Communication Protocol Converter Description

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Revised resume

Date	Version	Modified content
20201016	V1.0	First edition
20201126	V1.1	Setting parameter address modification in USB mode, Cancel write to save address, write data will be automatically saved, add MODBUS-ASCII mode

1 Overview

The communication protocol converter is independently developed and used for the communication conversion needs of the gripper such as PGC/PGE/CGC/PGI, so as to meet the requirements of controlling the gripper under different communication protocols. As shown below:

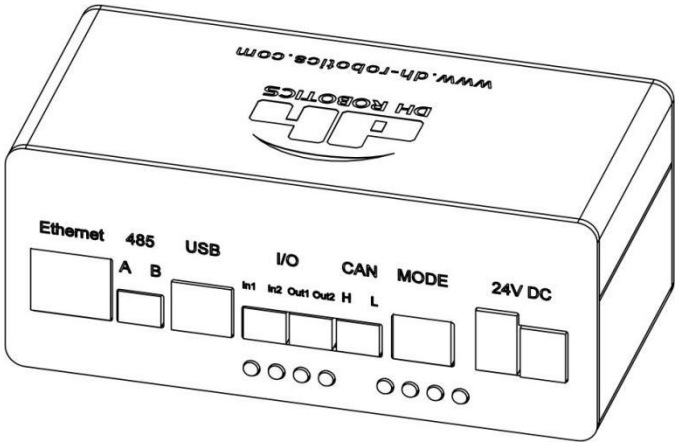
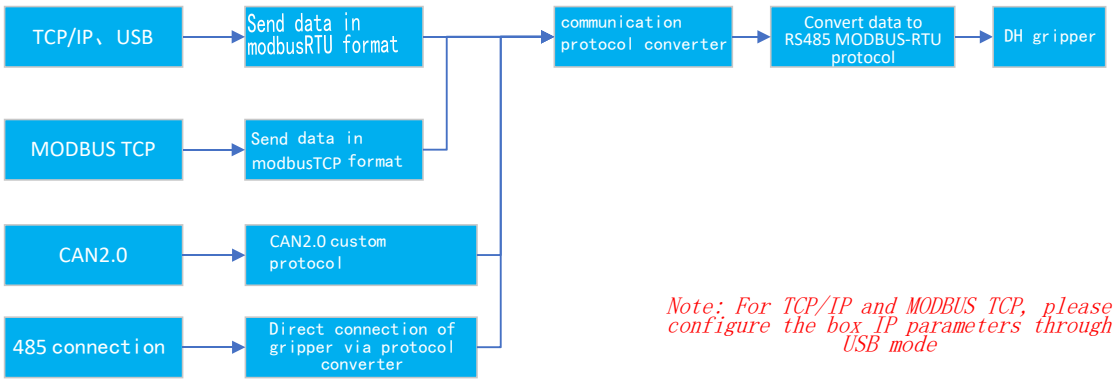


Figure 1.1 Rendering of the communication box

The gripper body is embedded with modbus-RTU protocol and IO mode for control, without any driver and servo. When the above two protocols cannot meet the project requirements, you can use the communication protocol converter to convert other communication protocols (USB, TCP/IP, MODBUS TCP, CAN2.0, etc.) to 485 mode to support different controllers (PC/ PLC/Robot) connection.

The protocol conversion principle is as follows.



Before using the communication protocol converter, you need to know how to set up different working modes. In this chapter, you will learn how to set up different working methods through the communication protocol converter.

1.1 Connection method

The gripper adopts the communication protocol converter for protocol conversion, then the power supply is provided by the communication protocol adapter, and the communication is also transferred by the communication protocol converter. Connect the communication line to different interfaces on the communication protocol converter.

The specific schematic connection diagram is shown in Figure 1.2 (taking the PGC series as an example, the PGE/PGI connection method is the same).

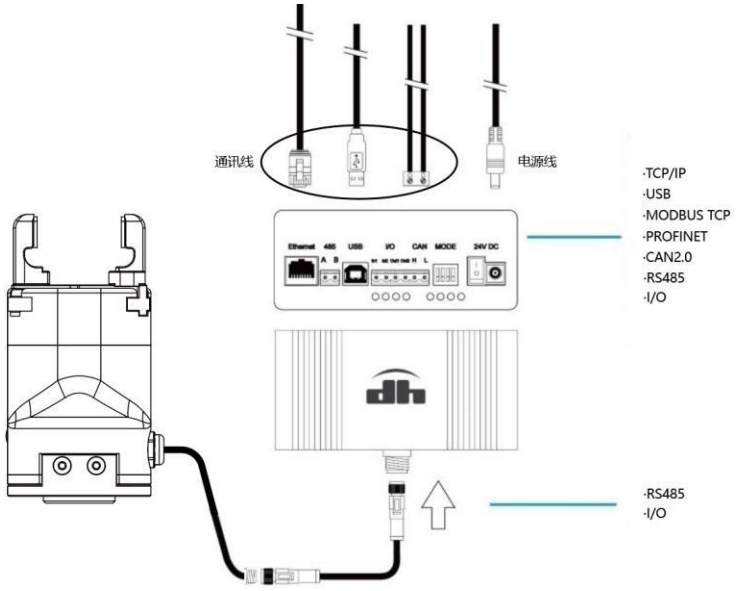


Figure 1.2 Connection Diagram

1.2 Working Mode Selection

The working mode of the communication protocol converter is mainly selected and set through the DIP switch. The communication protocol converter has a four-bit DIP switch, as shown in Figure 1.2. The order of the switch numbers is 1 2 3 4 from the left.

When the switch is up, it is in the "ON" state, and it is marked as 1; when the switch is down, it is in the "OFF" state, and it is marked as 0.

Figure 1.2 Schematic diagram of DIP switch

If the mode is USB mode, starting from the left (ie 1 bit), the switch state is 1 0 0 0 accordingly. The working mode corresponding to the state of the DIP switch is shown in Table 1.1.

Table 1.1 DIP switch status table

Switch status (mode number)	Operating mode	Switch status (mode number)	Operating mode
1 0 0 0	USB Mode	0 0 0 1	MODBUS-TCP Mode
0 1 0 0	TCP Client Mode	1 0 0 1	MODBUS-ASCII Mode
1 1 0 0	TCP Server Mode	1 1 1 0	CAN2.0A Mode
Other modes (ontology comes	MODBUS-RTU Mode	1 1 1 1	Upgrade Mode

with)			

Note: The gripper itself supports MODBUS RTU mode and IO mod

Warning

• Please switch off after each mode switch.

1.1.1 USB Mode

When you set the DIP switch to 1 0 0 0, the communication protocol converter is in USB mode, as shown in Table 1.2.

Table 1.2 USB Modes

Switch status (mode number)	Operating mode
1 0 0 0	USB mode

The USB mode is used for PC-side debugging and modifying the IP address of MODBUS-TCP and TCP/IP.

Access address 0x40 to configure box parameters. All box parameters are set in USB mode. The parameters will take effect after restarting after writing the value to the specified address. The parameters and corresponding addresses are as follows:

Table 1.3 Protocol Converter Address Setting Table

Field name	Address (hexadecimal)		address (decimal)
Client local IP	0x40	0x00~0x01	16384
Client Gateway		0x02~0x03	16386
Client Remote IP		0x04~0x05	16388
Client remote port		0x06	16390
Server server IP		0x07~0x08	16391
Server Gateway		0x09~0x0A	16393
Server port		0x0B	16395
MODBUS TCP port		0x0C	16396
CAN baud rate		0x0D	16397
box software version		0x0E(Read only)	16398

Parameters in USB mode

·In USB mode, the connection baud rate is 115200.

·The current version of the program will have default network parameter values after programming the program for the first time, which does not require manual configuration.

Command example in USB mode:

Initialize gripper:

Send: 01 06 01 00 00 01 49 F6

Return: 01 06 01 00 00 01 49 F6

Set the gripper position to 1000:

Send：01 06 01 03 03 E8 78 88

Reture：01 06 01 03 03 E8 7888

Set up the box server IP 192.168.3.100, gateway 192.168.3.1 and port 8888：

Send：01 10 40 07 00 05 0A C0 A8 03 64 C0 A8 03 01 22 B8 81 A9

Reture：01 10 40 07 00 05 A4 0B

1.1.2TCP Client Mode

When you set the DIP switch to 0 1 0 0, the communication protocol converter is in TCP client mode, as shown in Table 1.4.

Table 1.4. TCP client mode

Switch status (mode number)	Working mode
0 1 0 0 (2)	TCP client mode

In this mode, the communication protocol converter acts as a TCP client and can control the gripper through the TCP/IP protocol. As shown in Table 1.5.

Table 1.5 TCP Client Default Parameters

TCP client default parameters	
Default protocol converter IP	192.168.1.30
Default protocol converter gateway	192.168.1.1
Default remote server IP	192.168.1.60
Default remote server port	8888

If you need to set the communication protocol converter as a TCP client and establish a connection, you need to establish a server side on the controller side (PC/PLC/robot), and the communication protocol converter will start to try to establish a connection with the remote server. Remote service, the remote server can send commands to the gripper for control.

Command example in TCP client mode:

Initialize the gripper:

Send: 01 06 01 00 00 A5 48 4D

Return: 01 06 01 00 00 A5 484D

Set the gripper position to 1000:

Send: 01 06 01 03 03 E8 78 88

Return: 01 06 01 03 03 E8 78 88

Set the gripper position to 0:

Send: 01 06 01 03 00 00 78 36

Return: 01 06 01 03 00 00 7836

Recommendations for using TCP client mode

- Make sure the server is turned on normally.
- You can use the ping command of the computer to test the connection.
- If the computer is used as a network server, it is recommended to check whether the firewall allows the server application to connect to the Internet.
- If the communication protocol converter is directly connected to the computer, please set the computer's wired network Ipv4 address to static IP, and ensure that it is in the same network segment as the gripper. By default, the computer IP should be the 192.168.1.xx network segment:

Example: IP: 192.168.1.60 Subnet Mask: 255.255.255.0

- If the gripper is connected to a control device such as a computer through a router or switch, please confirm that the IP address of the gripper matches the network segment of the router.

1.1.2 TCP server-side mode

When you set the DIP switch to 1 1 0 0, the communication protocol converter is in TCP server-side mode, as shown in Table 1.6.

Table 1.6 TCP server-side modes

Switch status (mode number)	Working mode
1 1 0 0 (3)	1 1 0 0 (3) TCP server mode

In this mode, the communication protocol converter acts as a TCP server and can control the gripper through the TCP/IP protocol, as shown in Table 1.7.

Table 1.7 TCP server side default parameters

TCP server-side default parameters	
Default protocol converter IP	192.168.1.29
Default protocol converter gateway	192.168.1.1
Default listening port	8888

If you need to set the communication protocol converter as a TCP server and establish a connection, you need to establish a client on the controller side (PC/PLC/robot), and the controller side (PC/PLC/robot) can try to communicate with the communication protocol converter server After the connection is established, when the remote service is successfully connected, the controller can send commands to the gripper for control.

Command example in TCP server-side mode:

Initialize the gripper:

Send: 01 06 01 00 00 A5 48 4D

Return: 01 06 01 00 00 A5 48 4D

Set the gripper position to 1000:

Send: 01 06 01 03 03 E8 78 88

Return: 01 06 01 03 03 E8 78 88

Set the gripper position to 0:

Send: 01 06 01 03 00 00 78 36

Return: 01 06 01 03 00 00 78 36

Recommendations for the use of TCP server-side mode

• You can use the ping command of the computer to test the connection.

• If the communication protocol converter is directly connected to the computer, please set the computer's wired network Ipv4 address to static IP, and ensure that it is in the same network segment as the gripper: for example: IP: 192.168.1.60 Subnet mask: 255.255.255.0.

• If the gripper is connected to a control device such as a computer through a router or switch, please confirm that the IP address of the gripper matches the network segment of the router.

1.1.3 CAN2.0 Mode

When you set the DIP switch to 1 1 1 0, the communication protocol converter is in CAN2.0 mode, as shown in Table 1.8.

Table 1.8 CAN2.0 Mode

Switch status (mode number)	Working mode

The input end of the box is connected to the CAN terminal for control, and the CAN baud

rate is 500K. Due to the byte limitation of CAN transmission, the CAN mode

In the formula, only the write single register command (06) and the read single register command (03) are responded. The box converts the CAN data sent by the PC end into MODBUS RTU and forwards it to the gripper, and converts the data returned by the gripper into CAN format and returns it to the PC.

The CAN specific custom protocol is shown in the following table:

Table 1.9 CAN Custom Protocol Format

field	Value	Remark
access address high byte	01	
access address low byte	00	
read and write direction	01	1: Write / 0: Read
reserve	00	
data high byte	00	
data low byte	01	
reserve	00	
reserve	00	

The CAN communication needs to specify the slave ID, and the slave ID must be the same as the gripper ID in order to control the gripper.

CAN2.0 mode default parameters
CAN ID: 1
·CAN baud rate: 500Kbps

CAN mode command format:
Address high byte+address low byte+read/write+00+data high byte+data low byte+00 00 Command example in CAN2.0 mode:
Initialize the gripper:
Send: 01 00 01 00 00 A5 00 00
Return: 01 00 01 00 00 A5 00 00 Set the gripper position to 1000:
Send: 01 03 01 00 03 E8 00 00
Return: 01 03 01 00 03 E8 00 00 Set the gripper position to 0:
Send: 01 03 01 00 00 00 00 00
Return: 01 03 01 00 00 00 00 00

1.1.4 MODBUS-TCP Mode

When you set the DIP switch to 0 0 0 1, the communication protocol converter is in MODBUS-TCP mode, as shown in Table 1.10。

Table 1.10 RS485 Mode

Switch status (mode number)	Working mode
0 0 0 1	MODBUS-TCP

In this mode, the gripper can be controlled via the communication protocol converter using the MODBUS-TCP protocol.

Send it to the gripper, and convert the data returned by the gripper into MOSBUS TCP and return it to the PC.

The brief MODBUS TCP protocol is shown in Table 1.11(a), Table 1.11(b) and Table 1.11(c) below:Table 1.11(a) Writing to a single register

Table 1.11(a) Writing to a single register

field name	TCP(Hex)
Transaction ID high byte (sequence number)	00
Transaction ID low byte (sequence number)	00
Protocol ID high byte	00
Protocol ID low byte	00
Frame length high byte	00
frame length low byte	06
Unit Identifier (Gripper ID)	01
function code	*06*
Write address high byte	01
write address low byte	00
write data high byte	00
write data low byte	01

Table 1.11(b) Reading a single register

field name	TCP(Hex)
Transaction ID high byte (sequence number)	00
Transaction ID low byte (sequence number)	00
Protocol ID high byte	00
Protocol ID low byte	00
Frame length high byte	00
frame length low byte	06
Unit Identifier (Gripper ID)	01
function code	*03*
Read start address high byte	02
Read start address low byte	02
Read the high byte of the number of registers	00
Read the low byte of the	01

number of registers	

Table 1.11(c) Writing to Multiple Registers

field name	TCP(Hex)
Transaction ID high byte (sequence number)	00
Transaction ID low byte (sequence number)	00
Protocol ID high byte	00
Protocol ID low byte	00
Frame length high byte	00
frame length low byte	0B
Unit Identifier (Gripper ID)	01
function code	*10*

Write start address high byte	01
Write start address low byte	01
Write register number high byte	00
Write register count low byte	02
length in bytes	04
write data high byte	00
write data low byte	64
write data high byte	00
write data low byte	64

Example of MODBUS TCP command (xx is any hexadecimal number): Initialize gripper:
Send: xx xx 00 00 00 06 01 06 01 00 00 01
Return: xx xx 00 00 00 06 01 06 01 00 00 01

Set the gripper position to 1000:
Send: xx xx 00 00 00 06 01 06 01 03 03 E8
Return: xx xx 00 00 00 06 01 06 01 03 03 E8

Set the jaw closing and opening forces to 100
Send: xx xx 00 00 00 0B 01 10 01 01 00 02 04 00 64 00 64 Return: xx xx 00 00 00 06 01 10 01 01 00 02

1.2.6 MODBUS-ASCII mode

When you set the DIP switch to 1 0 0 1, the communication protocol converter is in MODBUS-ASCII mode, as shown in Table 1.10

Show.

Table 1.12 RS485 Mode

Switch status (mode number) Working mode

0 0 0 1 MODBUS-ASCII

In this mode, the gripper can be controlled via the communication protocol converter using the MODBUS-ASCII protocol.

In this mode, use the USB cable to connect the box and the PC. The USB interface is a virtual serial port. The MODBUS-ASCII command sent by the host computer will be converted into a MODBUS-RTU command through the communication box and sent to the gripper. On the contrary, the gripper feedback The information will also be converted into MODBUS-ASCII format through the communication box and returned to the host computer。

Command example in MODBUS-ASCII mode: Initialize gripper:

Send: 3A 30 31 30 36 30 31 30 30 30 30 41 35 35 33 0D 0A

Return: 3A 30 31 30 36 30 31 30 30 30 30 41 35 35 33 0D 0A

Set the gripper position to 1000:

Send: 3A 30 31 30 36 30 31 30 33 30 33 45 38 30 41 0D 0A

Return: 3A 30 31 30 36 30 31 30 33 30 33 45 38 30 41 0D 0A

Set the gripper position to 0:

Send: 3A 30 31 30 36 30 31 30 33 30 30 30 30 46 35 0D 0A

Return: 3A 30 31 30 36 30 31 30 33 30 30 30 30 46 35 0D 0A

1.2.7485 Direct Mode

When you set the DIP switch to a mode other than the known mode, the communication protocol converter is 485 direct connection mode, as shown in the table

1.12.

Table 1.13 485 Direct Mode

Switch status (mode number) Working mode

0 0 1 0 (Example) 485 Direct mode

In this mode, the box does not participate in the transformation of data. The data is only transmitted through the 485 interface. The communication protocol format is the standard MODBUS-RTU protocol. For details, you can check the communication control mode of the gripper itself.

Command example in 485 direct mode: Initialize gripper:

Send: 01 06 01 00 00 01 49 F6

Return: 01 06 01 00 00 01 49 F6

Set the gripper position to 1000:

Send: 01 06 01 03 03 E8 78 88

Return: 01 06 01 03 03 E8 78 88

Set the gripper position to 0:

Send: 01 06 01 03 00 00 78 36

Return: 01 06 01 03 00 00 78 36

1.2.8 Upgrade mode

When you set the DIP switch to 1 1 1 1, the communication protocol converter is in the upgrade mode, as shown in Table 1.13.

Table 1.14 RS485 Mode

Switch status (mode number) Working mode

1 1 1 1 Upgrade Mode

This mode is used to upgrade the box firmware program, use USB to connect the PC and the box, and the host computer selects the corresponding bin file to be upgraded to upgrade the firmware.