电应普
BEST SENSOR

DATASHEET

Product model: DYP-E09-V1.0

https://dypsensor.en.alibaba.com.
SHENZHEN DIANYINGPU TECHNOLOGY CO., LTD.

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一、Overview

(一) . Overview

The 8-in-1 transfer module is a functional transfer module, which can control 1 to 8 ranging modules according to the protocol specified by our company for combination or polling work. The response time of the transfer module is based on the actual work. Depending on the method, this transfer module can be used to detect and monitor the distances of multiple ranging modules in different scenarios, different directions, and multiple ranging modules.

The eight-in-one transfer module is hereinafter referred to as "transfer module" for description.

(二) . Product features and scope of application

1. Features

- DC12V power supply;
- 1 to 8 sensor work control, data integration output;
- Working temperature -15℃ to +60℃;
- The data output is stable and reliable;
- Electrostatic protection design, the input and output interfaces are equipped with electrostatic protection devices, which conform to the IEC61000-4-2 standard.

2. Scope of application

- Robot obstacle avoidance and automatic control.

二、Product introduction

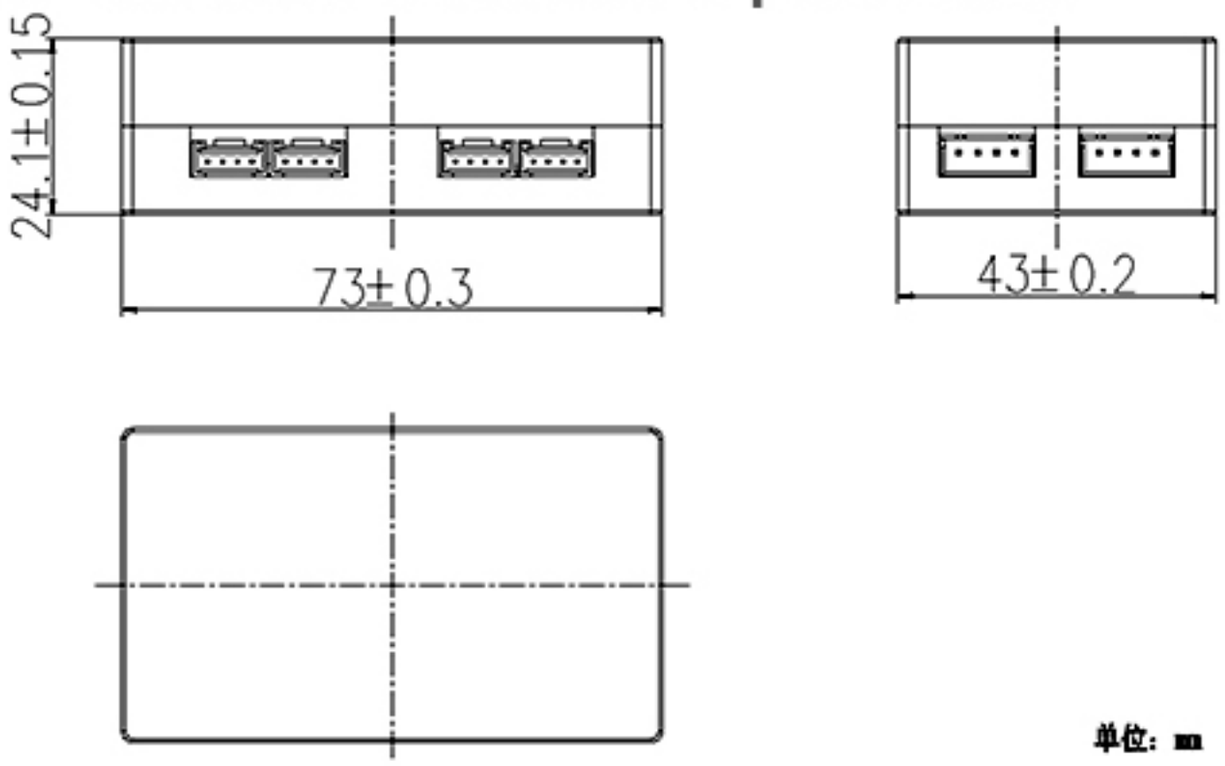
(一) Working parameters

Parameter item	RS485 output	Unit	Remarks
Operating Voltage	12	Unit	DC
Working current	≤130	mA	(1)
Output method	RS485	-	

Note: (1) The power supply is 12V, and the data is the data obtained by connecting 4 A02 sensors and 4 A19 sensors to the converter module. At any time, up to 4 sensors work at the same time, not the current value of 8 sensors working at the same time.

（二） Product size

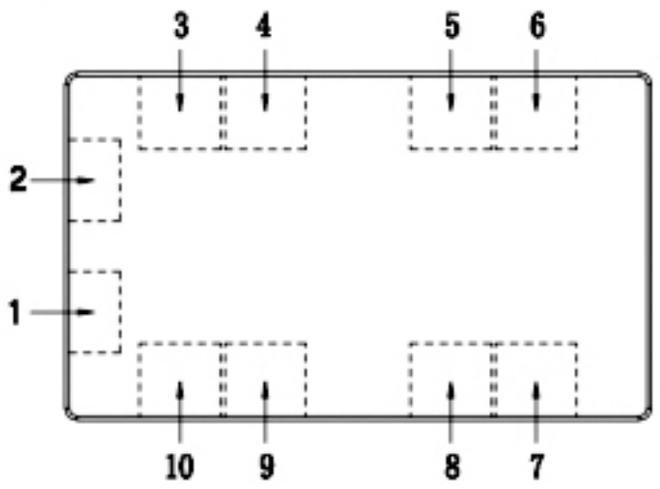
1. Converter module size parameters



单位：mm

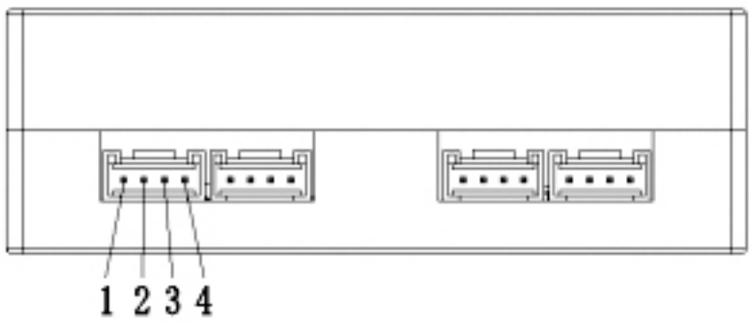
（三） Interface description

1. Converter interface description



No.	Interface name	Interface definition
1	main interface 1	UART interface
2	main interface 2	RS485 interface
3	interface 8	Ranging module interface 8
4	interface 7	Ranging module interface 7
5	Interface 6	Ranging module interface 6
6	interface 5	Ranging module interface 5
7	interface 4	Ranging module interface 4
8	interface 3	Ranging module interface 3
9	interface 2	Ranging module interface 2
10	interface 1	Ranging module interface 1

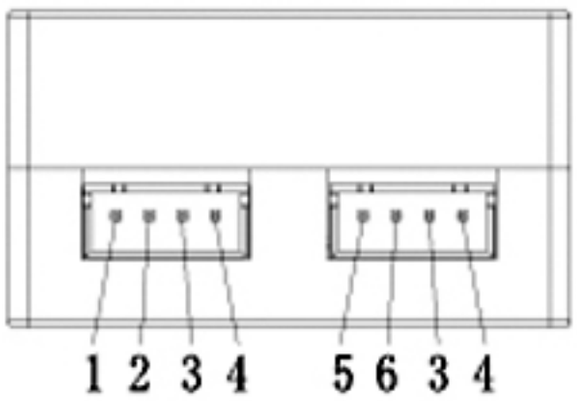
2. Description of interface 1~8



No.	Interface 1 Lead Name	Interface Lead Definition
1	RX	data receiving lead
2	TX	data transmission lead
3	GND	Negative power supply
4	VCC	Positive power supply

Note: The functional lead lines of interfaces 1 to 8 are completely the same, and only interface 1 is

3. Main interface description



No.	Lead name	Leader Definition
1	B	RS485 B line
2	A	RS485 A-line
3	GND	Negative pole of DC12V power supply
4	VCC	Positive pole of DC12V power supply
5	RX	UART RX line
6	TX	UART TX line

（四） Description of output method

1. Main interface 1 output

The main interface 1 is a UART interface that supports UART output protocol or Modbus protocol, and the corresponding model can be selected according to requirements.

The UART output protocol is divided into UART automatic output and UART controlled output, which can be selected and set through the 0x0202 register of the Modbus protocol. Both UART automatic output and UART controlled output have three working modes, which can be selected and set through the 0x0216 register of the Modbus protocol. When interface 1 is the UART output protocol, interface 1 can only respond to Modbus commands within 500ms of power-on of the transfer module.

When the interface 1 is Modbus protocol and the interface 2 is only the hardware interface, there is a difference, and the

2. Main interface 2 output

The main interface 2 is the RS485 interface, the protocol can be set as automatic output or controlled output, and supports the Modbus protocol. For details, please refer to the "Modbus Protocol Description" section.

3. UART output protocol description

（1）Communication parameters

UART	Data bits	Stop bit	Parity	Baud rate
TTL level	8	1	none	9600bps

（2） Output protocol format

Frame data	Illustrate	Byte
Frame header	Fixed to 0XFF	1 byte
Data1_H	The upper 8 bits of interface 1 data	1 byte
Data1_L	Lower 8 bits of interface 1 data	1 byte
Data2_H	The upper 8 bits of interface 2 data	1 byte
Data2_L	Lower 8 bits of interface 2 data	1 byte
Data3_H	The upper 8 bits of the interface 3 data	1 byte

Data3_L	Lower 8 bits of interface 3 data	1 byte
Data4_H	The upper 8 bits of the interface 4 data	1 byte
Data4_L	Lower 8 bits of interface 4 data	1 byte
Data5_H	The upper 8 bits of the interface 5 data	1 byte
Data5_L	Lower 8 bits of interface 5 data	1 byte
Data6_H	The upper 8 bits of the interface 6 data	1 byte
Data6_L	Lower 8 bits of interface 6 data	1 byte
Data7_H	The upper 8 bits of the interface 7 data	1 byte
Data7_L	Lower 8 bits of interface 7 data	1 byte
Data8_H	The upper 8 bits of interface 8 data	1 byte
Data8_L	Lower 8 bits of interface 8 data	1 byte
SUM	Communication checksum	1 byte

Note: The checksum only retains the lower 8 bits of the accumulated value;
SUM =(Frame header+ Data1_H + Data1_L + Data2_H + Data2_L + Data3_H + Data3_L + Data4_H + Data4_L + Data5_H + Data5_L+ Data6_H + Data6_L + Data7_H + Data7_L + Data8_H + Data8_L)&0x00FF

Example:
FF 07 A1 00 5F 00 D5 0F 0F 03 E8 05 DC 08 FC 09 C4 96
SUM = (FF + 07 + A1 + 00 + 5F + 00 + D5 + 0F + 0F + 03 + E8 + 05 + DC + 08 +
FC + 09 + C4)&FF
= 96

The data of interface 1 is 0X07A1, and the decimal value is 1953, that is, 1953mm;
The data of interface 2 is 0X005F, and the decimal value is 95, which is 95mm;
The data of interface 3 is 0X00D5, and the decimal value is 213, that is, 213mm;
The data of interface 4 is 0X0F0F, and the decimal value is 3855, that is, 3855mm.
The data of interface 5 is 0X03E8, and the decimal value is 1000, that is, 1000mm.
The data of interface 6 is 0X05DC, and the decimal value is 1500, that is, 1500mm.
The data of interface 7 is 0X08FC, and the decimal value is 2300, that is, 2300mm.

（3） Output protocol format

After the transfer module completes one work, the "TX" lead of the main interface 1 will output the data corresponding to the interface ranging module, and then immediately perform the second work, and this cycle is repeated. The working cycle is determined by the ranging module connected to the interface. The shorter the response time of the ranging module connected to the interface, the shorter the working cycle of the switching module.

Response time calculation formula:

Mode 1: (28+2*(response time of interface ranging module+12))～(28+2*timeout);

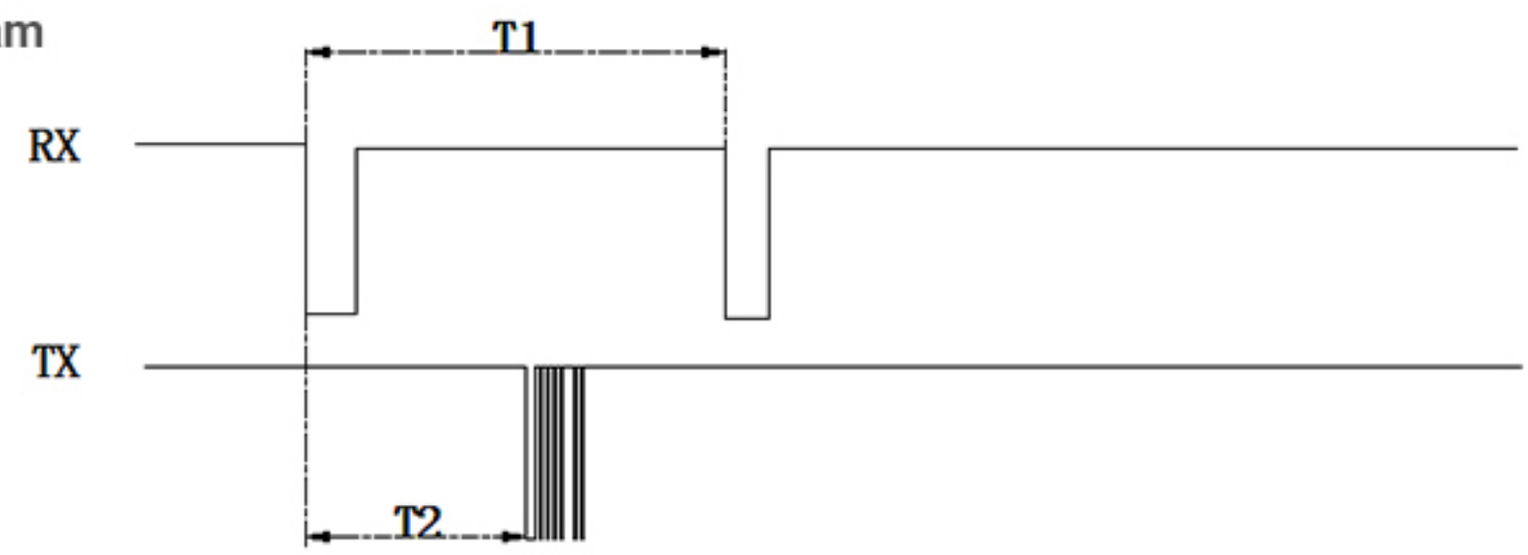
Mode 2: (28+4*(response time of interface ranging module+12))～(28+4*timeout);

Mode 3: (28+8*(response time of interface ranging module+12))～(28+8*timeout);

（4） UART controlled output

When the "RX" lead of the main interface of the transfer module receives a trigger pulse with a falling edge, the transfer module will perform a job, and after the work is completed, the "TX" lead of the main interface will output the corresponding interface ranging module The data.

Timing diagram



T2:

Mode 1: (28+2*(response time of interface ranging module+12))～(28+2*timeout);

Mode 2: (28+4*(response time of interface ranging module+12))～(28+4*timeout);

Mode 3: (28+8*(response time of interface ranging module+12))～(28+8*timeout);’

T1:

T1 =T2+20ms。

Remarks: (1) The response time of the ranging module connected to the interface is determined according to the response time of the actual ranging module connected;

The set timeout is 200ms by default.

4. Modbus protocol description

The transfer module uses the Modbus protocol, which supports modifying the module address, baud rate, and setting the trigger timeout time and other parameters. Through the command, the ranging module of a single interface can be triggered to work, and the measurement of 1 to 4 interfaces can also be triggered. Work simultaneously from the modules.

RS485	Data bits	top bit	Parity	Baud rate
RS485	8	1		9600bps

（1） Modbus protocol parameters

Model	Calibration	Sensor address	Read function code	Write function code
Modbus-RTU	CRC-16/MODBUS	Can be set, default 0x01	0x03	0x06

（2） Modbus protocol format

The user machine is the host device, and our switch module is the slave device.

Host sends (read):

Name	Device address	Function code 0x03	Register address	Number of registers	CRC16 checksum
Length (Byte)	1	1	2	2	2

The slave responds (read):

Name	Device address	Function code 0x03	Return bytes	Data area	CRC16 checksum
Length (Byte)	1	1	1	N	2

Host sends (writes):

Name	Device address	Function code 0x06	Register address	Data area	CRC16 checksum
Length (Byte)	1	1	2	2	2

Host sends (writes):

Name	Device address	Function code 0x06	Register address	Data area	CRC16 checksum
Length (Byte)	1	1	2	2	2

(3) Modbus register

State	Register Address	Register Function	Type of Data	Description (for reference)
read and write	0x0106	Interface 1 data	unsigned int, 16 bits	Trigger interface 1 to work and return the data of the ranging module connected to interface 1, unit: consistent with the connected ranging module
read and write	0x0107	interface 2 data	unsigned int, 16 bits	Trigger interface 2 to work and return the data of the ranging module connected to interface 2, unit: consistent with the connected ranging module
read and write	0x0108	interface 3 data	unsigned int, 16 bits	Trigger interface 3 to work and return the data of the ranging module connected to interface 3, unit: consistent with the connected ranging module
read and write	0x0109	interface 4 data	unsigned int, 16 bits	Trigger interface 4 to work and return the data of the ranging module connected to interface 4, unit: consistent with the connected ranging module
read and write	0x010A	interface 5 data	unsigned int, 16 bits	Trigger interface 5 to work and return the data of the ranging module connected to interface 5, unit: consistent with the connected ranging module
read and write	0x010B	interface 6 data	unsigned int, 16 bits	Trigger interface 6 to work and return the data of the ranging module connected to interface 6, unit: consistent with the connected ranging module
read and write	0x010C	interface 7 data	unsigned int, 16 bits	Trigger interface 7 to work and return the data of the ranging module connected to interface 7, unit: consistent with the connected ranging module
read and write	0x010D	interface 8 data	unsigned int, 16 bits	Trigger interface 8 to work and return the data of the ranging module connected to interface 8, unit: consistent with the connected ranging module

<table>
<tr><td>read and write</td><td>0x0200</td><td>slave address</td><td>unsigned int, 16 bits</td><td>Range: 0x01～0xFE, default 0x01, 0xFF is the broadcast address</td></tr>
<tr><td>read and write</td><td>0x0201</td><td>baud rate</td><td>unsigned int, 16 bits</td><td>0x01-2400, 0x02-4800, 0x03-9600, 0x04-14400, 0x05-19200, 0x06-38400, 0x07-57600, 0x08-76800, 0x09-115200
Default 0x03,9600bps;</td></tr>
<tr><td>read and write</td><td>0x0202</td><td>output mode</td><td>unsigned int, 16 bits</td><td>0x00: Controlled output mode, trigger work according to the corresponding protocol;
0x01: Automatic output mode, automatically work and output the distance value corresponding protocol format;</td></tr>
<tr><td>read and write</td><td>0x0215</td><td>Time of trigger timeout</td><td>unsigned int, 16 bits</td><td>Set how long after the trigger ranging module operation has not received the ranging module response module considered timeout, unit 10ms
Range: 0x08~0xC8, the default value is 0x14, and the decimal value is 20, that is, 200ms</td></tr>
<tr><td>read and write</td><td>0x0216</td><td>Interface sensor working mode</td><td>unsigned int, 16 bits</td><td>0x01 Mode 1: triggers four interfaces to work simultaneously, First trigger the 1,2,3,8 interface work, Then trigger the 4,5,6,7 interface work, Finally, output the measurement data of eight interfaces;

0x02 mode 2: trigger two interfaces to work simultaneously, Trigger work is in the order of pairwise combinations with 1 and 2, 3 and 8, 4 and 5, 6 and 7 , and output the measurement data of eight interfaces finally ;

0x03 mode 3: trigger the ranging module work of 1-8 interfaces in order, Last output the measurement data of eight interfaces;
Default : 0x03
Note: only valid when the 0X0202 register is 1</td></tr>
<tr><td>read and write</td><td>0x0228</td><td>interface switch</td><td>unsigned int, 16 bits</td><td>
<table>
<tr><td>15~8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>rese -rve</td><td>interf -ace8</td><td>interf -ace7</td><td>interf -ace6</td><td>interf -ace5</td><td>interf -ace4</td><td>interf -ace3</td><td>interf -ace2</td><td>interf -ace1</td></tr>
<tr><td colspan="9">Each bit of the lower 8 bits of the register corresponds to an interface. The corresponding position 1 indicates the closed interface, 0 indicates the open interface and the default 0x0000 is all open.</td></tr>
</table>
</td></tr>
</table>

Remarks: 1. Register data is high byte first, low byte last;

（4） Precautions for simultaneous triggering of multiple interfaces

The module interfaces are divided into 4 groups in total. The interfaces of the same group cannot work at the same time, but can be combined with the interfaces of other groups. Therefore, only 4 interfaces can be triggered to work at the same time. Work at the same time, but interface 1 and interface 2 are not in the same group and can work at the same time, and interface 6 and interface 7 can also work at the same time. When the module is set to the controlled output mode, when using the modbus protocol to trigger multiple interfaces to work at the same time, it is necessary to pay attention to whether the triggered interfaces are in the same group. If two interfaces of the same group are accidentally triggered at the same time, only the interface number is smaller The interface will be triggered. For example, interface 2, interface 3, and interface 4 are triggered at the same time. Because interface 2 and interface 4 belong to the same group, only interface 2 and interface 3 will work in the end.

Interface grouping list:

Grouping	interface	interface
①	1	5
②	2	4
③	3	7
④	6	8

（5） Response time

In automatic output mode, the response time indicates the period of data output by the main interface, and in controlled output mode, it indicates the time from when the main interface receives the last byte command sent by the host to the time when the main interface starts to output the first byte of data.

Calculation formula of response time in automatic output mode:

Mode 1: (28+2*(response time of interface ranging module+12))~(28+2*timeout);

Mode 2: (28+4*(response time of interface ranging module+12))~(28+4*timeout);

Mode 3: (28+8*(response time of interface ranging module+12))~(28+8*timeout);

Controlled output mode response time calculation formula:

(11+(response time of interface ranging module+12))~(11+timeout time);

（6） Example of Modbus communication

Example 1: Read data from interface 1
Host: 01 03 01 06 00 01 65 F7
Slave: 01 03 02 00 22 38 5D
Description: The data read to interface 1 is 0X0022, the decimal value is 34, that is, 34mm

Example 2: Read data from interface 2
Host: 01 03 01 07 00 01 34 37
Slave: 01 03 02 02 6B F8 CB
Description: The data read to interface 2 is 0X026B, the decimal value is 619, that is, 619mm

Example 3: Read data from interface 3
Host: 01 03 01 08 00 01 04 34
Slave: 01 03 02 01 26 38 0E
Description: The data read to interface 3 is 0X0126, and the decimal value is 294, that is, 294mm

Example 4: Read data from interface 4
Host: 01 03 01 09 00 01 55 F4
Slave: 01 03 02 01 9D 78 7D
Description: The data read to interface 4 is 0X019D, the decimal value is 413, that is, 413mm

Example 5: Read data on N interfaces at the same time
Host: 01 03 01 06 00 03 E4 36
Slave: 01 03 06 01 B2 01 3F 01 3B 69 0D
Description: Indicates that the values of 3 registers are continuously read from address 0x0106, that is, continuous reading from interface 1
The data on the 3 interfaces, the sensors on the 3 interfaces will be triggered at the same time, and the number of continuous readings is from
1 to 3, which can be used flexibly according to the usage

Example 6: Modify the slave address
Host: 01 06 02 00 00 05 48 71
Slave: 01 06 02 00 00 05 48 71
Description: The sensor address is changed from 0x01 to 0x05 (only valid in RS485 output mode)

Example 7: Modify the baud rate
Host: 05 06 02 01 00 01 19 F6
Slave: 05 06 02 01 00 01 19 F6
Description: The sensor address is 0x05, and the baud rate is modified to 0x01, which is 2400bps

Example 8: Modify the working mode to automatic working mode
Host: 01 06 02 02 00 01 E8 72
Slave: 01 06 02 02 00 01 E8 72
Description: The working mode is modified to 0x0001, that is, the automatic working mode

Example 9: Modify the working mode to a controlled working mode
Host: 01 06 02 02 00 00 29 B2
Slave: 01 06 02 02 00 00 29 B2
Description: The working mode is modified to 0x0000, that is, the controlled working mode

Example 10: Setting the trigger timeout period
Host: 01 06 02 15 00 14 99 B9
Slave: 01 06 02 15 00 14 99 B9
Description: Set the trigger timeout duration to: 0x0014, the decimal value is 20, that is, 200ms, if it exceeds 200ms after triggering
If it fails to receive the data returned by the corresponding interface, it means that the interface triggers a timeout.

Example 11: Set the interface working mode of the adapter module in the automatic working mode
Host: 01 06 02 16 00 03 29 B7
Slave: 01 06 02 16 00 03 29 B7
Description: Set the working mode to 0x0003, set to polling working mode, only valid in automatic working mode

Example 12: Shutting down interface 2 and interface 4
Host: 01 06 02 28 00 0A 88 7D
Slave: 01 06 02 28 00 0A 88 7D

三、Limit parameters

（一）Rated environmental conditions

Project	Minimum	Typical value	Maximum value	Unit	Remark
storage temperature	-25	25	70	℃	
Storage humidity	-	65%	90%	RH	(1)
Operating temperature	-15	25	60	℃	
Working humidity	-	65%	80%	RH	(1)

Description:
a. When the ambient temperature is 0-39°C, the maximum humidity is 90% (non-condensing);
b. When the ambient temperature is 40-50°C, the highest humidity is the highest natural humidity (non-condensing) at the current temperature.

（二）Rated electrical conditions

Parameter item	Parameter item			Unit	Remark
	Minimum	Typical value	Maximum value		
Operating Voltage	11.75	1 2	12.25	V	
Input ripple	-	-	50	mV	peak-to-peak
input noise	-	-	100	mV	peak-to-peak
ESD	-	-	±4K/±8K	V	

Note: The probe shell and output lead conform to the IEC61000-4-2 standard; the contact static electricity is ±4KV, and the air static electricity is ±8KV.

四、The module selection instructions

The E09-8-in-1 adapter module has the following output modes, and the user can choose the corresponding model according to the actual application needs.

No.	E09 model number	interface 1	interface 2	Remark
1	DYP-E094F-V1.0	UART TTL	RS485	Both interfaces are Modbus protocol output
2	DYP-E09TF-V1.0	UART TTL	RS485	Interface 1 is UART controlled output

五、Matters needing attention

1. The company reserves the right to make changes to this document without prior notice;
2. Please pay attention to the structural tolerance when designing. Unreasonable structural design may cause temporary abnormality of the transfer module and radar function;
3. Please pay attention to the electromagnetic compatibility assessment when designing, unreasonable system design may cause abnormal function of the transfer module and radar;
4. When the boundary application of product limit parameters is involved, please contact the FAE of our company to confirm the relevant precautions.

六、Packaging Specifications

1. The default is the conventional packaging method of Dianying General;
2. Packaging materials can be customized according to customer IQC related standards;
3. The container transportation method needs to adopt the staggered LCL method, and at the same time, the outer edge of the single stack needs to be wrapped with a reinforced corner board to provide sufficient support.