

# NU-BL5020-01

## 1KW (50V 20A) Brushless Motor Drive

### 1.FEATURES

#### 1. Four different control modes:

- Hall sensor based open loop control
- Hall sensor based closed-loop control
- Sensorless open-loop control
- Sensorless closed-loop control

#### 2. Multiple Speed input signals:

- On-board potentiometer speed input
- Analogue Speed input
- PWM Speed input
- RS485 Modbus Speed input

#### 3. Multiple Protections schemes:

- Over-voltage protection
- Under-voltage protection
- Over-current protection
- Motor Stall protection
- Hall sensor error protection

#### 4. Speed Ramp Implementation

For speed and direction change, to protect motor and drive.

#### 5. Speed Feedback signal

#### 6. Error Feedback signal and LED

#### 7. RS-485 MODBUS RTU protocol for serial control



## 2.CHARACTERISTICS

PARAMETER	DATA
Operating Voltage	18VDC~50VDC
Output Current (Continuous)	20A
Output Current (Maximum)	25A
Maximum Power	1000W
Cooling method	Natural air cooling or forced air cooling
Environment	Avoid dust, oil mist and corrosive gases
Operating Temperature	0℃~+50℃
Humidity	< 80%RH, no condensation, no frost
Vibration	< 0.5G (4.9m/s <sup>2</sup> ) 10Hz-60Hz (non-continuous operation)
Storage Temperature	-20℃~+65℃
Dimensions	143mm*80mm*33mm
Weight	326g

## 3.INTERFACE

FUNCTION	SIGN	DESCRIPTION
Serial	PC-IN	RJ45 connect RS485
	RS485-A	RS485 interface A port
	RS485-B	RS485 interface B port
Control	RV	On-board speed input potentiometer
	ALM	Alarm signal output. The output level changes from high to low when an alarm occurs.
	SPEED	Speed feedback signal output.
	X	Reserve
	EN	Enable/Disable signal input. High (or left unconnected) to enable the drive; Low (connected to Ground) to disable the drive.
	F/R	Direction control signal input. High (or left unconnected) to drive the motor in one direction; Low (connected to Ground) to drive the motor at the other direction.
	COM	Control signal Ground (internally connected to Power Ground).
	SV	External speed control signal input.
Hall Signal	5V	5V output
	HU	Hall sensor signal U phase input
	HV	Hall sensor signal V phase input
	HW	Hall sensor signal W phase input
	GND	Hall power GND
Motor and Power	U	Motor's U phase

	V	Motor's V phase
	W	Motor's W phase
	GND	Supply power input -
	VIN	Supply power input + (18VDC~50VDC)

**Note: The drive is not polarity protected, please double-check the power connection before switch on the power input.**

## 4.FUNCTIONS

### 4.1 Control modes

The drive supports 4 drive mode. The DIP switch SW3 and SW4 are used to select the different drive mode. The control mode must be selected before power up.

SW3	SW4	MODEL
ON	ON	Sensorless open loop model
OFF	ON	Hall open loop model
ON	OFF	Sensorless speed closed-loop model
OFF	OFF	Hall speed closed-loop model

### 4.2 Speed inputs

The drive supports four different speed input signals. The external analogue and PWM inputs used the same input pin SV. In order to use external input signals, the on-board speed input signal must be switched off, by turning the on-board potentiometer counter-clockwise until the switch in the potentiometer is activated (User can hear a click sound when the switch is activated).

The input range of external analogue input in 0.1 – 5.0V DC, It is recommended to use the 5V and Ground output from the drive; and use 10K  $\Omega$  -50K  $\Omega$  potentiometer.

When PWM input is used, the duty cycle of the PWM signal is used as speed input. The recommended PWM signal is

- Frequency range: 5KHz - 20KHz
- Amplitude: 5VDC
- Duty cycle: 2% - 100%。

### 4.3 Speed feedback output

The speed feedback output signal outputs the speed signal at motor commutation frequency,  $F_{comm}$ . The motor speed (RPM) can be calculated as –

$$\text{Motor Speed (RPM)} = F_{comm} / \text{Pole\_Pairs} / 3 * 60 \text{ (RPM)}$$

Where:  $F_{comm}$ : Speed feedback frequency (or Commutation frequency)

Pole\_Pairs: Motor pole pairs

For example:

One 4 pole motor, the output signal is 300Hz.

Motor speed =  $300 / 2 / 3 \times 60 = 3000 \text{ RPM}$ .

### 4.4 Protection and Alarm

The drive implements multiple protection schemes to protect the drive and motor. When the protection condition is triggered, the drive switches off its motor outputs and drives ALM output low. The motor outputs remain switched off and the ALM output is kept low, until the recovery condition is met.

PROTECTION	Trigger condition	Recover Condition
Over voltage	Input voltage > 53VDC	Input voltage <50V and speed input = 0
Under voltage	Input voltage < 16VDC	Input voltage >18V and speed input = 0
Over current	Output current > 25A	Output current <20A and speed input = 0
Over temperature	Temperature > 95℃	Temperature <50℃
Locked rotor	Time > 4s	Speed input = 0
Hall error	Input hall signal error	Connect hall signal correctly

**Note: Please disconnect the power supply when reconnecting the hall signal.**

There are one green LED and one red LED on the drive, marked as [RUN/ALM]. The green LED is a power indicator. The RED led is an error status indicator, it lit up to indicate different error conditions.

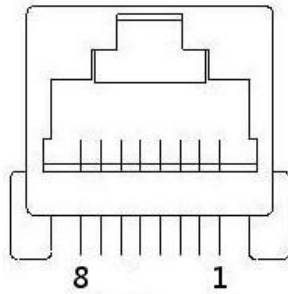
STATUS	RED INDICATOR
Normal	Turn off
Over voltage	Blink once every second
Under voltage	Blink twice every second
Over current	Blink 3 times every second
Over temperature	Blink 4 times every second
Locked rotor	Blink 5 times every second
Hall error	Blink 6 times every second

#### 4.4 MODBUS protocol

The drive supports RS-485 MODBUS protocol (RTU mode). It supports 303 (0x03) – read holding register and 606 (0x06) – write single holding register. It supports baud rate range is 9600-256000bps ( factory default baud rate -- 115200 bps ), 8 data-bit, no parity and 2 stop bit.

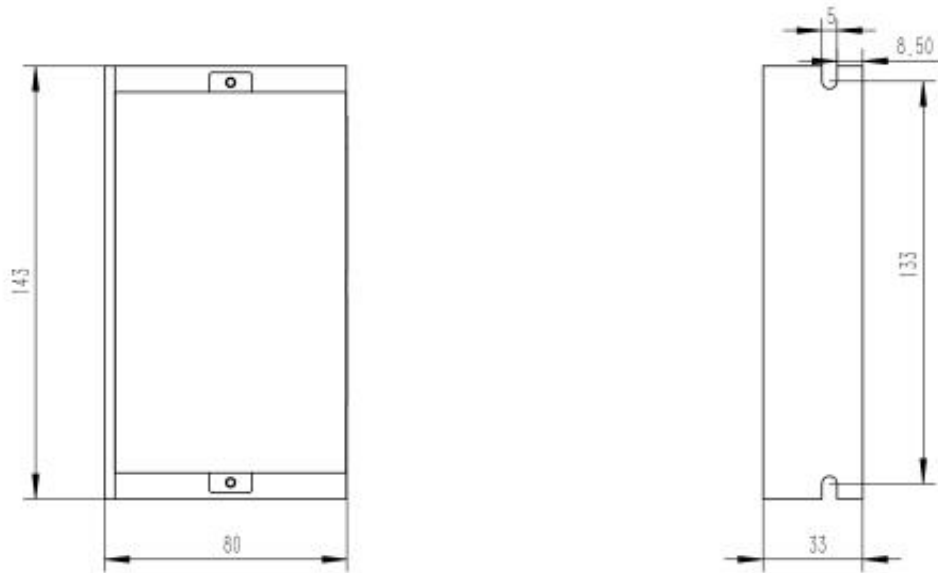
For detailed information on Modbus protocol, please refer to our Modbus protocol document.

MODBUS on RJ45 connector.



4	RS485-B
5	RS485-A
7	5V
8	GND

## 5.DIMENSIONS



REVISION HISTORY		
Version	Date	Description
V1.0	2019/10/24	Initial Release
V1.1	2020/04/16	Added instructions of RJ45 connector