltage output terminal
(CONTROL BOARD) [HN1200]		
Terminal number	Terminal name	Function and electric specification
L1.1 L2.2 (TB1)	Field power supply	Field supply AC input terminal
I+ K-	Field voltage	Motor field DC voltage output terminal
23 24 (TB2)	RUN	Motor operation signal input terminal
30	+15V	+15 [V] terminal (+VCC) 7.5[mA]
31	- 15V	-15 [V] terminal (-VCC) 7.5[mA]
32	GND (0 V)	GND terminal
33	N. R	Speed controller output terminal(0 ~ -10[V])
34	LOAD	Load current output terminal(0 ~ -10[V], 3[mA])
35	N-OUT	Rotational speed output terminal(0 ~ -10[V], 3[mA])
39	GND (0 V)	GND terminal
40	I-AUX	External auxiliary current control terminal(0 ~ -10[V])
41	N-AUX	External auxiliary speed control terminal(0 ~ ±10[V])
42	GND (0 V)	GND terminal
43	V-REF	Main speed command voltage input terminal (0 ~ +10[V])
44	+10V	Main speed command + reference voltage
52	SD	External signal wire shield terminal
53 (+) 54(-)	MOTOR T.G	Speed feedback(T.G) input terminal

6. In advance preparation

6-1. Select control power supply which agrees to a main power input condition. Connect PLS1 in the f 220V and connect PLS2 in 380V.

6-2. In order to be the same between the rated armature voltage DC motor and power supply voltage connect ES2 in the EMF voltage 220v and ES1 in the 380v.

6-3. Confirm field AC power supply and a motor field DC rated voltage and then select a field voltage.

Field AC power supply (TB1) L1.1/L2.1	Field output DC voltage I+/K- (TB1) FS select	
	FS1	FS2
AC 220V	DC 200V	DC 100V
AC 380V	DC 340V	DC 170V

6-4. It selects the DIP S/W which is suitable in operation condition.

(Sees the picture, 5.wiring diagram of device.)

	A D	D R
SW1 Selection speed acceleration gradient	Select in operation with acceleration and deceleration gradient from speed command value acceleration speed gradient : VR3 ACCEL deceleration speed gradient : VR4 DECEL	High-sensitive operation without acceleration and deceleration gradient from external speed command value.
	T G	EMF
SW2 Speed feedback one conditional selection	Use the terminal 53,54 in the case where there is taco-generator in the motor.	In the case where there is not taco-generator in the motor. (In one method of armature voltage feedback use)
	F L	OFF
SW3 Select protection and cooperation on abnormality of motor field.	When motor has separately excited field, select this. (shunt and compound motor)	Select when motor has not separately excited field select. (series motor)

7. Explanation of drive configuration.

7-1. Function explanation of each trimmer

N max (VR1) : Setting for maximum rotation speed

N min (VR2) : Setting for minimum rotation speed

Accel (VR3) : Setting for acceleration gradient

Decel (VR4) : Setting for deceleration gradient

Ngain (VR5) : Gain control of speed control amplifier

I x R (VR6) : Speed compensation according to load under armature voltage feedback.

LOAD OUT (VR10) : Setting output voltage for load meter.

N OUT (VR11) : Setting output voltage for speed meter.

7-2. Setting for limit electric current (Setting for Imax)

Turn Trimmer ,Nmax, Mmin, Accel, Decel, Ngain, IxR and Imax with a counterclockwise direction completely.

Select the location of the DIP S/W SW3 with switch off.

Connect the direct current amperemeter in order to measure the DC electric current of the motor armature in armature circuit.

Makes the electric wire which is connected in output terminal I+ field open.

Connect the main power and after connecting RUN terminal 23/24, turn Nmin with a clockwise direction 80%.

Turn the Imax with a clockwise direction slowly and observe the rise of the armature current.

Set Armature current the Imax 1.0~1.25 times between rated current.

Cancel The RUN the terminal and make the main power off. Connect output terminal I+ again. Also, select the DIP the S/W3 to the FL and turn the Nmin with a counterclockwise direction completely.

[Caution] Set a limit electric current and then observe the load share of the motor.
The set session is caught long, which makes the overheating of the motor to be destroyed.
The set demand hour should not exceed above 10 seconds.

7-3. The case which is not taco-generator, set of control method and load speed

compensation IXR from armature voltage feedback control.

Select the location of operation condition DIP S/W SW1 with the DR.

Select the location of operation condition DIP S/W SW2 with the EMF.

When the external speed settings and trimmer Nmax commit the main power from smallest condition, the POWER(LED1), FIELD ON(LED2), LOCK(LED3) come to light on.

Connect the RUN terminal 23/24(TB1) and come to light off in the LOCK(LED3).

Set an external speed settings slowly at the maximum value.

Observe the rotational state of the motor, checking the armature voltage until it arrives to rated speed the Nmax with a clockwise direction, and setting maximum speed.
Set an external speed settings with smallest.
Stop the motor from minimum point of external speed settings by using the Nmin.
Turn the Ngain with a clockwise direction until the drive is unstable from the condition which 50% sets an external settings.
When the Imax starts twinkles, turn back around the Ngain with counterclockwise direction to the point 20%.
The IxR is used only armature voltage feedback control(EMF).
If the speed changes by a load quantity, we use the IxR not to be speed fluctuation due to a load quantity.
It inspects the condition from low speed and high speed after the like that.
It selects a speed slope DIP S/W SW1. If we use a rise drop speed slope, it is located in the AD, and if not , it is located in the DR.
The ACCEL, the DECEL set the rising speed slope and a drop speed slope of the MOTOR according to a load condition and an operation condition.

7-4.Regulation method from taco-generator feedback control

(The IxR is located completely in counterclockwise.)
Select the location of operating condition DIP S/W SW2 with the TG.
Observe wiring diagram of device taco-generator (TG) 53/54 (TB2) to be connected.
When the external speed settings and trimmer Nmax commit the main power from smallest condition, the POWER(LED1), FIELD ON(LED2), LOCK(LED3) come to light on. Connect the RUN terminal 23/24(TB2) when it comes to light off in the LOCK(LED3).
Set an external speed settings slowly at the maximum value.
Observe the rotational state of the motor, checking the armature voltage until it arrives to rated speed the Nmax with a clockwise direction and setting maximum speed.
Set an external speed settings with smallest.
Stop the motor from minimum point of external speed settings by using the Nmin.
Turn the Ngain with a clockwise direction until the drive is unstable from the condition which 50% sets an external settings.
When the Imax starts twinkles, turn back around the Ngain with counterclockwise direction to the point 5%.
Select a speed slope DIP S/W SW1. If we use a rise drop speed slope, it is located in the AD, and if not , it is located in the DR.
The ACCEL, the DECEL set the rising speed slope and a drop speed slope of the MOTOR according to a load condition and an operation condition.

8. Trouble Inspection, and Remedial Measures

[table 8-1]

	Defect	Condition	Remedial Measures
1	DRIVE and the ON after setting an external set value, when the motor does not operate		
1.1	LED " PWR, LOCK and F.ON" Does not light	The power supply will not operate or, when being defect to main power FUSE and control power FUSE2	Inspect the main power voltage and the main power FUSE and a control power supply FUSE2
1.2	LED " PWR, LOCK and F.ON" lights on	When the run control system is locked	Connects23,24 terminals (TB2)
1.3	LED"PWR,Imax,F.ON" lights on	When external speed settings or feedback voltage value is not the same	External settings the maximum one case, TEST-P terminal number6 voltage (+10V), at the time of motor speed maximum one, TEST-P 7 PIN voltage. (The maximum -10V Nmax regulation)
		When the Imax trimmer is not set	Turn the Imax with a clockwise direction and set in load electric current
		When having a problem between the motor armature voltage output terminal and the motor	Motor armatures wiring circuit inspection and output voltage confirmation
1.4	LED "PWR,F.ON,LOCK, C.TG" lights on	When taco-generator(TG) occurs the problem	Taco-generator (TG) and relation circuit inspection
1.5	LED "PWR,LOCK"lights on, LED “F.ON"does not light	Field power and field winding destruction	Field power FUSE 1 and field voltage, electric current inspection
2	When the DRIVE is ON and the motor rotates from the limit maximum speed, when the regulation does not operate with external setting	When an execution speed value is inaccurate and the speed feedback execution speed value is not right	External set volume wiring circuit inspection (GND broken wire) and voltage feedback circuit, taco- generator connection circuit polarity and feedback voltage inspection motor field winding circuit inspection.
3	When the DRIVE is on after operating rotating from limit current, When not comes in ED Imax weakly in the case where the operation will not run	When operation does not run with overload, or when the operation load exaggerates	Measuring a motor armature current and the field current, after motor rated current confirming, to turn mechanical load inspection Imax with a clockwise direction, load electric current re-set
4	When the motor speed and armature electric current periodically are unstable	When the speed control circuit Ngain and the Nmax are inadequate, when taco-generator is inaccurate	Ngain trimmer and Nmax re-regulation, inspection of taco-generator
5	When the main power FUSE is destroyed	Armature defect of THYRISTOR and BRIDGE DIODE and field DIODE. Motor armature defect	After power off, THYRISTOR and BRIDGE DIODE inspection, motor armature winding and brush inspection
6	When the control power fuse1 is destroyed	Defect of control power supply transformer	Inspection of control power transformer
7	When the field power fuse2 is destroyed	Field DIODE defect and field winding defect	Field DIODE inspection and field winding inspection

☞ When conducting inspection or remedial measures, refer to a person in charge of drive at Hana Control Engineering.

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