Ningbo Longwell Electric Technology CO.,LTD

Yuyao,Zhejiang Province,China 315400

Phone: 86 574 6218 9863

Fax: 86 574 6218 9863

sales@zjlongwell.com

www.longwellfans.com

Communication format

1. Structure of a byte

Start (low)	Bit 0 (LSB)	Bit 1	Bit2	Bit3	Bit 4	Bit5	Bit 6	Bit7 (MSB)	Parity	Stop (high)

2. Communication process

Command from master：

Start > 3ms	Address 8 bits	Cmd 8 bits	Data N * 8 bits	CRC L 8Bit	CRC H 8Bit

Response from fan：

Start > 3ms	Address 8 bits	Cmd 8 bits	Data N*8 bits	CRC L 8Bit	CRC H 8Bit

In contrast to the general specifications, the maximum telegram length is 23 bytes!

The fan address defaults to 00

Baud rate: 19200bpm Check bit: EVEN Data bits: 8Bit Stop bit: 1

CRC /CRC H

A CRC checksum is defined via the complete telegram.

The polynomial for defining the checksum is $1 + x^2 + x^{15} + x^{16}$ (i.e. XOR link to 0xA001).

The initial value is 0xFFFF。

3.Commands

Command code	Commands
0x03	Read holding register
0x04	Read input register
0x06	Write single register
0x08	Diagnostics
0x10	Write multiple registers

Write single register

There are two parameter sets that can choose, left 1 right 2.

(1) Set the preferred running direction：

00 06 D1 02 00 00 (Write to other registers in this way)

00：Fan address 06：Write single register D102: Register address 0000：The written data

(0000：clockwise 0001：counter-clockwise)

(2) Select the internal parameter set：

00 06 D1 05 00 00

00：Fan address 06：Write single register D105: Register address 0000：The written data

(00：parameter set 1 01：parameter set 2) There can be two sets of set-point speed adjustments

(3) Register required to be set for speed regulation

D106/D107 Address of parameter set 1 : D106

Address of parameter set 2 : D107

Control model 0：in closed loop speed control 2：in open loop PWM control

In closed loop speed control mode：

D101 1 ： RS485 Communication speed adjustment 0 ： 0V- 10V VSP

D119 Maximum speed value setting

D11A Maximum permitted speed limit (maximum speed is less than this value)

D001 Default setting value

D128 speed limit values

D145 minimum speed

In open loop PWM control mode ：

D101 1 ： RS485 Communication speed adjustment 0 ： Analogue input 0 to 10V

D001 Default setting value

D10E/D10F Maximum modulation level

D110/D111 Minimum modulation level

NINGBO LONGWELL ELECTRIC TECHNOLOGY CO.,LTD

Phone: 0086 574 6218 9863 FAX : 0086 574 6218 9863 www.longwellfans.com sales@zjlongwell.com

a) in closed loop speed control

The default set value denotes a speed

$$Default\ set\ value\ [rpm] = \frac{Data\ bytes}{64000} \cdot nMax\ [rpm]$$

nMax [rpm] to maximum speed in revolutions per minute (see 2.27 Maximal speed)

The value zero means motor standstill

b) in open loop PWM control

The default set value denotes a modulation level:

$$Default\ set\ value\ [\%] = \frac{Data\ bytes}{65536} \cdot 100\%$$

The value zero means motor standstill

Default setting 0V- 10V VSP

D101 : 0

(4) Enable motor stop

D112/D113

0: Motor runs continuously (even if set value = 0)

1：Motor stops if set value = 0

(5) Set value (EEPROM)

D103:Store the default settings to D114 / D115 when you write 1

D114/D115:The default set value is stored in D114 when using parameter set 1,

The default set value is stored in D115 when using parameter set 2

(6) Flow restriction is required to fill in the register

D13B:Maximum coil current (8 bit)

D1A1 :DC circuit current reference value (equal to data bytes * 2mA)

(7) Control limitation

D12F：Address

This parameter defines which limitation functions are activated.

Reserved	Reserved	0	0	Reserved	Reserved	I	P

The MSB is of no relevance!

I ..... Coil current limitation

P ..... Power limitation

D155：Maximum power (8-bit)

D1A0 ：DC circuit voltage reference (equal to data byte * 20mV)

D1A1 ：DC circuit current reference value (equal to data bytes * 2mA)

Maximum power = (Data Bytes / 256) * DC circuit voltage reference * DC circuit current reference

(8) Register required for emergency operation

D15C Emergency operation function on/off

0：Inactive 1：Active

Permitted value range: 0 to 1

When 0-10V speed:

D15F Potentiometer curve, limit value for cable break

Encoding:

$$U\_cable\ break\ [V] = \frac{Data\ byte}{65536} \cdot 10V$$

Emergency operation occurs when the speed control voltage is less than this value

D15D Emergency operation Setpoint (Setpoint data conversion with default settings)

a) in closed loop speed control

The emergency operation set value denotes a speed:

$$Emergency\ operation\ set\ value\ [rpm] = \frac{Data\ bytes}{64000} \cdot nMax\ [rpm]$$

b) in open loop PWM control

The emergency operation set value denotes a modulation level:

$$Emergency\ operation\ set\ value\ [\%] = \frac{Data\ bytes}{65536} \cdot 100\%$$

The value zero means motor standstill

D15B Emergency direction 0：counter-clockwise 1：clockwise 2：According to the original specified direction

When the RS485 communication speed adjustment

D15E Emergency operation time lag Emergency operation time lag [ms] = Data byte · 100ms

When the time is unsuccessful communication enter the emergency operation

D15D Emergency operation Setpoint (Setpoint data conversion with default settings)

D15B Emergency direction 0：counter-clockwise 1：clockwise 2：According to the original specified direction

(9) Maximum permissible modulation level

Address of ice protection：D150

Address for max. starting modulation level ：D151

Address for number of startup attempts：D152

Address of the starting modulation level：D116

Encoding:

a) Ice protection

Value	Ice protection
0	Inactive
1	Inactive

b) Max. starting modulation level

Max. starting modulation level [%] = (Data byte /256) * 100%

The MSB is of no relevance!

c) Number of startup attempts

Number of startup attempts = Data byte

The MSB is of no relevance!

Function:

The "Ice protection" function is intended to enable a fan with fan blades that have frozen into place to shake the motor free by attempting to start the fan in both directions in alternation; during this process, the modulation level is increased during each attempt. The first attempt begins with the value specified under starting modulation level (see 2.24 Starting modulation level) and the desired direction of rotation. If this does not succeed in getting the fan rotating, during each additional attempt, the direction of rotation is reversed and the starting modulation level is increased by 5%, to a value no higher than that specified in "Max. starting modulation level". At the same time, an "Ice protection active" warning is generated (see 3.10 Warning). This process is continued until the number of attempts specified in the "Number of startup attempts" is reached. If this also does not succeed in getting the fan rotating, the "Locked motor" error message (see 3.9 Motor status) is generated. During additional startup attempts, the modulation level is returned to the value defined in the parameter "Starting modulation level" and not increased any more.

(10) Control parameters

2 control parameters are provided for closed loop speed control and closed loop sensor control:

- P factor kp
- I factor ki

Address of P factor (parameter set 1) : D10A

Address of P factor (parameter set 2) : D10B

Address of I factor (parameter set 1) : D10C

Address of I factor (parameter set 2) : D10D

Write authorisation : Longwell, customer, end customer

The external input "parameter set" and the parameter "Internal parameter set" are used to select whether the values in "P factor / I factor (parameter set 1)" or the values in "P factor / I factor are applicable.

Encoding:

Each control parameter consists of 2 bytes.:

a) P factor

$$P\text{-}factor = \frac{Data\ bytes}{256} \cdot 100\%$$

This means that values can be set for the P factor between 0 and 25,600%, in steps of 0.39%

b) I factor

$$I\text{-}factor = \frac{Data\ bytes}{65536} \cdot 100\%$$

This means that values can be set for the I factor between 0 and 100%, in steps of 0.00153%

(11) Set the fan address

All fans have the same default address of 00. If the system consists of multiple fans, in order to communicate with each fan separately, the address must be changed so that each fan has a different address. By writing to the single-register instructions 0x06

To change the fan address is：

1. Turn on the first fan and all other fans (all other fans are not powered)；
2. Change the fan address by writing a single register with instruction 0x06. If the address of the first fan is set to 2, the main system sends 00 06 D1 00 00 02

00：fan default address 06：Write single register D100: Register address 0002：New address of fan

3. Open the second fan；
4. Change the fan address by writing a single register with instruction 0x06, if the address of the second fan is set to 3, and the main system sends 00 06 D1 00 00 03

00：fan default address 06：Write single register D100: Register address 0003：New address of fan

5. Repeat operations similar to steps 3 and 4, turn on the next fan and send similar instructions to set a new address for it until all fans are assigned a separate address (set address range 0001 to 00 F 7).When a new address is set for the fan to communicate with a fan, the "fan address" in the sent instruction should be changed to the corresponding new address for communication. For example, the preferred operation direction of the fan address 2 shall be sent: 02 06 D1 02 00 00; the preferred operation direction of the fan with the fan address 3 shall be sent: 03 06 D1 02 00 00.

Read the input register

This register is an invalid for the readable-only register write

(1) Actual speed

D010

The actual speed is made up of the speed parameter and the maximum speed:

$$Actual\ speed\ [rpm] = \frac{Data\ bytes}{64000} \cdot nMax\ [rpm]$$

00 04 D0 10 00 01

00：Fan default address 04：Read the input register instructions D010：Register address 0001：Read the number

When the number of reads is 2, D010 and D011 are read simultaneously, and multiple times are added successively

Read the other input registers the same as this method

(2) Motor status

D011

The motor status specifies errors currently detected in the fan.

00 04 D0 11 00 01

00：Fan default address 04：Read the input register instructions D011：Register address 0001：Read the number

Encoding:

Error indicator:

Address of error indicator = Data bytes

Error:

0	0	0	Uzlow	0	0	0		0
BLK	HLL	TFK	FB	SKF	TFE	0		PHA

If bit = 1, the error described below has been detected:

UzLow: DC-link undervoltage

BLK: Locked motor

HLL: Hall sensor error

TFM: Motor overheated

SKF: Communications error between bus controller and commutation controller

TFE: Power mod overheated

(3) Warning

D012

00 04 D0 12 00 01

00：Fan default address 04：Read the input register instructions D012：Register address 0001：Read the number

Encoding:

A set bit makes the warning active:：

MSB	Ice	UeHigh	0	UzHigh	Heating	Cable break	n_Low	Reserved
LSB	Brake	UzLow	TEI_high	TM_high	TE_high	P_Limit	L_high	I_Limit

Ice : Ice protection function active
Motor attempts to shake rotor loose - see 2.39 Ice protection)
UeHigh : Supply voltage high
UzHigh : DC-link voltage high
Heating : Heating enabled
The motor should not be started when the heating is enabled!
Cable break : Cable break at set value analogue input
(Voltage at the analogue input < Limit value for cable break - see 2.45)
n_Low : Actual speed is less than limit speed for running monitor
(see 2.36 Limit speed for running monitor)
Brake : Brake mode: set if exterior drive is applied in opposite direction with high speed for prolonged period
UzLow : DC-link voltage low
TEI_high : Electronics interior temperature high
TM_high : Motor temperature high
TE_high : Output stage temperature high
P_Limit : Power limitation engaged
L_high : Line impedance too high (DC-link voltage unstable)
I_Limit : Current limitation engaged
(4) DC-voltage

D013

$$Uz\ [V] = \frac{Data\ byte}{256} \cdot Reference\ Uz\ [V]$$

Bezug Uz .....DC-link voltage reference variable (see 2.50 Reference value of DC-link voltage)
(6) Module temperature
D015
T_module [°C] = Data byte
(7) Motor temperature
D016
T_module [°C] = Data byte
(8) Electronics interior temperature
D017
T_EI [°C] = Data byte
(9) Current direction of rotation
D018
0：counter-clockwise 1：clockwise
(10) Current set value
D01A

The set value denotes a speed:

$$Set\ value\ [rpm] = \frac{Data\ bytes}{64000} \cdot nMax\ [rpm]$$

(11) Current parameter set

D01D

0：Parameter set 1　　1：Parameter set 2

(12) Current control function

D01E

0：Positive: Control variable = Actual value - Set value　1：Negative: Control variable = Set value - Actual value

Command:

The following commands from the "MODBUS Application Protocol Specification V1.1"general specifications are supported:

Code	Command
0×03	Read holding register
0×04	Read input register
0×06	Write single register
0×08	Diagnostics
0×10	Write multiple register

Other commands are not supported.

CUSTOMER APPROVAL

CUSTOMER SIGNATURE:	**DATE :**

NINGBO LONGWELL ELECTRIC TECHNOLOGY CO.,LTD

Phone: 0086 574 6218 9863 FAX : 0086 574 6218 9863 www.longwellfans.com sales@zjlongwell.com