

VER 2.0

Technical Manual

DS-OL42-IPD / DS-OL42-IRS4



Table of Contents

1. Features	4
2. Technical Parameters.....	4
3. Schematic and Interface Definition.....	5
4. Setting Switch.....	6
4.1 Indicator Function	6
5. Power Supply.....	6
5.1 Voltage.....	6
5.2 Current.....	7
5.3 Regeneration of Discharge.....	7
6. Signal Input.....	7
6.1 Pulse Signal : STEP.....	7
6.2 Direction Signal : DIR.....	7
6.3 Pulse / Direction Input Timing Diagram.....	8
7. Typical Connection of High-Speed Input Port	9
7.1 Differential Connection.....	9
7.2 Common Positive Connection.....	9
7.3 Common female Connection.....	9
8. Typical Connection of Universal Input Port.....	10
8.1 Common Positive Connection.....	10
8.2 Common Female Connection.....	10
9. Typical Connection of Signal Output.....	11
9.1 Relay Connection.....	11
9.2 Optocoupler Connection.....	11
10. Control Parameter.....	12
10.1 Status (Class 00).....	12
10.2 Basic Settings (Class 01).....	12
10.3 Motion Settings (Class 04).....	13
10.4 Input Settings (Class 05).....	14
10.5 Output Settings (Class 06).....	15

11. Modbus-RTU Protocol Example.....16

 11.1 Running Motor.....16

 11.2 Read Motor Status.....20

 11.3 Read Alarm Status.....22

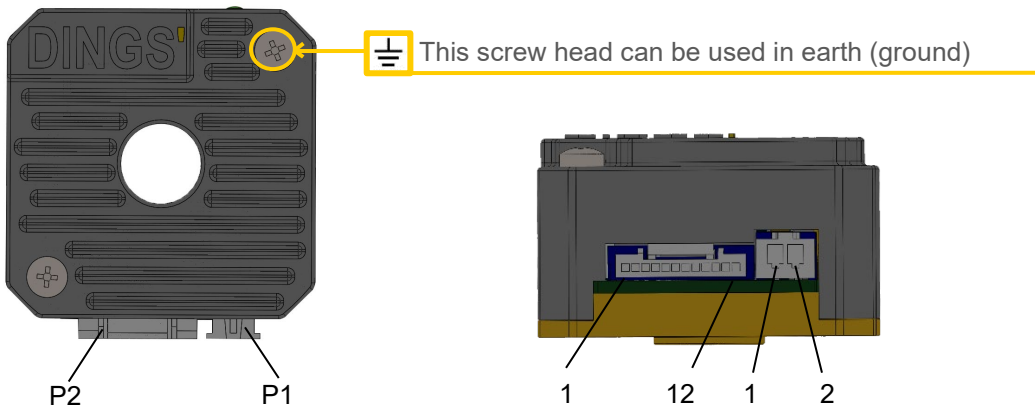
1. Features

- Input power : DC 24-36V
- Output rated current (peak value) : 0.5~3.0A/Phase
- Pulse, RS485 control, support MODBUS RTU communication protocol, Max site 31
- Hollow integral drive, Compatible with E, C, K, N and Shaft Diameter < 11mm Stepper motor
- 4 Input signals
- 1 output signals
- Protection function : Over current, Over voltage, Under voltage, Power protection against reverse connection
- 2 High speed input ports, Maximum response frequency: 500KHz (Duty ratio 50%)

2. Technical Parameters

Drive model		DS-OL42-IPD / DS-OL42-IRS4
Adapted motor		Suitable for two-phase hybrid stepping motor
Power supply		DC 24V~36V
Output current		0.5A~3.0A/phase (peak)
Drive way		Full-bridge bipolar PWM drive
Device initialization time		2s
Input signal	2 high-speed input signals	Optocoupler input voltage: H = 3.5-26V, L = 0-0.8V On current 5~8mA
	2 universal input signals	Optocoupler input voltage: H = 5, L = 0-0.8V On current 5~8mA
Output signal	1 common output signal	Optocoupler output, voltage up to 30VDC, maximum current 10mA
Size		42.2x42.2x25.2mm
Weight		60g
Working Environment	Precaution	Avoid dust, oil mist and corrosive gases
	Humidity	< 85 % RH, Non-condensing
	Temperature	0°C - +40°C
	Cooling	Installation in a ventilated environment

3. Schematic and Interface Definition



P1. Power input (in the order from left to right as shown)

Pin	Name	Description
1	V+	24V – 48VDC
2	GND	Power supply ground

P2. Signal input/output (as shown, arranged from left to right)

Pin	Name	Description
1	IN1+	External pulse mode : Pulse Internal pulse mode : Universal input port 5 -24V effective, Max. input frequency 500KHz, signal definition configurable
2	IN1-	
3	IN2+	External pulse mode : Direction Internal pulse mode : Universal input port 5 -24V effective, Max. input frequency 500KHz, signal definition configurable
4	IN2-	
5	COMIN	Single-ended input signal common Both positive and negative (5VDC) compatible
6	IN3	External pulse mode : Offline Internal pulse mode : Universal input port, 5V effective Max. input frequency 1KHz, signal definition configurable
7	IN4	External pulse mode : Alarm clear Internal pulse mode : Universal input port, 5V effective Max. input frequency 1KHz, signal definition configurable
8	OUT+	Optoelectronic isolated output, max. voltage 30VDC, max. saturation current 10 mA
9	OUT-	
10	485-GND	485 Communication Port

11	485-A
12	485-B

4. Setting Switch

4.1 Indicator Function

4.1.1 Status Indication :

Status	Communication code	Description
Stopping	2	The motor is holding but the motor is not running
Running	3	The motor is running
Motor free	1	The motor can move freely

4.1.2 Error Indication :

Error Code	LED Blinks	Communication Value	Description
Over current	1	10	Motor phase current over or drive failure
Motor phase	2	11	Motor wire were not connected
Over voltage	3	14	Power voltage is over than 42V
Under voltage	4	13	Power voltage is less than 18V

5. Power Supply

5.1 Voltage

The chopper driver continuously changes the size and direction of the motor winding voltage and detects the current to obtain accurate phase current. If both high efficiency and low noise are to be ensured, the driver supply voltage shall be at least 5 times the motor rated phase voltage (that is, the motor rated phase current × phase resistance).

If you need the motor to get better high speed performance, you need to increase the driver supply voltage. If power is supplied from a regulated power supply, the supply voltage shall not exceed 36V. If non-stabilized power supply is used, the voltage shall not exceed 25V.

Because the rated current of non-stabilized power supply is full load current; When the load is light, such as when the motor is not running, the actual voltage is up to 1.4 times the rated voltage of the power supply. For smooth and quiet operation of the motor, choose low voltage.

5.2 Current

The maximum supply current shall be the sum of the two phase currents. Usually, the amount of current you need depends on the type of motor, voltage, speed, and load conditions.

The actual supply current value is much lower than this maximum value, because the driver USES a switching amplifier that converts high voltage and low voltage current into low voltage and high current. The more the supply voltage exceeds the motor voltage, the less supply current is required. When the motor is connected to a 48V power supply, the output current of the power supply is half of that of the 24V power supply.

5.3 Regeneration of Discharge

When the motor slows down, it ACTS like a generator, converting the kinetic energy of the load into electricity. Some energy is consumed by the driver and motor.

If your application has a large load running at high speed, a considerable amount of kinetic energy can be converted into electricity. Easy to cause the drive alarm (overvoltage) may even cause damage to the drive.

6. Signal Input

6.1 Pulse Signal : STEP

The driver port has a built-in optocoupler, which can accept 5-24VDC single-ended or differential signals, and the highest voltage can reach 26V. Its change from off to on is understood as accepting a valid pulse edge command. For the common anode, the low level is valid (the common negative is valid for the high level).

At this time, the driver will drive the motor to run one step according to the corresponding timing. For the normal operation of the driver, the duty cycle of the effective level signal should be below 50%. In order to ensure the reliable response of the pulse signal, the duration of the pulse effective level of the subdivided driver should not be less than 1us. The signal response frequency of the subdivision driver is 500KHz, and an excessively high input frequency may get an incorrect response.

6.2 Direction Signal : DIR

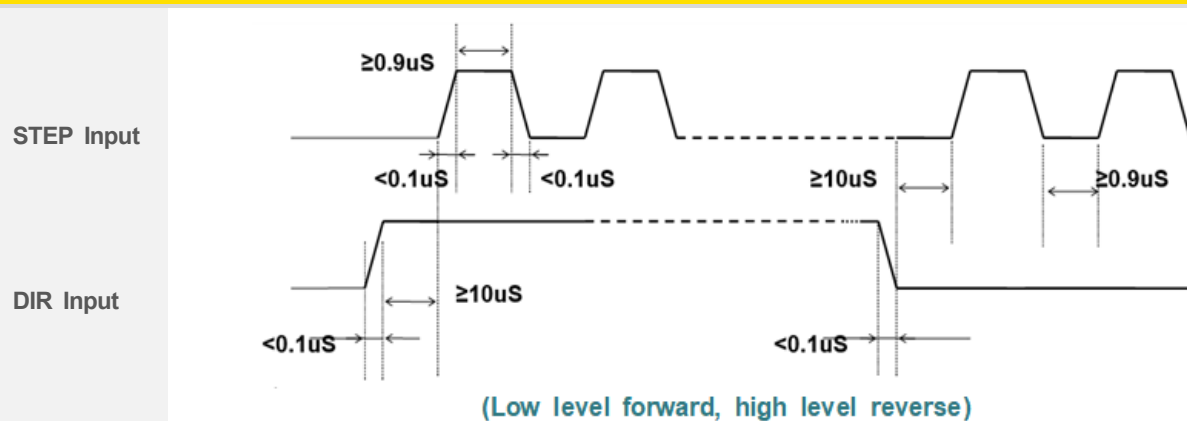
Can accept 5-24VDC single-ended or differential signals, the highest voltage can reach 26V. The on / off of the internal photocoupler at this end is interpreted as two directions of motor operation. The

change of the direction signal will change the direction of motor operation. The floating of this end is equivalent to the input high level. It should be noted that the subdivision driver should ensure that the direction signal is established at least 10 μ s ahead of the pulse signal input to avoid the driver's incorrect response to the pulse signal.

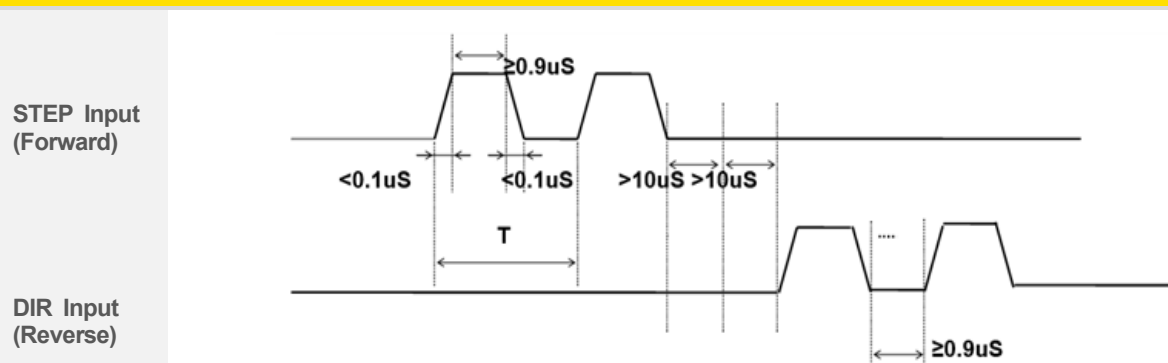
When the motor is commutated, it must be switched after the motor decelerates and stops to the starting frequency. The commutation signal must be changed after the last STEP pulse of the previous direction signal and before the first STEP pulse of the next direction. When no commutation is required, the direction signal terminal can be left floating.

6.3 Pulse / Direction Input Timing Diagram

Input signal waveform and timing (single pulse method)

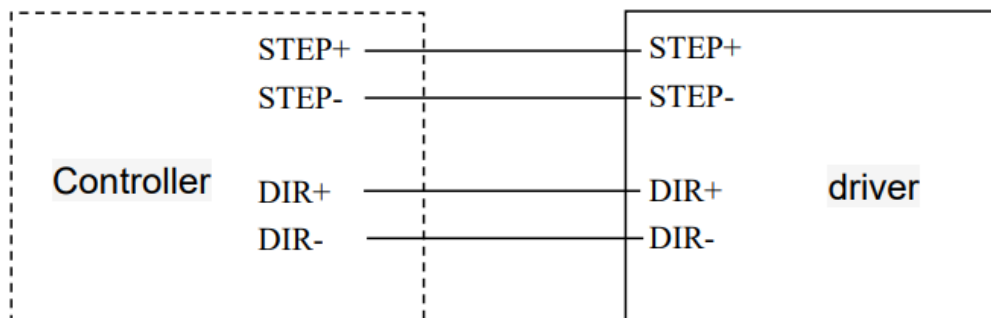


Input signal waveform and timing (double pulse method)

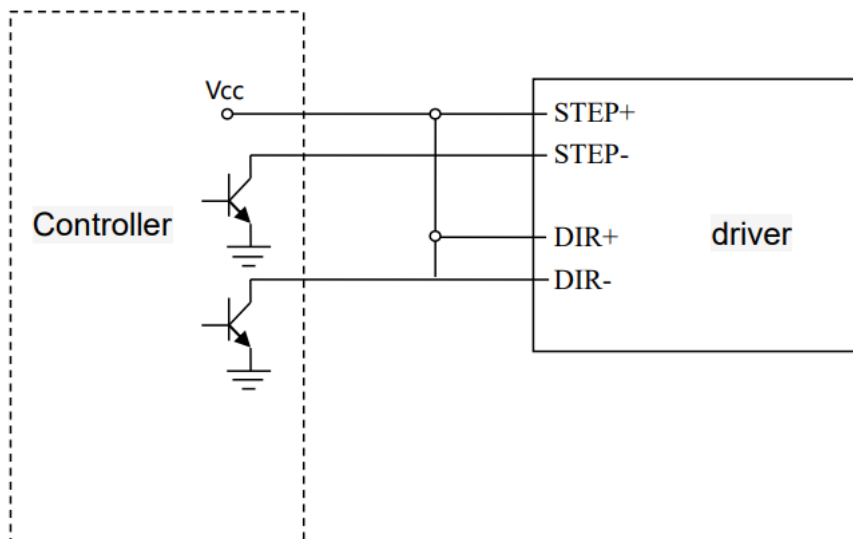


7. Typical Connection of High-Speed Input Port

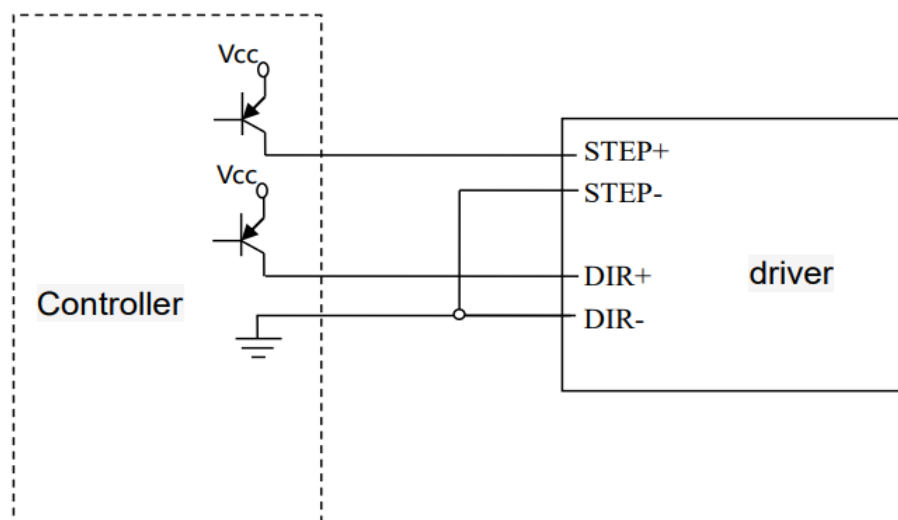
7.1 Differential Connection



7.2 Common Positive Connection

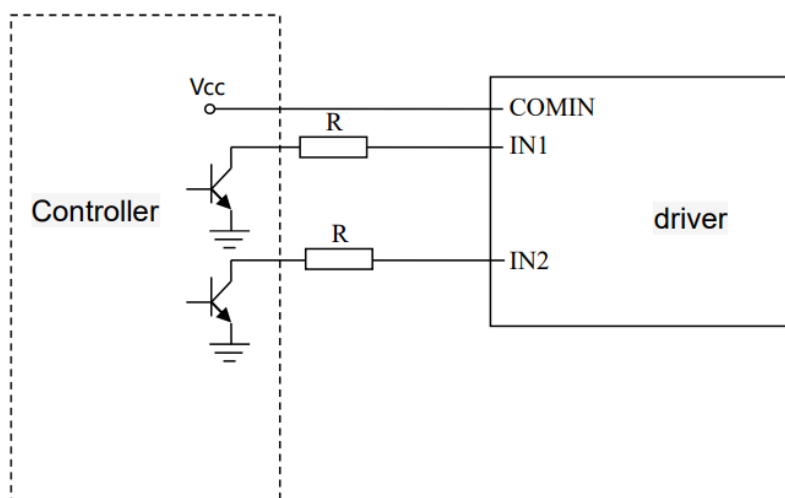


7.3 Common Female Connection

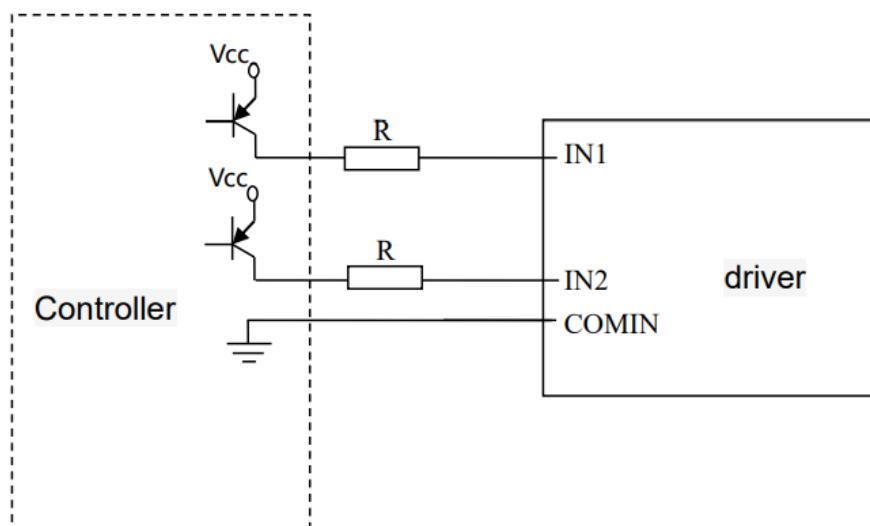


8. Typical Connection of Universal Input Port

8.1 Common Positive Connection



8.2 Common Female Connection

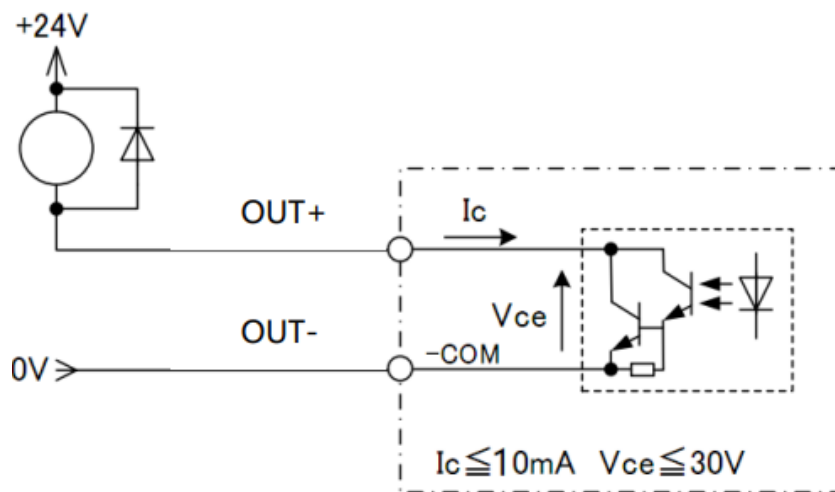


Notes

VCC 3.5-5VDC R=0 Ω;
VCC 12VDC R=1K Ω;
VCC 24VDC R=2.2k Ω;

9. Typical Connection of Signal Output

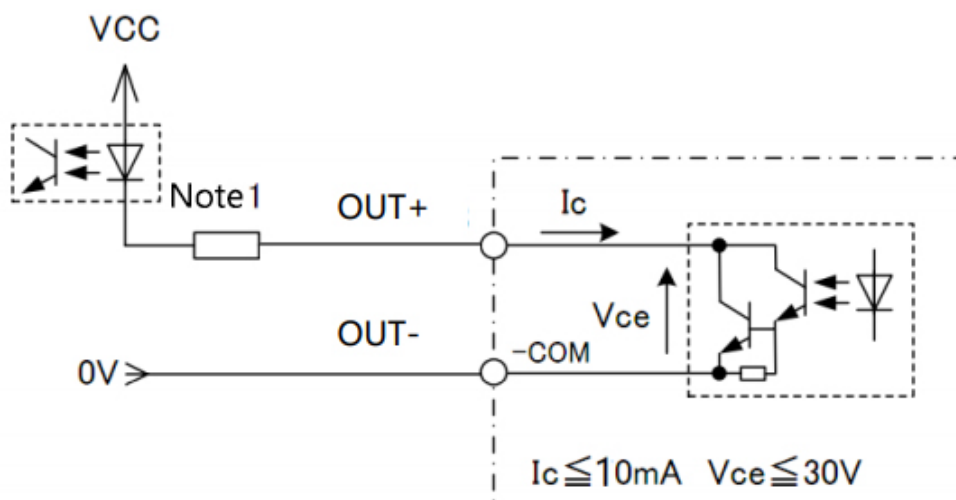
9.1 Relay Connection



Notes

When the relay is connected, it is required to connect diodes at both ends of the relay (such as IN4000 series)

9.2 Optocoupler Connection



- The alarm output is optically isolated, with a maximum voltage of 30VDC and a maximum saturation current of 10mA.
- When the driver is working normally, the output is closed.
- When the drive fails, the output is left floating.

10. Control Parameter

10.1 Status (Class 00)

adr	word	content	Elaborate	Range / unit		
0100	1	Actual motor current	Real-time current value	0.1%		
0101	1	Input voltage	Real-time input power voltage value	1V		
0104	2	Microstep resolution	Setted microstep resolution value	ppr		
0106	1	Pulse mode	1 is pulse + direction mode, 2 is double pulse mode	1-2		
0108	1	Error code	Please refer to the alarm code for details, and display "0" for no fault			
			Error Code	LED Blinks	Communication value	Description
			Over current	1	10	Motor phase current over or drive failure
			Motor phase	2	11	Motor wire were not connected
			Over voltage	3	14	Power voltage is over than 42V
			Under voltage	4	13	Power voltage is less than 18V
0109	1	Operating status	Drive running status, content indicator flashing description			
			Status	Communication value	Description	
			Stopping	2	The motor is holding but the motor is not running	
			Running	3	The motor is running	
			Motor free	1	The motor can move freely	
0110	1	Hardware version	Drive hardware version	-		
0111	1	Software version	Drive software version	-		
0117	2	Target position	Target position	pulse		
0119	1	Actual speed	Real-time speed value	0.01rps		
0126	1	Actual position	Real-time Position value	pulse		

10.2 Basic Settings (Class 01)

adr	word	content	Elaborate	Range / unit
0201	1	Direction switch	Direction settings: 0:Default 1:Reverse running direction	0 ~ 1
0202	1	Pulse edge	Pulse edge setting, pulse mode only: 0:Falling edge	0 ~ 1

			1:Rising edge	
0213	1	Half current proportion	Stop current percentage setting. Open-loop mode only	10%~100%
0224	1	Smooth filter	The smaller the value, the smoother the operation and the higher the delay time	0~700
0234	1	Pulse filter	The filter coefficient of the input pulse, The higher the value, the lower the pulse frequency response. Pulse mode only.	1~15
0241	1	Current setting	Current setting(mA)	100~3200 0.1A~~3.2A
0242	2	Microstep setting	Microstep setting(ppr).	200~102400 ppr
0244	1	Pulse mode	Pulse mode, pulse mode only: 1:Pulse + Dir 2:Pulse + Pulse	1~2
0245	1	Half current time	Delay time(ms) for motor to enter stop state after stop running. Open-loop mode only	1~30000 ms
0296	1	Control mode	Control mode: 0:Pulse control 1:Integrate control	0~1
0298	1	Station number	Station NO. settings. Reconnect is needed after modification.	1~250
0299	2	Baud rate	Baud rate setting. Take effect after the driver restart. Settable value:4800,9600,14400,19200,38400,57600,115200.	4800~115200

10.3 Motion Settings (Class 04)

addr	word	content	Elaborate	Range / unit
0301	1	Start velocity	Start velocity, invalid in pulse control mode. Unit:0.01rps	1~1000 0.01~20rps
0302	1	Start velocity	Start velocity, invalid in pulse control mode. Unit:0.01rps	1~1000 0.01~20rps
0303	1	Acceleration	Acceleration, invalid in pulse control mode. Unit:rps ²	5~500 rps ²
0304	1	Deceleration	Acceleration, invalid in pulse control mode. Unit:rps ²	5~500 rps ²
0305	1	Homing mode	Homing mode, invalid in pulse control mode: 0:Forward to origin 1:Backward to origin 2:Forward to limit+ 3:Backward to limit-	0~3
0306	1	Velocity for position mode	The maximum velocity for position mode, invalid in pulse control mode. Unit:0.01rps.	1~5000 0.01~50rps
0307	1	Velocity for velocity mode	The maximum velocity for velocity mode, invalid in pulse control mode. Unit:0.01rps.	-5000~5000 -50~50rps
0308	1	Velocity for JOG mode	The maximum velocity for JOG mode, invalid in pulse control mode. Unit:0.01rps.	1~5000 0.01~50rps
0309	1	Homing approach velocity	Approach velocity for homing, invalid in pulse control mode. Unit:0.01rps.	1~5000 0.01~50rps
0310	1	Homing creep velocity	Creep velocity for homing, invalid in pulse control mode. Unit:0.01rps.	1~5000 0.01~50rps
0311	2	Homing offset	The homing offset, invalid in pulse control mode.	-2000000000~ 2000000000 pulse

0313	2	Target Position		
0317	2	Soft limit+	Soft limit+ setting, invalid in pulse control mode.	-2000000000~ 2000000000 pulse
0319	2	Soft limit-	Soft limit- setting, invalid in pulse control mode.	-2000000000~ 2000000000 pulse
0321	2	Set current position	Default: 0	-2000000000~ 2000000000 pulse
0323	1	Control commands	0: empty 1: Absolute running, running to the set distance, running direction is determined by distance plus or minus, speed plus or minus value is invalid, it is effective to modify target position during running 2: Relative running, running at a set distance and running speed. The running direction is determined by the distance plus or minus. The speed plus or minus value is invalid. Modifying the movement distance during running is invalid 3: Speed mode 4: Jog forward 5: Reverse jog 6: Deceleration and stop 7: Emergency stop 8: Set the current position, which can only be set when the motor is stopped 12: Back to origin 13: Alarm clear 20: Enable Default: 0	0~29
0324	1	Memory switch	Memory switch setting, invalid in pulse control mode: bit0: Disable or enable Soft limit+ bit1: Disable or enable Soft limit-	0-65535
0325	1	Max acceleration	Maximum acceleration, invalid in pulse control mode. Unit:rps2	5-10000

10.4 Input Settings (Class 05)

addr	word	content	Elaborate	Range / unit
0400	1	IN1 function	0: No function 1: Absolute position run, invalid in pulse control mode 2: Relative position run, invalid in pulse control mode 3: Velocity run, invalid in pulse control mode 4: JOG+, invalid in pulse control mode 5: JOG-, invalid in pulse control mode 6: Stop. Slow down and stop, invalid in pulse control mode 7: E-Stop. Quick stop 8: Set position trigger, invalid in pulse control mode, current position is set by addr-321 9: Limit+ signal 10: Limit- signal 11: Origin signal 12: Homing run, invalid in pulse control mode; 13: Alarm clear 14: Not Supported 15: Not Supported 16: Program run, invalid in pulse control mode 17: Program suspend, invalid in pulse control mode 18: Program stop, invalid in pulse control mode	0~30

			19:Not Supported 20:Servo ON/OFF control 21:Move forward for a distance, invalid in pulse control mode 22:Move backward for a distance, invalid in pulse control mode 23:Not Supported 24:Not Supported 25:Program select bit0, invalid in pulse control mode 26:Program select bit1, invalid in pulse control mode 27:Program select bit2, invalid in pulse control mode 28:Program select bit3, invalid in pulse control mode 29:Program select bit4, invalid in pulse control mode	
0401	1	IN2 function	The setting content is the same as IN1 (default value: 0)	0~30
0402	1	IN3 function	The setting content is the same as IN1 (default value: 0)	0~30
0403	1	IN4 function	The setting content is the same as IN1 (default value: 0)	0~30
0429	1	Universal digital input logic	Input port logic, range:1 ~ 32767, corresponding IN[7:1]: 0000000 ~ 1111111.	0~32767

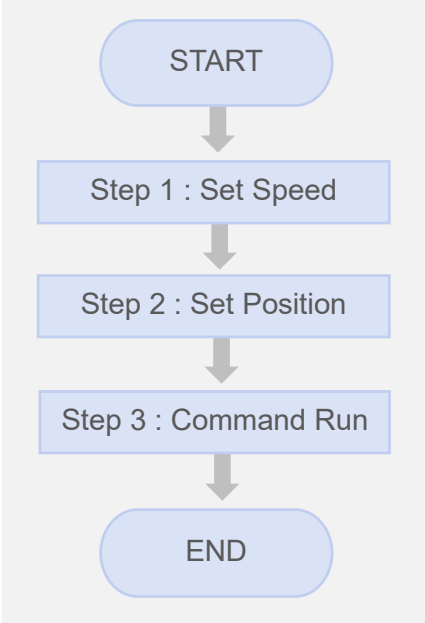
10.5 Output Settings (Class 06)

adr	word	content	Elaborate	Range / unit
0420	1	OUT1 function	100:Controllable output, controlled by addr 428 101:Alarm out, no output when alarm occurs 102:In-position indication 103:Servo ON/OFF indication, no output when servo ON	100~103
0430	1	Output port logic	Output port logic, range:0 ~ 15, corresponding OUT[4:1]: 0000 ~ 1111.	0~15

11. Modbus-RTU Example

11.1 Running Motor

11.1.1 Absolute Position Mode



Step	Add.	Word	Content	Range	Unit
1	0306	1	Velocity for position mode	1 ~ 5000	0.01 rps
2	0313	2	Target Position	-2,000,000,000 ~ 2,000,000,000	pulse
3	0323	1	Control commands	0 ~ 29	-

● Example. 1

Step 1 : Set Speed

Slave ID	1 (0x01)	Driver ID
Function	6 (0x06)	Write Single Register
Address	306 (0x0132)	Running Speed
Data	1200 (0x04B0)	1200 = 12 RPS = 720 RPM
CRC	0x8D2A	CRC-16

Request							
Slave ID	Function	Starting Address		Data		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x06	0x01	0x32	0x04	0xB0	0x2A	0x8D
CRC 16							

Response							
Slave ID	Function	Starting Address		Data		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x06	0x01	0x32	0x04	0xB0	0x2A	0x8D
CRC 16							

● **Example. 2**

Step 2 : Set Position

Slave ID	1 (0x01)	Driver ID
Function	16 (0x10)	Write Multi Register
Address	313 (0x0139)	Target Position
Quantity	2 (0x02)	Quantity of Registers
Data	5000 (0x00001388) -5000 (0xFFFFEC78)	5000 pulse -5000 pulse

Request												
Slave ID	Function	Starting Address		Quantity of Registers		Byte Count	Data 1		Data 2		CRC 16	
		Hi	Lo	Hi	Lo		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x10	0x01	0x39	0x00	0x02	0x04	0xEC	0x78	0xFF	0xFF	0x88	0x78
CRC 16												

Response							
Slave ID	Function	Starting Address		Quantity of Registers		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x10	0x01	0x39	0x00	0x02	0x90	0x39
CRC 16							

● **Example. 3**

Step 3 : Command Run

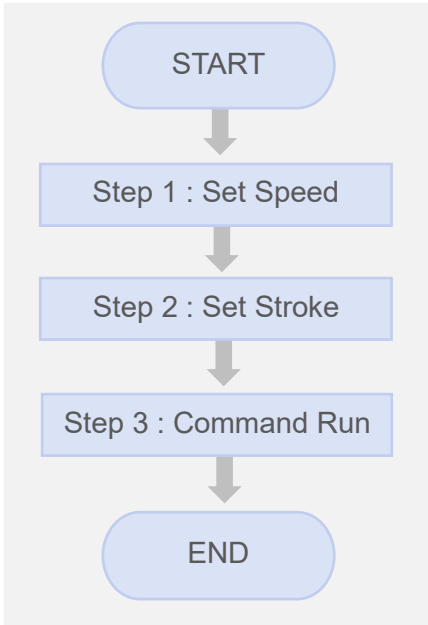
Slave ID	1 (0x01)	Driver ID
Function	6 (0x06)	Write Single Register
Address	323 (0x0143)	Command Run
Data	01 (0x0001)	1 : Absolute running
CRC	0x23F8	CRC-16

Request							
Slave ID	Function	Starting Address		Data		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x06	0x01	0x43	0x00	0x01	0xB8	0x22
CRC 16							

Response							
Slave ID	Function	Starting Address		Data		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x06	0x01	0x43	0x00	0x01	0xB8	0x22

CRC 16	
--------	--

11.1.2 Relative Position Mode



Step	Add.	Word	Content	Range	Unit
1	0306	1	Velocity for position mode	1 ~ 5000	0.01 rps
2	0313	2	Target Position	-2,000,000,000 ~ 2,000,000,000	pulse
3	0323	1	Control commands	0 ~ 29	-

● Example. 1

Step 1 : Set Speed

Slave ID	1 (0x01)	Driver ID
Function	6 (0x06)	Write Single Register
Address	306 (0x0132)	Running Speed
Data	1200 (0x04B0)	1200 = 12 RPS = 720 RPM
CRC	0x8D2A	CRC-16

Request							
Slave ID	Function	Starting Address		Data		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x06	0x01	0x32	0x04	0xB0	0x2A	0x8D
CRC 16							

Response							
Slave ID	Function	Starting Address		Data		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x06	0x01	0x32	0x04	0xB0	0x2A	0x8D
CRC 16							

● Example. 2

Step 2 : Set Stroke

Slave ID	1 (0x01)	Driver ID
Function	16 (0x10)	Write Multi Register
Address	313 (0x0139)	Running Stroke
Quantity	2 (0x02)	Quantity of Registers
Data	5000 (0x00001388) -5000 (0xFFFFEC78)	5000 pulse -5000 pulse

Request

Slave ID	Function	Starting Address		Quantity of Registers		Byte Count	Data 1		Data 2		CRC 16	
		Hi	Lo	Hi	Lo		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x10	0x01	0x39	0x00	0x02	0x04	0x13	0x88	0x00	0x00	0xB9	0xEF
CRC 16												

Response

Slave ID	Function	Starting Address		Quantity of Registers		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x10	0x01	0x39	0x00	0x02	0x90	0x39
CRC 16							

● Example. 3

Step 3 : Command Run

Slave ID	1 (0x01)	Driver ID
Function	6 (0x06)	Write Single Register
Address	323 (0x0143)	Command Run
Data	02 (0x0002)	2 : Relative running
CRC	0x23F8	CRC-16

Request

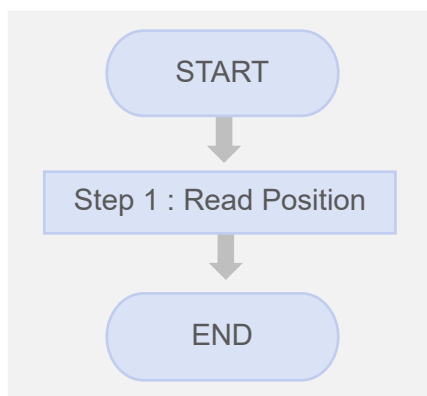
Slave ID	Function	Starting Address		Data		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x06	0x01	0x43	0x00	0x02	0xF8	0x23
CRC 16							

Response

Slave ID	Function	Starting Address		Data		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x06	0x01	0x43	0x00	0x02	0xF8	0x23
CRC 16							

11.2 Read Motor Status

11.2.1 Read Current Position



Step	Add.	Word	Content	Range	Unit
1	0117	2	Target position	-2,000,000,000 ~ 2,000,000,000	pulse

● Example

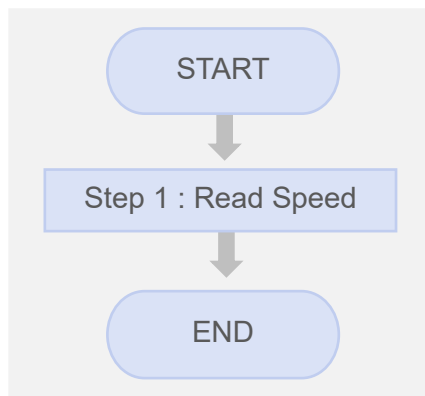
Step 1 : Read Current Position

Slave ID	1 (0x01)	Driver ID
Function	3 (0x03)	Read Register
Address	117 (0x0075)	Current Position
Quantity	2 (0x02)	Quantity of Registers

Request							
Slave ID	Function	Starting Address		Quantity of Registers		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x03	0x00	0x75	0x00	0x02	0xD5	0xD1
CRC 16							

Response IF : current position = 5000 (0 x 00001388)								
Slave ID	Function	Byte Count	Read Registers 126		Read Registers 127		CRC 16	
			Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x03	0x04	0x13	0x88	0x00	0x00	0x7E	0x9D
CRC 16								

11.2.2 Read Current Speed



Step	Add.	Word	Content	Range	Unit
1	0119	1	Actual speed	1 ~ 5000	0.01 RPS

● Example

Step 1 : Read Current Speed

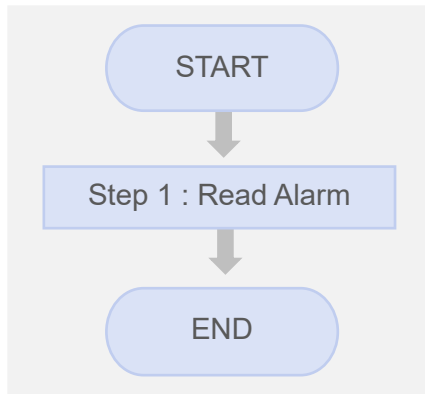
Slave ID	1 (0x01)	Driver ID
Function	3 (0x03)	Read Register
Address	119 (0x0077)	Current Speed
Quantity	1 (0x01)	Quantity of Registers

Request							
Slave ID	Function	Starting Address		Quantity of Registers		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x03	0x00	0x77	0x00	0x01	0x34	0x10
CRC 16							

Response IF : current speed = 1200 (0 x 04B0)						
Slave ID	Function	Byte Count	Read Registers 119		CRC 16	
			Hi	Lo	Lo	Hi
0x01	0x03	0x02	0x04	0xB0	0xBB	0x30
CRC 16						

11.3 Read Alarm Status

11.3.1 Alarm Status



Step	Add.	Word	Content	Range	Unit
1	0108	1	Error code	-	-

● Example

Step 1 : Read Alarm Status

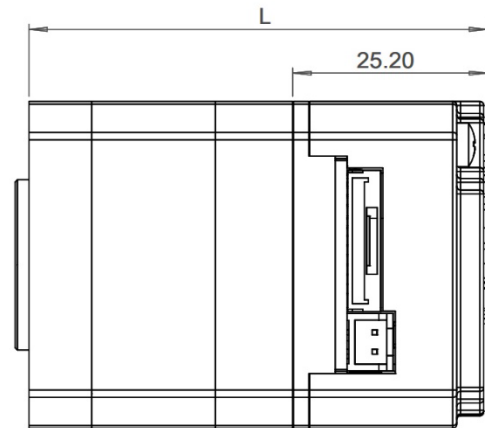
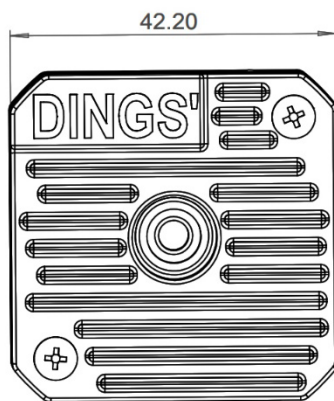
Slave ID	1 (0x01)	Driver ID
Function	3 (0x03)	Read Register
Address	108 (0x006C)	Alarm Status
Quantity	1 (0x01)	Quantity of Registers

Request							
Slave ID	Function	Starting Address		Quantity of Registers		CRC 16	
		Hi	Lo	Hi	Lo	Lo	Hi
0x01	0x03	0x00	0x6C	0x00	0x01	0x44	0x17
CRC 16							

Response IF : alarm status = 11 (0 x 000B) = Motor phase loss							
Slave ID	Function	Byte Count	Read Registers 176		CRC 16		
			Hi	Lo	Lo	Hi	
0x01	0x03	0x02	0x00	0x0B	0xF9	0x83	
CRC 16							

● Overall Dimension

Unit : mm



* For the convenience of viewing, the above is non-standard projection view

* If the driver works continuously under high input voltage and power, the effective cooling area should be expanded or forced cooling should be adopted.

Don't use it in the place with no air circulation or the ambient temperature over 40 °C ;
don't install the driver in the humid or exposed environment.



+86-0519-8517 7825



+86-0519-8517 7807



No. 2850 Luheng Road, Changzhou Economic
Development Zone, Jiangsu Province, China



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International Customer

Person in Charge :

Daniel Jang

daniel@dingsmotion.com

No. 2850 Luheng Road, Changzhou
Economic Development Zone,
Jiangsu Province, China

+86-519-85177825, 85177826

North America Customer

Person in Charge :

Nicolas Ha

sales@dingsmotionusa.com

335 Cochrane Circle Morgan Hill,
CA 95037

+1-408-612-4970

China Customer

Person in Charge :

mcc@dingsmotion.com

No. 2850 Luheng Road, Changzhou
Economic Development Zone,
Jiangsu Province, China

+86-519-85177825, 85177826