Yudian AI-TCP (8x88 Special Edition) Protocol Converter Manual

I. Introduction

1.1 Overview

The AI-TCP (8x88 Special Edition) protocol converter is designed to convert the MODBUS protocol of Yudian instruments into the MODBUSTCP protocol. It supports four commands under the MODBUS protocol (03H, 04H, 06H, 10H) to facilitate broader communication with other MODBUS devices. To ensure speed, the protocol conversion uses the RTU (binary) mode.

The AI-TCP protocol converter from Yudian offers two input voltage models: 220V and 24V. It supports data acquisition for up to 12 instruments, with a maximum of 125 WORDs readable at once in RTU mode and a maximum of 32 WORDs writable at once.

The converter has seven sockets, supporting simultaneous access by up to seven host computers.

Precautions:

Only supports 8X88 (version V9.2x and above);

Only supports Modbus to ModbusTCP protocol conversion;

Supports a maximum of 12 instruments (96 channels), with instrument addresses ranging from 1 to 12.

A maximum of 32 data (WORD) can be written at once.

1.2 Appearance

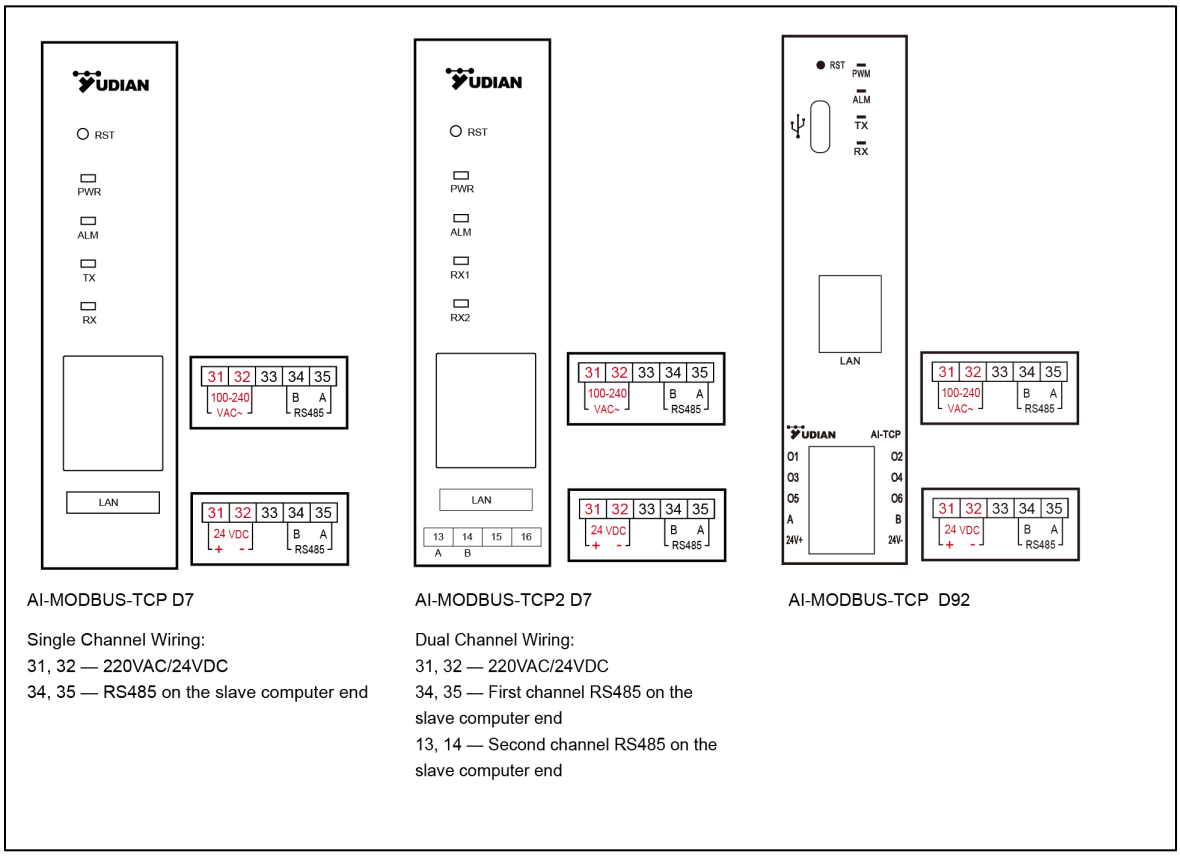
D71 Dimensions D92 Dimensions

Figure 1: AI-TCP1 Protocol Converter

1.3 Model

AI	□	□	□	□	Description
Model					AI-TCP Protocol Converter
Port Selection		TCP1			One instrument end RS485 interface, host computer end Ethernet port
		TCP2			Two instrument end RS485 interfaces, host computer end Ethernet port
Dimensions			D71		
			D92		
Power Supply				100-240AC	Default is 24VDC power supply
				24VDC	

1.4 D71 / D92 Wiring Diagram



AI-MODBUS-TCP D7

Single Channel Wiring:
31, 32 — 220VAC/24VDC
34, 35 — RS485 on the slave computer end

AI-MODBUS-TCP2 D7

Dual Channel Wiring:
31, 32 — 220VAC/24VDC
34, 35 — First channel RS485 on the slave computer end
13, 14 — Second channel RS485 on the slave computer end

AI-MODBUS-TCP D92

Figure 2 AI-Modbus-TCP Multifunctional

II. System Framework

Up to seven host computers can be used. The communication section block diagram is as follows:

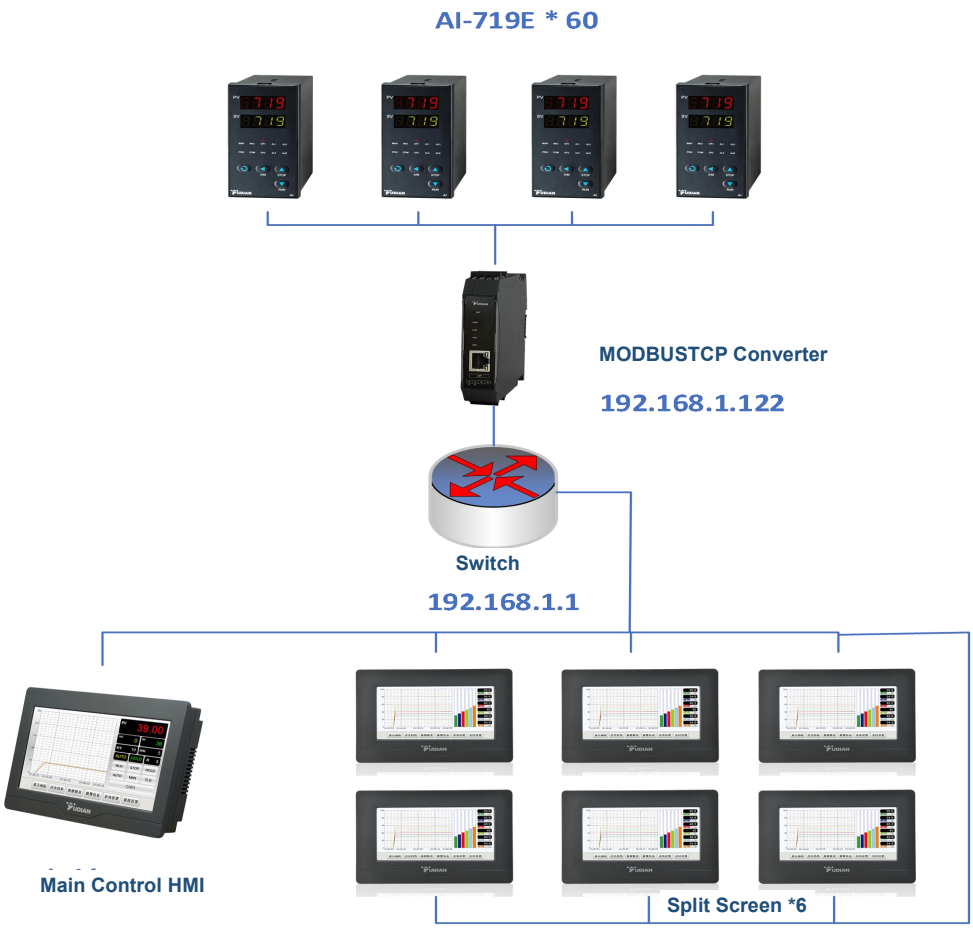


Figure 3　Communication

In this case, the AI-TCP1 protocol converter is used, which has one RS485 channel and can support protocol conversion for up to 12 AI instruments.

III. AI-TCP Protocol Converter Settings

3.1 Setting the Protocol Converter

The default address of the module is 192.168.1.8. Enter this address in the browser's input field to access the protocol converter's settings interface. Note that browsers below IE8 are not supported; use Google Chrome or other browsers instead.
Here, we use Sogou Browser, defaulting to Speed Mode (Compatibility Mode uses the IE kernel, which does not fully support the converter's webpage), as shown below:

Figure 4: Entering the Protocol

Upon entering the settings interface, the first thing visible is the status bar. The MAC address here is the MAC address of the protocol converter.

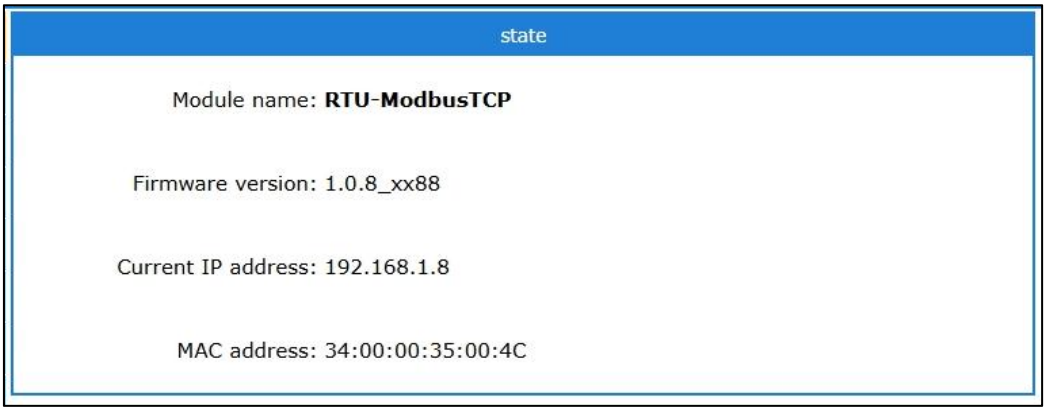


Figure 5 Status

The IP settings interface is shown below. If you need to change the address of the protocol converter, do so here.

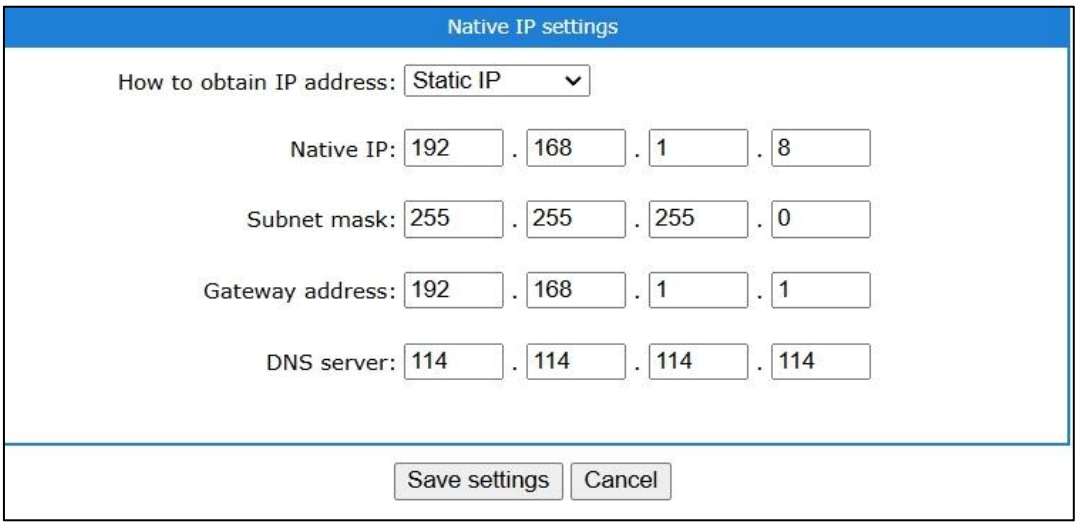


Figure 6 Local IP Settings

The baud rate setting needs to match the instrument.

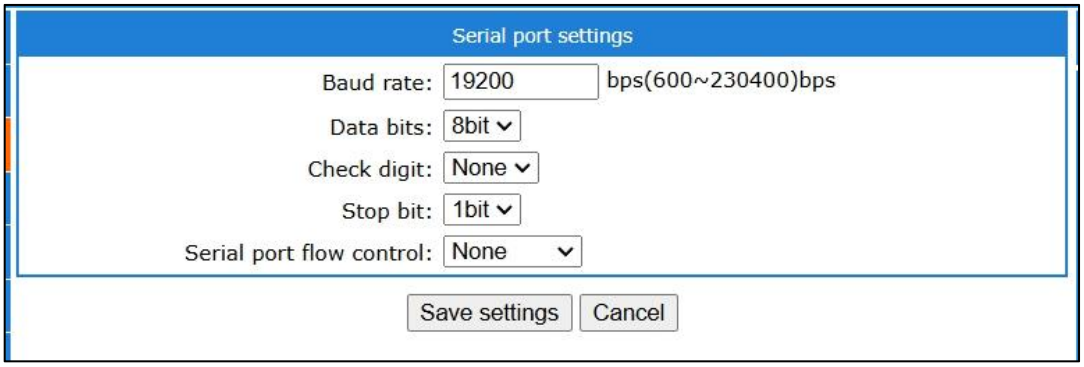


Figure 7: Baud Rate Settings

Click on the first MODBUS to enter the register settings interface and set the registers we need to access, as shown below:

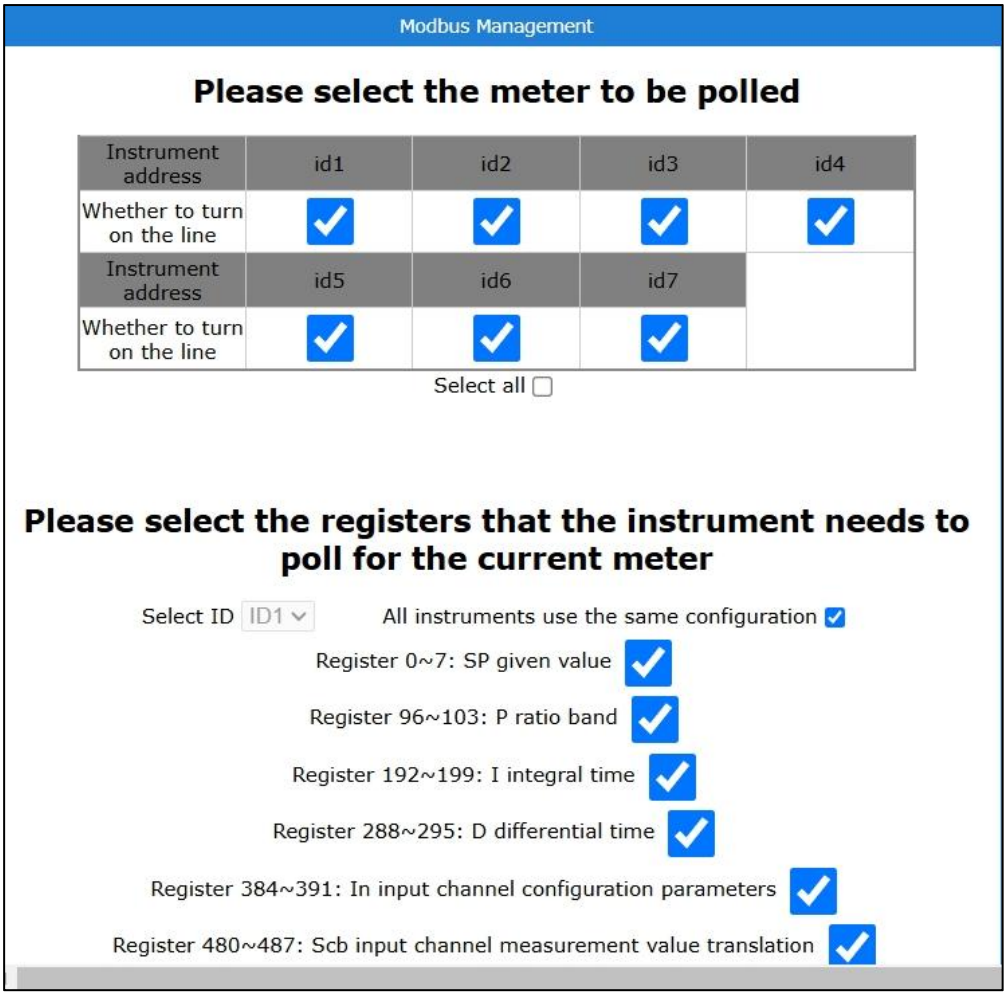


Figure 8 Register Settings

Select Instrument: The converter will poll the selected instruments

Select ID: For example, selecting ID1 means the current configuration is applied to the instrument with ID 1

All Instruments Use the Same Configuration: Once checked, all instruments will be polled according to the current configuration's registers
Select Register: The converter will poll the selected registers

Here, try to select only the instruments that need polling to avoid affecting polling speed.
During use, we can monitor the protocol converter's communication in real-time through the module monitoring interface.

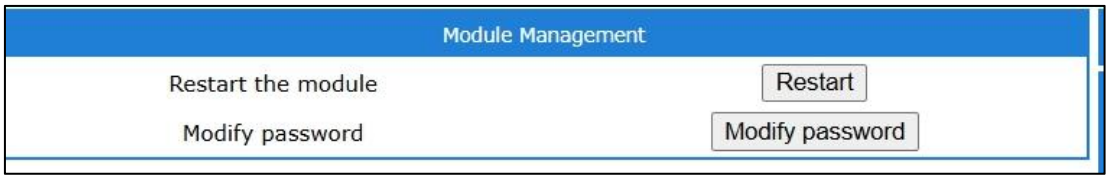


Figure 9 Module Monitoring

3.2 Common Troubleshooting

3.2.1 Unable to Access Settings Webpage

If you cannot access the protocol converter's settings interface, check if the network cable is properly connected and if the network port indicator light is on.
If the network cable is normal, use the ping command to see if you can ping the protocol converter's address. If you cannot ping it, press and hold the protocol converter's reset button for 6 seconds to reset all parameters and try again. If you can ping the protocol converter but cannot access the webpage, check if the browser is in Speed Mode, and try connecting the protocol converter directly via a network cable to eliminate IP address conflicts in the local network.

3.2.2 Instrument Communication Failure

First, check if the baud rate is consistent.
Then, through the "Module Monitoring" section of the webpage, identify which instrument is timing out and handle it accordingly.

IV. AI Instrument Settings

In the communication section, we need to focus on the instrument's address and baud rate. Other settings are not elaborated here; refer to the manual and other cases for detailed settings.

V. Channel Starting Address

Holding Register:
First Channel: 0 (Touch Screen as 40001)
Second Channel: 20000 (Touch Screen as 420001)

Read-Only Register:
First Channel: 0 (Touch Screen as 30001)
Second Channel: 2000 (Touch Screen as 32001)

The first channel starts from 0, the second channel's holding register starts from 20000, and the read-only register starts from 2000.
For example, to read the address 7 of the first instrument of the second channel, the host computer reads the ModbusTCP register as 20007 (42007).

VI. Holding Register (03 Function Code)

<table>
<tr><th colspan="2">ModbusTCP Register</th><th>8x88 Register</th><th>Description</th></tr>
<tr><td rowspan="12">0000~0095</td><td>0000~0007</td><td>Instrument 1 0~7</td><td rowspan="12">Arrange the 0~7 of instruments 1~12 sequentially into 0~95 of ModbusTCP register</td></tr>
<tr><td>0008~00015</td><td>Instrument 2 0~7</td></tr>
<tr><td>0016~00023</td><td>Instrument 3 0~7</td></tr>
<tr><td>0024~0031</td><td>Instrument 4 0~7</td></tr>
<tr><td>0032~00039</td><td>Instrument 5 0~7</td></tr>
<tr><td>0040~00047</td><td>Instrument 6 0~7</td></tr>
<tr><td>0048~0055</td><td>Instrument 7 0~7</td></tr>
<tr><td>0056~00063</td><td>Instrument 8 0~7</td></tr>
<tr><td>0064~00071</td><td>Instrument 9 0~7</td></tr>
<tr><td>0072~00079</td><td>Instrument 10 0~7</td></tr>
<tr><td>0080~00087</td><td>Instrument 11 0~7</td></tr>
<tr><td>0088~00095</td><td>Instrument 12 0~7</td></tr>
<tr><td rowspan="12">0096~0191</td><td>0096~0103</td><td>Instrument 1
96~103</td><td rowspan="12">Arrange the 96~103 of instruments 1~12 sequentially into 96~191 of the ModbusTCP register. The method remains the same for registers before 1664, and further details are not elaborated.</td></tr>
<tr><td>0104~0111</td><td>Instrument 2
96~103</td></tr>
<tr><td>0112~0119</td><td>Instrument 3
96~103</td></tr>
<tr><td>0120~0127</td><td>Instrument 4
96~103</td></tr>
<tr><td>0128~0135</td><td>Instrument 5
96~103</td></tr>
<tr><td>0136~0143</td><td>Instrument 6
96~103</td></tr>
<tr><td>0144~0151</td><td>Instrument 7
96~103</td></tr>
<tr><td>0152~0159</td><td>Instrument 8
96~103</td></tr>
<tr><td>0160~0167</td><td>Instrument 9
96~103</td></tr>
<tr><td>0168~0175</td><td>Instrument 10
96~103</td></tr>
<tr><td>0176~0183</td><td>Instrument 11
96~103</td></tr>
<tr><td>0184~0191</td><td>Instrument 12
96~103</td></tr>
<tr><td>0192~0287</td><td></td><td></td><td>Reference 0096~0191</td></tr>
<tr><td>0288~0383</td><td></td><td></td><td>Reference 0096~0191</td></tr>
<tr><td>0384~0479</td><td></td><td></td><td>Reference 0096~0191</td></tr>
</table>

0480~0575			Reference 0096~0191
0576~0671			Reference 0096~0191
0672~0767			Reference 0096~0191
0768~0863			Reference 0096~0191
0864~0959			Reference 0096~0191
0960~1055			Reference 0096~0191
1056~1151			Reference 0096~0191
1152~1247			Reference 0096~0191
1248~1535			Alternate Address
1536~1631			Reference 0096~0191
1632~1663			Alternate Address
1664~1711	1664~1667	Instrument 1 1664~1667	
	1668~1671	Instrument 2 1664~1667	
	1672~1675	Instrument 3 1664~1667	
	1676~1679	Instrument 4 1664~1667	
	1680~1683	Instrument 5 1664~1667	
	1684~1687	Instrument 6 1664~1667	
	1688~1691	Instrument 7 1664~1667	
	1692~1695	Instrument 8 1664~1667	
	1696~1699	Instrument 9 1664~1667	
	1700~1703	Instrument 10 1664~1667	
	1704~1707	Instrument 11 1664~1667	
	1708~1711	Instrument 12 1664~1667	
1712~1727			Alternate Address
1728~1775			Reference 1664~1711, 4 references per address, up to 12 addresses, totaling 48 parameters
1776~2047			Alternate Address
2048~2112 2116~2131		Instrument 1 2048~2112, 2116~2131	Add 100 addresses to each instrument

2148~2212 2216~2231		Instrument 2 2048~2112, 2116~2131	
2248~2312 2316~2331		Instrument 3 2048~2112, 2116~2129	
...		...	
3048~3112 3116~3131		Instrument 11 2048~2112, 2116~2131	
3148~3212 3216~3231		Instrument 12 2048~2112, 2116~2131	
3300~3315		32-bit Floating Point PV of Instrument 1	
3316~3331		32-bit Floating Point PV of Instrument 2	
3332~3347		32-bit Floating Point PV of Instrument 3	
3348~3363		32-bit Floating Point PV of Instrument 4	
3364~3379		32-bit Floating Point PV of Instrument 5	
3380~3395		32-bit Floating Point PV of Instrument 6	
…		…	
3476~3491		32-bit Floating Point PV of Instrument 12	
3500~3515		32-bit Integer PV Combination of Instrument 1	PV = High 16 bits / 10.0 + Low 16 bits / 65536 The multiplier for the high 16 bits depends on the input type
3516~3531		32-bit Integer PV Combination of Instrument 2	

3532~3547		32-bit Integer PV Combination of Instrument 3	
3548~3563		32-bit Integer PV Combination of Instrument 4	
3564~3579		32-bit Integer PV Combination of Instrument 5	
3580~3595		32-bit Integer PV Combination of Instrument 6	
…		…	
3676~3691		32-bit Integer PV Combination of Instrument 12	

Registers start from 0. If the instrument's manual starts from address 1, please refer to the hexadecimal reference code.

Registers not mapped in the above table cannot be read, written, or modified.

VII. Input Registers (Function Code 04—Read Only)

ModbusTCP Input Registers		8x88 Register	Description
0000~0011	0	Instrument 1 Status	0 - Communication Timeout 1 - Normal
	1	Instrument 2 Status	
	2	Instrument 3 Status	
	3	Instrument 4 Status	
	4	Instrument 5 Status	
	5	Instrument 6 Status	
	6	Instrument 7 Status	
	7	Instrument 8 Status	
	8	Instrument 9 Status	
	9	Instrument 10 Status	
	10	Instrument 11 Status	
	11	Instrument 12 Status	
0012~00107	12	Channel 1 Alarm Status	Corresponds to holding registers 1664~1771, with 8 channels per instrument. For example, for the second instrument, start calculating from channel 9 alarm status.
	13	Channel 2 Alarm Status	
	14	Channel 3 Alarm Status	
	15	Channel 4 Alarm Status	
	16	Channel 5 Alarm Status	
	17	Channel 6 Alarm Status	
	18	Channel 7 Alarm Status	
	19	Channel 8 Alarm Status	
	20	Channel 9 Alarm Status	
	21	Channel 10 Alarm Status	
	...	...	
	107	Channel 96 Alarm Status	
0108~0215	108	Channel 1 Control Status	Corresponds to holding registers 1728~1775, with 8 channels per instrument.
	109	Channel 2 Control Status	
	110	Channel 3 Control Status	
	111	Channel 4 Control Status	
	112	Channel 5 Control Status	
	113	Channel 6 Control Status	
	114	Channel 7 Control Status	
	115	Channel 8 Control Status	
	116	Channel 9 Control Status	
	117	Channel 10 Control Status	
	...	...	
	215	Channel 96 Control Status	

0216~0227	216	Instrument 1 Operating Status	bit0~bit7 represent the operating status of 8 channels of each instrument: 0: Normal Control 1: Stop
	217	Instrument 2 Operating Status	
	218	Instrument 3 Operating Status	
	219	Instrument 4 Operating Status	
	220	Instrument 5 Operating Status	
	221	Instrument 6 Operating Status	
	222	Instrument 7 Operating Status	
	223	Instrument 8 Operating Status	
	224	Instrument 9 Operating Status	
	225	Instrument 10 Operating Status	
	226	Instrument 11 Operating Status	
	227	Instrument 12 Operating Status	
0228~0239	228	Instrument 1 Control Status	bit0~bit15 represent the operating and tuning status of 8 channels of each instrument: 00: Operating 01: Stop 10: Auto-tuning
	229	Instrument 2 Control Status	
	230	Instrument 3 Control Status	
	231	Instrument 4 Control Status	
	232	Instrument 5 Control Status	
	233	Instrument 6 Control Status	
	234	Instrument 7 Control Status	
	235	Instrument 8 Control Status	
	236	Instrument 9 Control Status	
	237	Instrument 10 Control Status	
	238	Instrument 11 Control Status	
	239	Instrument 12 Control Status	
240~254		Spare	
255		Number of Idle Sockets	Maximum 7
256		Connection Identifier	Fixed at 8588
257		Software Version	

VIII. Register Arrangement and Parameter Description

The following provides a detailed description of parameter arrangement. The interpretation of parameters may vary for different models of temperature control instruments. Please refer to the specific instrument manual for details.

8.1 Detailed Register List 1

ModbusTCP Register		Temperature Control Instrument 8x88 Registers	Parameter Name	Description
0000~0095	0000~0007	Instrument 1 SP01~SP07	Preset Setpoint SP	Setting range: -9990~32000. The setpoint and PID together form a parameter group consisting of 4 parameters. Output channels can select different groups as setpoint and PID parameters via the PnXX parameter. Typically, the output channel number and PID parameter group number are the same, but the output channel can also switch to choose different setpoint and PID parameter groups. Different output channels can share the same PID and setpoint parameter groups.
	0008~0015	Instrument 2 SP01~SP07		
	0016~0023	Instrument 3 SP01~SP07		
	0024~0031	Instrument 4 SP01~SP07		
	0032~0039	Instrument 5 SP01~SP07		
	0040~0047	Instrument 6 SP01~SP07		
	0048~0055	Instrument 7 SP01~SP07		
	0056~0063	Instrument 8 SP01~SP07		
	0064~0071	Instrument 9 SP01~SP07		
	0072~0079	Instrument 10 SP01~SP07		
	0080~0087	Instrument 11 SP01~SP07		
	0088~0095	Instrument 12 SP01~SP07		

0096~0191	0096~0103	Instrument 1 P01~P07	Proportional Band P	Setting range: 0~32000, with the same unit as the setpoint.
	0104~0111	Instrument 2 P01~P07		
	0112~0119	Instrument 3 P01~P07		
	0120~0127	Instrument 4 P01~P07		
	0128~0135	Instrument 5 P01~P07		
	0136~0143	Instrument 6 P01~P07		
	0144~0151	Instrument 7 P01~P07		
	0152~0159	Instrument 8 P01~P07		
	0160~0167	Instrument 9 P01~P07		
	0168~0175	Instrument 10 P01~P07		
	0176~0183	Instrument 11 P01~P07		
	0184~0191	Instrument 12 P01~P07		
0192~0287	0192~0199	Instrument 1 I01~I07	Integral Time I	Unit: 0.1 seconds, setting range: 0.0~3200.0 seconds.
	0200~0207	Instrument 2 I01~I07		
	0208~0215	Instrument 3 I01~I07		
	0216~0223	Instrument 4 I01~I07		
	0224~0231	Instrument 5 I01~I07		
	0232~0239	Instrument 6 I01~I07		
	0240~0247	Instrument 7 I01~I07		
	0248~0255	Instrument 8 I01~I07		
	0256~0263	Instrument 9 I01~I07		
	0264~0271	Instrument 10 I01~I07		
	0272~0279	Instrument 11 I01~I07		
	0280~0287	Instrument 12 I01~I07		

0288~0383	0288~0295	Instrument 1 D01~D07	Differential Time D	Unit: 0.01 seconds, setting range: -327.60~+327.60 seconds. (The maximum result for auto-tuning is +327.60. For larger values, you can manually write the value as an unsigned 16-bit number, which will be displayed as the corresponding signed 16-bit value on the table.)
	0296~0303	Instrument 2 D01~D07		
	0304~0311	Instrument 3 D01~D07		
	0312~0319	Instrument 4 D01~D07		
	0320~0327	Instrument 5 D01~D07		
	0328~0335	Instrument 6 D01~D07		
	0336~0343	Instrument 7 D01~D07		
	0344~0351	Instrument 8 D01~D07		
	0352~0359	Instrument 9 D01~D07		
	0360~0367	Instrument 10 D01~D07		
	0368~0375	Instrument 11 D01~D07		
	0376~0383	Instrument 12 D01~D07		
0384~0479	0384~0391	Instrument 1 In01~In07	Input Channel Configuration Parameter Group Selection In	Setting range 0~9999. The unit digit is set to 1~4 to select the input specification group for the configured measurement channel. Setting it to 0 disables measurement for that channel. The tens and hundreds
	0392~0399	Instrument 2 In01~In07		
	0400~0407	Instrument 3 In01~In07		
	0408~0415	Instrument 4 In01~In07		
	0416~0423	Instrument 5 In01~In07		

	0424~0431	Instrument 6 In01~In07		digits configure the multi-segment curve correction address for the measurement channel. Setting it to 0 disables the correction. For example, setting In01=112 means that Channel 1 selects the 2nd input configuration parameter group, and the multi-segment curve correction entry address for that channel is d11.
	0432~0439	Instrument 7 In01~In07		
	0440~0447	Instrument 8 In01~In07		
	0448~0455	Instrument 9 In01~In07		
	0456~0463	Instrument 10 In01~In07		
	0464~0471	Instrument 11 In01~In07		
	0472~0479	Instrument 12 In01~In07		
0480~0575	0480~0487	Instrument 1 Sc01~Sc07	Input Channel Measurement Value Offset Sc	Setting range: -9990~32000, used for offsetting and correcting the measurement value. Specifically, if the input channel measurement is disabled, the physical measurement value will be 0. Writing this value is equivalent to assigning the measurement value for that channel via the host computer or program.
	0488~0495	Instrument 2 Sc01~Sc07		
	0496~0503	Instrument 3 Sc01~Sc07		
	0504~0511	Instrument 4 Sc01~Sc07		
	0512~0519	Instrument 5 Sc01~Sc07		
	0520~0527	Instrument 6 Sc01~Sc07		
	0528~0535	Instrument 7 Sc01~Sc07		
	0536~0543	Instrument 8 Sc01~Sc07		
	0544~0551	Instrument 9 Sc01~Sc07		
	0552~0559	Instrument 10 Sc01~Sc07		
	0560~0567	Instrument 11 Sc01~Sc07		
	0568~0575	Instrument 12 Sc01~Sc07		
0576~0671	0576~0583	Instrument 1 On01~On07	Output Channel Configuration Parameters	Setting range 0~9999. The unit digit is set to 1~4 to select the output
	0584~0591	Instrument 2 On01~On07		
	0592~0599	Instrument 3 On01~On07		

	0600~0607	Instrument 4 On01~On07	On	channel configuration parameter group. The tens, hundreds, and thousands digits are reserved for future use. When the default value is 0, it is associated with output parameter group 1.
	0608~0615	Instrument 5 On01~On07		
	0616~0623	Instrument 6 On01~On07		
	0624~0631	Instrument 7 On01~On07		
	0632~0639	Instrument 8 On01~On07		
	0640~0647	Instrument 9 On01~On07		
	0648~0655	Instrument 10 On01~On07		
	0656~0663	Instrument 11 On01~On07		
	0664~0671	Instrument 12 On01~On07		
0672~0767	0672~0679	Instrument 1 Pn01~Pn07	Output Channel PID Configuration Parameter Group and Measurement Channel Selection Pn	Setting range 0~9999. The units and tens digits set 1~96 to select the PID and setpoint SP parameter group (a total of 96 groups). Setting to 0 automatically selects the same number PID and setpoint parameter group. In normal mode (parameter AFC.2=0), the hundreds and thousands digits set 1~96 to select the input channel for PV. Setting to 0 automatically selects the same number measurement value as the control PV value. In sensor backup mode
	0680~0687	Instrument 2 Pn01~Pn07		
	0688~0695	Instrument 3 Pn01~Pn07		
	0696~0703	Instrument 4 Pn01~Pn07		
	0704~0711	Instrument 5 Pn01~Pn07		
	0712~0719	Instrument 6 Pn01~Pn07		
	0720~0727	Instrument 7 Pn01~Pn07		
	0728~0735	Instrument 8 Pn01~Pn07		
	0736~0743	Instrument 9 Pn01~Pn07		

	0744~0751	Instrument 10 Pn01~Pn07		(parameter AFC.2=1), the same number measurement value is prioritized as the control PV value. However, if the same number PV is out of range or abnormal, the channel measurement value defined by the hundreds and thousands digits of the Pn parameter is automatically selected as the PV value for this channel.
	0752~0759	Instrument 11 Pn01~Pn07		
	0760~0767	Instrument 12 Pn01~Pn07		
0768~0863	0768~0775	Instrument 1 At01~At07	Output Channel Operating Mode At	Setting to 0 enables APID, representing a PID control algorithm with AI functionality. Setting to 1 activates Auto-Tuning At. Setting to 2 enables ON/OFF control mode. Setting to 3 enables manual control mode. Setting to 4 stops control and disables output. Setting to 1XX defines a cascade control mode for the secondary controller (inner
	0776~0783	Instrument 2 At01~At07		
	0784~0791	Instrument 3 At01~At07		
	0792~0799	Instrument 4 At01~At07		
	0800~0807	Instrument 5 At01~At07		
	0808~0815	Instrument 6 At01~At07		
	0816~0823	Instrument 7 At01~At07		
	0824~0831	Instrument 8 At01~At07		
	0832~0839	Instrument 9 At01~At07		
	0840~0847	Instrument 10 At01~At07		
	0848~0855	Instrument 11 At01~At07		

	0856~0863	Instrument 12 At01~At07		loop), where the actual setpoint for this channel will equal SP plus the output percentage of channel XX multiplied by the LA parameter value. For example, setting At10=101 means that the setpoint for channel 10 will be calculated as: Setpoint==SP10+ OP01*LA10/25600 . Setting to 2XX disables PID control. The output of this channel will proportionally follow the output of channel XX, with the proportional band parameter setting the relative output proportion from 0~3200.0%. For example, setting At10=206 means that the output value OP10 for channel 10 is calculated as OP10=OP6*P10*0. 1%. Here, OP10 follows the output of OP6, and the P10 value is expressed in units of 0.1%. The valid range of this function XX is 1~16.

0864~0959	0864~0871	Instrument 1 Op01~Op07	Output Value of Output Channel Op	In automatic mode, this channel is read-only and represents the PID control output value (for ON/OFF control, 0 means off and 25650 means on). In manual mode, this channel is both readable and writable, and the written value can serve as the manual output control value. The value 25600 indicates 100% output.
	0872~0879	Instrument 2 Op01~Op07		
	0880~0887	Instrument 3 Op01~Op07		
	0888~0895	Instrument 4 Op01~Op07		
	0896~0903	Instrument 5 Op01~Op07		
	0904~0911	Instrument 6 Op01~Op07		
	0912~0919	Instrument 7 Op01~Op07		
	0920~0927	Instrument 8 Op01~Op07		
	0928~0935	Instrument 9 Op01~Op07		
	0936~0943	Instrument 10 Op01~Op07		
	0944~0951	Instrument 11 Op01~Op07		
	0952~0959	Instrument 12 Op01~Op07		
0960~1055	0960~0967	Instrument 1 HA01~HA07	Multifunctional Parameter 1 HA	Setting range:-9990~32000, multifunctional parameter. By default, it used as the high limit alarm value for the measurement value selected by the 1st output channel. It can also be defined as a positive deviation alarm or used for scaling definition in transmission output, etc.
	0968~0975	Instrument 2 HA01~HA07		
	0976~0983	Instrument 3 HA01~HA07		
	0984~0991	Instrument 4 HA01~HA07		
	0992~0999	Instrument 5 HA01~HA07		
	1000~1007	Instrument 6 HA01~HA07		
	1008~1015	Instrument 7 HA01~HA07		
	1016~1023	Instrument 8 HA01~HA07		
	1024~1031	Instrument 9 HA01~HA07		
	1032~1039	Instrument 10 HA01~HA07		
	1040~1047	Instrument 11 HA01~HA07		
	1048~1055	Instrument 12 HA01~HA07		

1056~1151	1056~1063	Instrument 1 LA01~LA07	Multifunctional Parameter 2 LA	Setting range: -9990~32000, multifunctional parameter. By default, it serves as the low limit alarm value for the measurement value selected by the 1st output channel. It can also be configured as a negative deviation alarm, etc.
	1064~1071	Instrument 2 LA01~LA07		
	1072~1079	Instrument 3 LA01~LA07		
	1080~1087	Instrument 4 LA01~LA07		
	1088~1095	Instrument 5 LA01~LA07		
	1096~1103	Instrument 6 LA01~LA07		
	1104~1111	Instrument 7 LA01~LA07		
	1112~1119	Instrument 8 LA01~LA07		
	1120~1127	Instrument 9 LA01~LA07		
	1128~1135	Instrument 10 LA01~LA07		
	1136~1143	Instrument 11 LA01~LA07		
	1144~1151	Instrument 12 LA01~LA07		
1152~1247	1152~1159	Instrument 1 SV01~SV07	PID Actual Setpoint SV	In the ordinary fixed-point temperature control mode, this is simply equal to SP1~SP96. Note that in modes with heating/cooling slope control or secondary control mode in cascade control, it is not equal to SP1~SP96. When the heating/cooling slope limit function is available, the start setpoint can
	1160~1167	Instrument 2 SV01~SV07		
	1168~1175	Instrument 3 SV01~SV07		
	1176~1183	Instrument 4 SV01~SV07		
	1184~1191	Instrument 5 SV01~SV07		
	1192~1199	Instrument 6 SV01~SV07		
	1200~1207	Instrument 7 SV01~SV07		
	1208~1215	Instrument 8 SV01~SV07		
	1216~1223	Instrument 9 SV01~SV07		
	1224~1231	Instrument 10 SV01~SV07		
	1232~1239	Instrument 11 SV01~SV07		

	1240~1247	Instrument 12 SV01~SV07		be defined by writing this parameter. At the same time, by inputting data for multiple channels , synchronized heating and cooling curves for multiple channels can be achieved.
1248~1535			Alternate Address	Alternate Address
1536~1631	1536~1543	Instrument 1 PV01~PV07	Measured Value PV	Read only; if the measurement value needs to be transmitted from the host computer, the channel can be closed and the Sc parameter written to achieve this. The system will automatically refresh this parameter.
	1544~1551	Instrument 2 PV01~PV07		
	1552~1559	Instrument 3 PV01~PV07		
	1560~1567	Instrument 4 PV01~PV07		
	1568~1575	Instrument 5 PV01~PV07		
	1576~1583	Instrument 6 PV01~PV07		
	1584~1591	Instrument 7 PV01~PV07		
	1592~1599	Instrument 8 PV01~PV07		
	1600~1607	Instrument 9 PV01~PV07		
	1608~1615	Instrument 10 PV01~PV07		
	1616~1623	Instrument 11 PV01~PV07		
	1624~1631	Instrument 12 PV01~PV07		
1632~1663			Alternate Address	Alternate Address
1664~1711	1664~1667	Instrument 1ALM01~ALM07	Alarm Status	Each parameter contains the alarm status for two channels. The high byte corresponds to the odd-numbered channel, and the
	1668~1671	Instrument 2ALM01~ALM07		
	1672~1675	Instrument 3ALM01~ALM07		
	1676~1679	Instrument 4 ALM01~ALM07		

	1680~1683	Instrument 5 ALM01~ALM07		low byte corresponds to the even-numbered channel. BIT0 to BIT4 correspond to the following alarms: input error, HA, LA, dHA, and dLA. When the alarm lock function is enabled, this parameter can be written to unlock.
	1684~1687	Instrument 6 ALM01~ALM07		
	1688~1691	Instrument 7 ALM01~ALM07		
	1692~1695	Instrument 8 ALM01~ALM07		
	1696~1699	Instrument 9 ALM01~ALM07		
	1700~1703	Instrument 10 ALM01~ALM07		
	1704~1707	Instrument 11 ALM01~ALM07		
	1708~1711	Instrument 12 ALM01~ALM07		
1712~1727			Alternate Address	Alternate Address
1728~1775	1728~1731	Instrument 1 OUT01~OUT07	Control Status	Read only; each parameter includes the control status of 2 channels. BIT0: 0 indicates auto-tuning state, 1 indicates non-auto-tuning state; BIT1: 0 indicates normal control, 1 indicates stop control state. Note: Do not write to this parameter. If need to change the related control status, write to the corresponding parameter. The system will automatically refresh this parameter.
	1732~1735	Instrument 2 OUT01~OUT07		
	1736~1739	Instrument 3 OUT01~OUT07		
	1740~1743	Instrument 4 OUT01~OUT07		
	1744~1747	Instrument 5 OUT01~OUT07		
	1748~1751	Instrument 6 OUT01~OUT07		
	1752~1755	Instrument 7 OUT01~OUT07		
	1756~1759	Instrument 8 OUT01~OUT07		
	1760~1763	Instrument 9 OUT01~OUT07		
	1764~1767	Instrument 10 OUT01~OUT07		
	1768~1771	Instrument 11 OUT01~OUT07		
	1772~1775	Instrument 12 OUT01~OUT07		
1776~2047			Alternate Address	Alternate Address

2048~2103 2117~2129		Instrument 1 2048~2103 2117~2129	Other Parameters	Add 100 addresses to each instrument. For detailed explanations, see section 8.2 or the instrument manual.
2148~2203 2217~2229		Instrument 2 2048~2103 2117~2129		
2248~2303 2317~2329		Instrument 3 2048~2103 2117~2129		
2348~2403 2417~2429		Instrument 4 2048~2103 2117~2129		
2448~2503 2517~2529		Instrument 5 2048~2103 2117~2129		
2548~2603 2617~2629		Instrument 6 2048~2103 2117~2129		
2648~2703 2717~2729		Instrument 7 2048~2103 2117~2129		
2748~2803 2817~2829		Instrument 8 2048~2103 2117~2129		
2848~2903 2917~2929		Instrument 9 2048~2103 2117~2129		
2948~3003 3017~3029		Instrument 10 2048~2103 2117~2129		
3048~3103 3117~3129		Instrument 11 2048~2103 2117~2129		
3148~3203 3217~3229		Instrument 12 2048~2103 2117~2129		

8.2 Detailed Register List 2

<table>
<tr>
<td>0800~0803H</td>
<td>2048~2051</td>
<td>InP1~4; Input Specification Definition</td>
<td>This parameter is one of the input group parameters and is used to select the input specification. It needs to match the corresponding module. For example, the thermocouple input module must be set
<table>
<tr><td>0 K</td><td>13 T (0~300.00℃)</td></tr>
<tr><td>1 S</td><td>17 K (0~300.00℃)</td></tr>
<tr><td>2 R</td><td>18 J (0~300.00℃)</td></tr>
<tr><td>3 T</td><td>25 0~75mV voltage input</td></tr>
<tr><td>4 E</td><td>28 0~20mV voltage input</td></tr>
<tr><td>5 J</td><td>29 0~50mV Voltage Input or 0~20mA Current Input</td></tr>
<tr><td>6 B</td><td>30 0~60mV voltage input</td></tr>
<tr><td>7 N</td><td>35 -10~+10mV</td></tr>
<tr><td>8 WRe3-WRe25</td><td>36 -37.5~+37.5mV voltage input</td></tr>
<tr><td>9 WRe5-WRe26</td><td>38 10~50mV Voltage Input or 4~20mA Current Input</td></tr>
<tr><td>12 F2 radiation high-temperature thermometer</td><td>39 15~75mV voltage input</td></tr>
</table>
to thermocouple as the input specification. There are 4 sets of input parameters in total, each including 4 parameters: InP, ScL, ScH, and FIL.
InP is used to select the input specification whose value corresponds to the following:</td>
</tr>
<tr>
<td>0804H~0807H</td>
<td>2052~2055</td>
<td>ScL1~4 Linear Input Calibration Lower Limit Value</td>
<td>Define the lower limit of the linear input scale, with units the same as the measured value.</td>
</tr>
<tr>
<td>0808H~080BH</td>
<td>2056~2059</td>
<td>ScH1~4 Scale upper limit value</td>
<td>Define the upper limit of the linear input scale, with units the same as the measured value.</td>
</tr>
</table>

080CH~080FH	2060~2063	FIL1~4 Digital Filtering	Define the intensity of digital filtering for the input. A setting of 0 means no filtering, 1 represents median value filtering, and 2~100 represent integration filtering. The unit is the sampling period.
0810H~0813H	2064~2067	dHA1~4 Alarm Parameters	The default is positive deviation alarm, but it can also be defined as an high limit alarm. This is one of the output group parameters. The output parameter group can either select the same numbered parameter group as the input or choose a different parameter group. The instrument has a total of 4 sets of output parameters.
0814H~0817H	2068~2071	dLA1~4 Alarm Parameters	The default is negative deviation alarm, but it can also be defined as a low limit alarm.
0818H~081BH	2072~2075	AAF1~4 Alarm Function Selection	AAF.0~AAF.4 select whether the input fault, HA alarm, LA alarm, dHA, and dLA alarms will be automatically reset or not. If set to 1, the alarm will not be automatically reset, and the customer needs to send a write command to clear the corresponding alarm status register to release the alarm action.

AAF Detailed Explanation	Description
Bit0	0: The alarm status automatically resets after the input signal error is cleared. 1: The alarm status does not automatically reset after the input signal error is cleared. To manually reset, write 0 to the corresponding bit of the alarm status parameter for the corresponding channel. For odd-numbered channels, write bit8=0 in the alarm status; for even-numbered channels, write bit0=0.
Bit1	0: The alarm status automatically resets after the HA alarm is cleared. 1: The alarm status does not automatically reset after the HA alarm is cleared. To manually reset, write 0 to the corresponding bit of the alarm status parameter for the corresponding channel. For odd-numbered channels, write bit9=0 in the alarm status; for even-numbered channels, write bit1=0.
Bit2	0: The alarm status automatically resets after the LA alarm is cleared. 1: The alarm status does not automatically reset after the LA alarm is cleared. To manually clear the alarm, write 0 to the corresponding bit in the alarm status parameter for the respective channel. For odd-numbered channels, write bit10=0 in the alarm status; for even-numbered channels, write bit2=0.
Bit3	0: The alarm status automatically resets after the dHA alarm is cleared. 1: The alarm status does not automatically reset after the dHA alarm is cleared. To manually clear the alarm, write 0 to the corresponding bit in the alarm status parameter for the respective channel. For odd-numbered channels, write bit11=0 in the alarm status; for even-numbered channels, write bit3=0.
Bit4	0: The alarm status automatically resets after the dLA alarm is cleared. 1: The alarm status does not automatically reset after the dLA alarm is cleared. To manually clear the alarm, write 0 to the corresponding bit in the alarm status parameter for the respective channel. For odd-numbered channels, write bit10=0 in the alarm status; for even-numbered channels, write bit4=0.
Bit5~bit7	Spare

081CH~081FH	2076~2079	HYS1~4 Hysteresis	The unit is the same as the measurement value. It is used as the hysteresis for alarms, ON/OFF control, and PID auto-tuning. However, auto-tuning can also use EHYS as the hysteresis by selecting it in Act.1.
0820H~0823H	2080~2083	OPL1~4 Output Lower Limit	Setting range 0~100, default as output lower limit. It can also be defined as the output value in the event of input faults/overload.
0824H~0827H	2084~2087	OPH1~4 Output Upper Limit	Setting range: 0~105, used as the output upper limit.
0828H~082BH	2088~2091	OHE1~4 Segmented Power Limit Setting	OPH valid range, with the same unit as the measurement value. This is used to implement the segmented output limit function. When the measurement value is less than OHEF, the output is limited by OPH. When the measurement value exceeds OHEF, the output is not limited, i.e., it is 100%.
082CH~082FH	2092~2095	Act1~4 Control Function Selection	Act.0: Set to 0 for reverse action (heating), or 1 for direct action (cooling). Act.1: Set to 0 for using the HYS value of this parameter group as the hysteresis for self-tuning and ON/OFF control; set to 1 to use the global parameter EHYS as the hysteresis. Act.2: Set to 0 to force the output to 0 when an input fault occurs on this channel; set to 1 to force the output to OPL when an input fault occurs. Act.3: Set to 0 to define the output lower limit as OPL; set to 1 to fix the output lower limit at 0. Act.4: Set to 1 to force the output to the input fault state when a HA alarm occurs.

<table>
<tr><td></td><td colspan="3"><table>
<tr><th>ACT Detailed Explanation</th><th>Description</th></tr>
<tr><td>Bit0</td><td>0: Reverse action mode (heating control)
1: Direct action mode (cooling control).</td></tr>
<tr><td>Bit1</td><td>0: The At auto-tuning and (ON/OFF) bit control use the HYS value of this parameter group as the hysteresis. For example, if On01 = 2, then the hysteresis value for channel 2 will use HYS2.
1: The At auto-tuning and (ON/OFF) bit control use the global parameter EHYS as the hysteresis</td></tr>
<tr><td>Bit2</td><td>0: When an input fault occurs on this channel, the output will be forced to 0
1: When an input fault occurs, the output will be forced to OPL</td></tr>
<tr><td>Bit3</td><td>0: When an input fault occurs, the output will be forced to OPL
1: The output lower limit will be fixed at 0</td></tr>
<tr><td>Bit4</td><td>0: The output will not be affected during the HA alarm
1: During the HA alarm, the output will also be forced to the same state as the input fault condition.</td></tr>
<tr><td>Bit5~bit7</td><td>Spare</td></tr>
</table></td></tr>
<tr><td>0830H~0833H</td><td>2096~2099</td><td>Srh1~4
Heating Slope Limit Value</td><td>Indicate the heating rate in degrees per minute. A value of 0 means no limit. When the SP value changes, the rate of change will be limited. Upon initial power-up or when control is started, the current measured value PV will be automatically set as the initial setpoint value. Additionally, if set AFC.3=1, any modification to the setpoint value SPXX will also automatically use the current measured value PV as the initial setpoint. Note this function does not apply to secondary control channels in cascade control mode. Note that the control cycle CTI value should be divisible by 60.0, such as 0.5, 0.8, 1.0, 1.2, 1.5, 2.0 seconds, etc. If other values are set, such as 0.9 or 1.1 seconds, there will be calculation errors in the heating slope value.</td></tr>
</table>

0834H~0837H	2100~2103	SrL1~4 Cooling Slope Limit Value	Indicate the cooling rate in degrees per minute. A value of 0 means no limit. The usage is the same as the Srh parameter.
0838H~083FH	2104~2111	Alternate Address, Do Not Use	
0840H	2112	Addr Communication Address	Define the communication address of this device, with a range of 0~88.
0841H	2113	bAud Communication Baud Rate	Define the baud rate, the unit is 0.1K, setting range: 9.6K~115.2K.
0842H	2114	Adn Extended Input Loop Count	If the communication input interface of the device's expansion module fails to receive sufficient measurement values from the input modules defined by Adn, a corresponding input fault alarm signal will be triggered. If the actual input exceeds the set value, it is meaningless. This parameter is only used to define the communication input alarm prompt range and does not disable the measurement channel. To disable the measurement channel, the In parameter should be set.
0843H	2115	Func Local Operating Mode	This version cannot use this function.
0844H	2116	Ctn Control Loop Count	Indicate the number of control loops enabled. Each control loop occupies 10ms of processing time. If set to 96, the actual control cycle will be at least 0.96 seconds.
0845H	2117	Srun Run/Stop Selection	Normally, the instrument operates in automatic control mode, but each channel can independently set the At parameter to turn off. If Srun is set to 9655, all PID channels will stop control output, and one command shutdown can be realized. If Srun is set to 15, the control mode remains active; however, when the power is turned off and then back on, the system will automatically enter the 9655 global stop state.

0846H	2118	CtI	Define the control cycle, with a range of 0.0~5.0 seconds. 0.0 is the system's minimum achievable cycle. For example, if the total number of control loops Ctn=16, the actual execution control cycle will be 0.16 seconds. The minimum control cycle for this version cannot be less than 0.1 seconds.
0847H	2119	ALAL Alarm Common Output Configuration (requires external alarm module expansion)	ALAL.0~4 define whether input fault, HA alarm, LA alarm, dHA, and dLA alarms will be output as a common alarm. Set to 0 for no output; set to 1 for output. Any alarm will trigger the global common alarm output AL0 action. The global common alarm output requires the alarm output terminal to be installed on the host.
0848H	2120	ALCH Alarm Independent Output Range Configuration (requires external alarm module expansion)	Define the start and end numbers of the independent alarm output channels for expansion. Although up to 5*97 alarm signals can be generated, note that the maximum number of extended alarm output channels is 256. For instance, if each channel requires 4 independent alarms, the difference between the output channel end number and the output channel start number should not exceed 64.

0849H	2121	ALbt Alarm Independent Output Configuration	ALbt.0~4 define whether input fault (including over-range, open circuit, communication disconnection, etc.), HA alarm, LA alarm, dHA, and dLA alarms are output. Set to 0 for no output; set to 1 for output. For example, if ALAL = 7, ALbt = 3, and ALCH = 16, the extended alarm output module will output 3 common alarms and 32 independent alarm signals. The output terminal numbers 1~3 will correspond to the common input alarm, high limit alarm, and low limit alarm; terminals 4~8 will sequentially correspond to channel 1 input error alarm, channel 1 HA alarm, channel 1 LA alarm, channel 2 input error alarm, channel 2 HA alarm, and so on. For another example, if ALAL = 0, ALbt = 31, and ALCH = 616, the system will output 55 alarm signals, with 5 alarms for each of channels 6~16.
084AH	2122	AFA Function Parameter Configuration A	AFA.0: Set to 0 for HA as the default high limit alarm, or 1 for positive deviation alarm. AFA.1: Set to 0 for LA as the default lower limit alarm, or 1 for negative deviation alarm. AFA.2: Set to 0 for dHA as the default positive deviation alarm, or 1 for high limit alarm. AFA.3: Set to 0 for dLA as the default negative deviation alarm, or 1 for low limit alarm. AFA.4: Set to 0 for LA as the default low limit alarm, or 1 for high limit alarm (this adds an additional high limit alarm).
084BH	2123	AFB Function Parameter Configuration B	Backup Function

084CH	2124	AFC Function Parameter Configuration C	AFC.0: Select communication parity bit. Set to 0 for no parity, or 1 for even parity. AFC.1=0: Choose linear output as 4~20mA or 2~10V; AFC.1=1: Choose current output as 0~20mA or 0~10V. AFC.2=0: No sensor backup function; AFC.2=1: Sensor backup function enabled. AFC.3=0: When using slope control, changes in the setpoint do not trigger the measurement value startup (PV START) function; AFC.3=1: When using slope control, changes in the setpoint trigger the measurement value startup function. Note that when using this function, the maximum number of control channels should not exceed 4.
084DH	2125	Nonc	Nonc.0~4: Define the output as normally open (NO) or normally closed (NC) for input fault, HA alarm, LA alarm, dHA alarm, and dLA alarm, respectively. 0: Normally open (closes when an alarm occurs). 1: Normally closed. Note that if the system is powered off, the relay is disconnected regardless of the settings.
084EH	2126	EAF host sampling parameter configuration; note that this is only valid for the host's sampling rate. The sampling rate of the extended input module is configured by the extension module itself.	EAF=0: The main input refresh rate is automatically selected based on the CTI control cycle parameter, with thermocouples and voltage/current having a maximum refresh rate of 20ms per channel. EAF=1: Fixed at 20ms per channel. EAF.AB=2: Fixed at approximately 40ms per channel. EAF.AB=3: Fixed at approximately 80ms per channel.

084FH	2127	EHYS Additional Hysteresis	If a different hysteresis value is required for auto-tuning and ON/OFF control compared to the HYS alarm hysteresis, EHYS can be selected as the hysteresis value for auto-tuning and ON/OFF control through Act.1.
0850H	2128	dPt	The data range is 0~3, set the display decimal point position of the host operation panel. This setting is only for the convenience of displaying values on the basic operation panel and does not affect the data read by the host computer, the host computer program can handle the decimal point display by itself.
0851H	2129	Host Status	Read only. BIT0~5 represent the status of the host's O1~ O4 and AL1, AL2, totaling 6 I/O ports. A value of 0 indicates output. BIT8 is set to 1 to indicate a system fault, such as a memory data error, while BIT9 is set to 1 to signal the presence of a global alarm.

This product is restriction of use in the industrial environment.

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