

High Accuracy Standard Temperature Controller

# TK Series

**USER MANUAL**

**For COMMUNICATION**

CE c  US





# Preface

Thank you for purchasing Autonics product.

Please familiarize yourself with the information contained in the **Safety Precautions** section before using this product.

This user manual contains information about the product and its proper use, and should be kept in a place where it will be easy to access.

# User Manual Guide

- Please familiarize yourself with the information in this manual before using the product.
- This manual provides detailed information on the product's features. It does not offer any guarantee concerning matters beyond the scope of this manual.
- This manual may not be edited or reproduced in either part or whole without permission.
- A user manual is not provided as part of the product package. Visit our web site ([www.autonics.com](http://www.autonics.com)) to download a copy.
- The manual's content may vary depending on changes to the product's software and other unforeseen developments within Autonics, and is subject to change without prior notice. Upgrade notice is provided through out homepage.
- We contrived to describe this manual more easily and correctly. However, if there are any corrections or questions, please notify us these on our homepage.


# Communication Protocol


TK Series is accepted to Modbus RTU Protocol.

Broadcast command is not supported.

# Safety Precautions

- Following these safety precautions will ensure the safe and proper use of the product and help prevent accidents, as well as minimizing possible hazards.
- Safety precautions are categorized as Warnings and Cautions, as defined below:

 <b>Warning</b>	<b>Warning</b>	Failure to follow the instructions may lead to a serious injury or accident.
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 <b>Caution</b>	<b>Caution</b>	Failure to follow the instructions may lead to a minor injury or accident.
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## Warning

- In case of using this unit with machinery (Ex: nuclear power control, medical equipment, ship, vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.  
It may cause a fire, human injury or damage to property.
- Install the unit on a panel.  
It may cause electric shock.
- Do not connect, inspect or repair when power is on.  
It may cause electric shock.
- Wire properly after checking terminal number.  
It may cause a fire.
- Do not disassemble the case. Please contact us if it is required.  
It may cause electric shock or a fire.

## Caution

- This unit shall not be used outdoors.  
It might shorten the life cycle of the product or cause electric shock.
- When connecting wire, AWG 20(0.50mm<sup>2</sup>) should be used and screw bolt on terminal block.  
It may cause a malfunction or fire due to contact failure.
- Please observe the rated specifications.  
It might shorten the life cycle of the product and cause a fire.
- Do not use beyond of the rated switching capacity of relay contact.  
It may cause insulation failure, contact melt, contact failure, relay broken and fire etc.
- In cleaning unit, do not use water or an oil-based detergent and use dry towels.  
It may cause electric shock or a fire.
- Do not use this unit in place where there are flammable or explosive gas, humidity, direct ray of the light, radiant heat, vibration and impact etc.

It may cause a fire or an explosion.

- Do not inflow dust or wire dregs into the unit.

It may cause a fire or a malfunction.

- Please wire properly after checking the terminal polarity when connecting temperature sensor.

It may cause a fire or an explosion.

**The above specifications are subject to change and some models may be discontinued without notice.**





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# 1 Modbus RTU Protocol

## 1.1 Read Coil Status(Func01-01H)

Read the output of ON/OFF(OX reference, Coil) status in Slave device.

### 1) Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←———— CRC16 —————→

### 2) Response(Slave)

Slave Address	Function	Byte Count	Data	Data	Data	Error Check(CRC16)	
						Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←———— CRC16 —————→

If read the output status of 10 within Coil 000001(0000 H) to 000010(0009 H) on the Slave(Address 17) from the Master.

#### ▪ Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC16)	
		High	Low	High	Low	Low	High
11 H	02 H	00 H	00 H	00 H	0A H	## H	## H

If the values of Coil 000008(0007 H) to 000001(0000 H) on Slave are “ON-ON-OFF-OFF-ON-ON-OFF-ON” and the values of Coil 000010(0009 H) to 000009(0008 H) are “OFF-ON”.

#### ▪ Response(Slave)

Slave Address	Function	Byte Count	Data (000008 to 000001)	Data (000010 to 000009)	Error Check(CRC16)	
					Low	High
11 H	01 H	02 H	CD H	01 H	## H	## H

## 1.2 Read Input Status(Func02-02H)

Read the input(1X reference) ON/OFF Status in Slave device.

### (1) Query(Master)

Slave Address	Function	Starting Address		No. of Points.		Error Check(CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←————— CRC16 —————→

### (2) Response(Slave)

Slave Address	Function	Byte Count	Data	Data	Data	Error Check(CRC16)	
						Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←————— CRC16 —————→

If read the input status of 10 (ON: 1, OFF:0) within 100001(0000 H) to 100010(0009 H) on Slave(Address 17) from the Master.

- Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC16)	
		High	Low	High	Low	Low	High
11 H	02 H	00 H	00 H	00 H	0A H	## H	## H

If the values of 100008(0007 H) to 100001(0000 H) on the Slave are “ON-ON-OFF-OFF-ON-ON-OFF-ON” and the values of 100010(0009 H) to 100009(0008 H) are “OFF-ON”.

- Response(Slave)

Slave Address	Function	Byte Count	Data (100008 to 100001)	Data (100010 to 100009)	Error Check(CRC16)	
					Low	High
11 H	02 H	02 H	CD H	01 H	## H	## H

## 1.3 Read Holding Registers(Func03–03H)

Read the Binary data of Holding Registers(4X reference) in Slave device.

### (1) Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

### (2) Response(Slave)

Slave Address	Function	Byte Count	Data		Data	Data	Error Check(CRC16)		
			High	Low	High	Low	High	Low	Low
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

If read the value of 2 within Holding Register 40001(0000 H) to 40002(0001 H) on Slave(Address 17) from the Master.

- Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC16)	
		High	Low	High	Low	Low	High
11 H	03 H	00 H	00 H	00 H	02 H	## H	## H

If the values of 40001(0000 H) and 40002(0001 H) on Slave are respectively "555(22B H)" and "100(64 H)".

- Response(Slave)

Slave Address	Function	Byte Count	Data		Data	Data	Error Check(CRC16)	
			High	Low	High	Low	Low	High
11 H	03 H	04 H	02 H	2B H	00 H	64 H	## H	## H

## 1.4 Read Input Registers(Func04–04H)

Read the Binary data of Input Registers(3X reference) in Slave device.

### (1) Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←————— CRC16 —————→

### (2) Response(Slave)

Slave Address	Function	Byte Count	Data	Data	Data	Error Check(CRC16)	
						Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←————— CRC16 —————→

If read the value of 2 within Input Register 30001(0000 H) to 30002(0001 H) on Slave from the Master.

- Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC16)	
		High	Low	High	Low	Low	High
11 H	04 H	00 H	00 H	00 H	02 H	## H	## H

If the values of 30001(0000 H) and 30002(0001 H) are respectively “10(A H)” and “20(14 H)”.

- Response(Slave)

Slave Address	Function	Byte Count	Data		Data		Error Check(CRC16)	
			High	Low	High	Low	Low	High
11 H	04 H	04 H	00 H	0A H	00 H	14 H	## H	## H

## 1.5 Force single coil (Func 05–05H)

Turns ON (FF00 H) or OFF (0000 H) of single coil (0X reference) status within slave device.

### (1) Query (Master)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←————— CRC16 —————→

### (2) Response (Slave)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←————— CRC16 —————→

If Coil 000001 (0000 H) turns ON of Slave (Address 17) from Master.

- Query (Master)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	05 H	00 H	00 H	FF H	00 H	## H	## H

- Response (Slave)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	05 H	00 H	00 H	FF H	00 H	## H	## H

## 1.6 Preset Single Registers(Func06–06H)

Preset the Binary data of single Holding Registers(4X reference) in Slave device.

### (1) Query(Master)

Slave Address	Function	Register Address		Preset Data		Error Check(CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←———— CRC16 —————→

### (2) Response(Slave)

Slave Address	Function	Register Address		Preset Data		Error Check(CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←———— CRC16 —————→

If write “10(A H)” to Holding Register 40001(0000 H) on Slave(Address 17) from the Master.

- Query(Master)

Slave Address	Function	Starting Address		Preset Data		Error Check(CRC16)	
		High	Low	High	Low	Low	High
11 H	06 H	00 H	00 H	00 H	0A H	## H	## H

- Response(Slave)

Slave Address	Function	Starting Address		Preset Data		Error Check(CRC16)	
		High	Low	High	Low	Low	High
11 H	06 H	00 H	00 H	00 H	0A H	## H	## H



## 1.7 Preset Multiple Registers(Func16–10H)

Write consecutively the Binary data of Holding Registers(4X reference) in Slave device.

### (1) Query(Master)

Slave Address	Function	Starting Address		No. of Register		Byte Count	Data		Data		Error Check (CRC16)	
		High	Low	High	Low		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←————— CRC16 —————→

### (2) Response(Slave)

Slave Address	Function	Starting Address		No. of Register		Error Check(CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

←————— CRC16 —————→

If write “10(A H)” to both 400001(0000 H) and 400002(0001 H) of Holding Register on Slave(Address 17) from the Master.

#### ▪ Query(Master)

Slave Address	Function	Starting Address		No. of Register		Byte Count	Data		Data		Error Check (CRC16)	
		High	Low	High	Low		High	Low	High	Low	High	
11 H	10 H	00 H	00 H	00 H	02 H	04 H	00 H	0A H	00 H	0A H	## H	## H

#### ▪ Response(Slave)

Slave Address	Function	Starting Address		No. of Register		Error Check(CRC16)	
		High	Low	High	Low	Low	High
11 H	10 H	00 H	00 H	00 H	02 H	## H	## H

Please use the Single Register Write function rather than Multi Register Write function if you use the slave(device) connecting with external devices such as PLC, Graphic Panel, except in the case of download that presets minimum/maximum or basic value of the parameter by input type in PC loader program.

## 1.8 Exception Response-Error Code

If occurs an error, send a response command and transmit each Exception code after set(1) the highest-level bit of received command(function).

Slave Address	Function(Command)+80 H	Exception Code	Error Check(CRC16)	
			Low	High
1Byte	1Byte	1Byte	1Byte	1Byte

←————— CRC16 —————→

- ILLEGAL FUNCTION(Exception Code: 01 H): A command(Function order) that is not supported
- ILLEGAL DATA ADDRESS(Exception Code: 02 H): Starting Address of the queried data is inconsistent with transmittable address from the device
- ILLRGAL DATA VALUE(Exception Code: 03 H): Numbers of queried data are inconsistent with the numbers of transferable data from device
- SLAVE DEVICE FAILURE(Exception Code: 04 H): Not properly complete the queried orders

If read the output status of non-existing coil 001001(03E8 H) [ON: 1, OFF: 0] on Slave(Address 17) from the Master.

- Query (Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC16)	
		High	Low	High	Low	Low	High
11 H	01 H	03 H	E8 H	00 H	01 H	## H	## H

- Response (Slave)

Slave Address	Function(Command)+80 H	Exception Code	Error Check(CRC16)	
			Low	High
11 H	81 H	02 H	## H	## H

## 2 Modbus Mapping Table

### 2.1 Read Coils(Func01) / Write Single Coil (Func05)

No(Address)	Classification	Description	Set Range	Unit	Factory Default
000001(0000)	RUN/STOP	Control Output Run/Stop	0: <i>rUn</i> 1: <i>StoP</i>	-	<i>rUn</i>
000002(0001)	Auto-Tuning Run	Auto-Tuning Run/Stop	0: <i>oFF</i> 1: <i>oN</i>	-	<i>oFF</i>
000003 to 000050	Reserved				

### 2.2 Read Discrete Inputs(Func02)

No(Address)	Classification	Description	Set Range	Unit	Factory Default
100001(0000)	°C Indicator	Unit Indicator	0: OFF 1: ON	-	-
100002(0001)	°F Indicator	Unit Indicator	0: OFF 1: ON	-	-
100003(0002)	% Indicator	Unit Indicator	0: OFF 1: ON	-	-
100004(0003)	OUT1 Indicator	Control Output 1 Indicator	0: OFF 1: ON	-	-
100005(0004)	OUT2 Indicator	Control Output 2 Indicator	0: OFF 1: ON	-	-
100006(0005)	AT Indicator	Auto-Tuning Indicator	0: OFF 1: ON	-	-
100007(0006)	SV1 Indicator	Multi SV 1 Indicator	0: OFF 1: ON	-	-
100008(0007)	SV2 Indicator	Multi SV 2 Indicator	0: OFF 1: ON	-	-
100009(0008)	SV3 Indicator	Multi SV 3 Indicator	0: OFF 1: ON	-	-
100010(0009)	AL1 Indicator	Alarm Output 1 Indicator	0: OFF 1: ON	-	-
100011(000A)	AL2 Indicator	Alarm Output 2 Indicator	0: OFF 1: ON	-	-
100012(000B)	MAN Indicator	Manual Control Indicator	0: OFF 1: ON	-	-
100013(000C)	DI-1 Input	DI-1 Input Status	0: OFF 1: ON	-	-
100014(000D)	DI-2 Input	DI-2 Input Status	0: OFF 1: ON	-	-
100015 to 100050	Reserved				

## 2.3 Read Input Registers(Func04)

No(Address)	Classification	Set Range	Unit	Factory Default	Note
300001 to 300100	Reserved				
300101(0064)	-	Product Number H	-	-	
300102(0065)	-	Product Number L	-	-	
300103(0066)	-	Hardware Version	-	-	
300104(0067)	-	Software Version	-	-	
300105(0068)	-	Model Name 1	-	"TK"	"Product Name"
300106(0069)	-	Model Name 2	-	"4"	"4-row indicator"
300107(006A)	-	Model Name 3	-	"14"	"Option Output" "Power Type"
300108(006B)	-	Model Name 4	-	"RR"	"OUT1 Output" "OUT2 Output"
300109(006C)	-	Model Name 5	-	" "	
300110(006D)	-	Model Name 6	-	" "	
300111(006E)	-	Model Name 7	-	" "	
300112(006F)	-	Model Name 8	-	" "	
300113(0070)	-	Model Name 9	-	" "	
300114(0071)	-	Model Name 10	-	" "	
300115(0072)	-	Reseved	-	-	
300116(0073)	-	Reseved	-	-	
300117(0074)	-	Reseved	-	-	
300118(0075)	-	Coil status Start Address	-	0000	
300119(0076)	-	Coil status Quantity	-	0	
300120(0077)	-	Input status Start Address	-	0000	
300121(0078)	-	Input status Quantity	-	0	
300122(0079)	-	Holding Register Start Address	-	0000	
300123(007A)	-	Holding Register Quantity	-	0	
300124(007B)	-	Input Register Start Address	-	0000	
300125(007C)	-	Input Register Quantity	-	0	
300127 to 300200	Reserved				
301001(03E8)	PV	Present Value	-1999 to 9999	°C/°F/-	
301002(03E9)	-	Decimal point location	0: 0      1: 0.0 2: 0.00    3: 0.0000	-	
301003(03EA)	-	Indicator Unit	0: °C      1: °F 2: °P      3: °FF	-	
301004(03EB)	5u	SV Setting Value	Within L - 5u to H - 5u	°C/°F/-	0000
301005(03EC)	H - nu	Heating Side MV	0 to 1000 : H 0.0 to H 100	%	-
301006(03ED)	L - nu	Cooling Side MV	0 to 1000 : L 0.0 to L 100	%	-
301007(03EE)	°C Indicator	Unit Indicator	0: OFF    1: ON	-	Bit 0

No(Address)	Classification		Set Range	Unit	Factory Default	Note	
	°F Indicator	Unit Indicator	0: OFF 1: ON	-	-	Bit 1	
	% Indicator	Unit Indicator	0: OFF 1: ON	-	-	Bit 2	
	OUT1 Indicator	Control Output 1 Indicator	0: OFF 1: ON	-	-	Bit 3	
	OUT2 Indicator	Control Output 2 Indicator	0: OFF 1: ON	-	-	Bit 4	
	AT Indicator	Auto-tuning Indicator	0: OFF 1: ON	-	-	Bit 5	
	SV1 Indicator	Multi SV1 Indicator	0: OFF 1: ON	-	-	Bit 6	
	SV2 Indicator	Multi SV2 Indicator	0: OFF 1: ON	-	-	Bit 7	
	SV3 Indicator	Multi SV3 Indicator	0: OFF 1: ON	-	-	Bit 8	
	AL1 Indicator	Alarm Output 1 Indicator	0: OFF 1: ON	-	-	Bit 9	
	AL2 Indicator	Alarm Output 2 Indicator	0: OFF 1: ON	-	-	Bit A	
	MAN Indicator	Manual Control Indicator	0: OFF 1: ON	-	-	Bit B	
		DI-1 Input	DI-1 Input Status	0: OFF 1: ON	-	-	Bit C
		DI-2 Input	DI-2 Input Status	0: OFF 1: ON	-	-	Bit D
301008(03EF)	-	Heater Current Value Monitoring	0.0 to 50.0	-	-		

- Consists of the 301007(03EE) Address bit data.

Bit F	Bit E	Bit D	Bit C	Bit B	Bit A	Bit 9	Bit 8
-	-	DI-2 Input	DI-1 Input	MAN Ind.	AL2 Ind.	AL1 Ind.	SV4 Ind.
0	0	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1
1 Byte							

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SV3 Ind.	SV2 Ind.	AT Ind.	OUT2 Ind.	OUT1 Ind.	% Ind.	°F Ind.	°C Ind.
0 or 1	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1
1 Byte							

## 2.4 Read Holding Register(Func03) / Write Single Register(Func06) / Write Multiple Registers(Func16).

### 2.4.1 Parameter 0 Group[Func: 03/06/16, RW: R/W]

- MV Monitoring/Manual Control Setting Group

No(Address)	Parameter	Description	Set Range	Unit	Factory Default
400001(0000)	SV	SV Set Value	Within L - SV to H - SV	°C/°F/-	0
400002(0001)	H - MV	Heating MV	0 to 1000 : H 00 to H 100	%	-
400003(0002)	C - MV	Cooling MV	0 to 1000 : C 00 to C 100	%	-
400004(0003)	-	Auto/Manual Control	0: AUTO 1: MAN	-	AUTO
400005 to 400050	Reserved				

### 2.4.2 Parameter 1 Group[Func: 03/06/16, RW: R/W]

No(Address)	Parameter	Description	Set Range	Unit	Factory Default
400051(0032)	Run/Stop	Control Output Run/Stop	0: Run 1: Stop	-	Run
400052(0033)	SV - n	Multi SV Number	0: SV-0 1: SV-1 2: SV-2 3: SV-3	-	SV-0
400053(0034)	C - A	Heater Current Monitoring	0 to 500: 000 to 500 (display range)	A	-
400054(0035)	AL 1L	Alarm Output 1 Low-limit Set Value	Deviation Alarm: -F.S. to F.S. Absolute Value Alarm: Within the display range	°C/°F/-	1550
400055(0036)	AL 1H	Alarm Output 1 High-limit Set Value			
400056(0037)	AL 2L	Alarm Output 2 Low-limit Set Value			
400057(0038)	AL 2H	Alarm Output 2 High-limit Set Value			
400058(0039)	SV - 0	Set Value(SV)-0	Within L - SV to H - SV	°C/°F/-	0000
400059(003A)	SV - 1	Set Value(SV)-1			
400060(003B)	SV - 2	Set Value(SV)-2			
400061(003C)	SV - 3	Set Value(SV)-3			
400062(003D)	AL 3L	Alarm Output 3 Low-limit Set Value	Deviation Alarm: -F.S. to F.S. Absolute Value Alarm: Within the display range	°C/°F/-	1550
400063(003E)	AL 3H	Alarm Output 3 High-limit Set Value			
400064 to 400100	Reserved				

### 2.4.3 Parameter 2 Group[Func: 03/06/16, RW: R/W]

No(Address)	Parameter	Description	Set Range	Unit	Factory Default
400101(0064)	<i>Rt</i>	Auto-tuning Run/Stop	0: <i>oFF</i> 1: <i>oN</i>	-	<i>oFF</i>
400102(0065)	<i>H-P</i>	Heating Proportional Band	1 to 9999: <i>000.1</i> to <i>9999</i>	°C/°F/%	<i>0 100</i>
400103(0066)	<i>C-P</i>	Cooling Proportional Band			
400104(0067)	<i>H-I</i>	Heating Integral Time	0 to 9999: <i>0000</i> to <i>9999</i>	Sec.	<i>0000</i>
400105(0068)	<i>C-I</i>	Cooling Integral Time			
400106(0069)	<i>H-d</i>	Heating Derivative Time	0 to 9999: <i>0000</i> to <i>9999</i>	Sec.	<i>0000</i>
400107(006A)	<i>C-d</i>	Cooling Derivative Time			
400108(006B)	<i>db</i>	Dead_Overlap Band	- Proportional Band to <i>00</i> to +Proportional Band (Based on smaller proportional band value) <ON/OFF – ON/OFF Control> - <i>999</i> to <i>0999</i> (H), - <i>9999</i> to <i>9999</i> (L)	Digit	<i>0000</i>
			- <i>99.9</i> to <i>099.9</i> (Analog)	%F.S.	<i>0000</i>
400109(006C)	<i>rESt</i>	Manual Reset	0 to 1000: <i>0000</i> to <i>1000</i>	%	<i>0500</i>
400110(006D)	<i>HHYS</i>	Heating Hysteresis	1 to 100: <i>00 1</i> to <i>100</i> (Temperature H, Analog)	Digit	<i>002</i>
			1 to 1000: <i>000.1</i> to <i>100.0</i> (Temperature L)		
400111(006E)	<i>HdSt</i>	Heating OFF Offset	0 to 100: <i>000</i> to <i>100</i> (Temperature H, Analog)	Digit	<i>000</i>
			0 to 1000: <i>000.0</i> to <i>100.0</i> (Temperature L)		
400112(006F)	<i>CHYS</i>	Cooling Hysteresis	1 to 100: <i>00 1</i> to <i>100</i> (Temperature H, Analog)	Digit	<i>002</i>
			1 to 1000: <i>000.1</i> to <i>100.0</i> (Temperature L)		
400113(0070)	<i>CdSt</i>	Cooling OFF Offset	0 to 100: <i>000</i> to <i>100</i> (Temperature H, Analog)	Digit	<i>000</i>
			0 to 1000: <i>000.0</i> to <i>100.0</i> (Temperature L)		
400114(0071)	<i>L-lv</i>	MV Low-limit Set Value	<i>000.0</i> to <i>H-lv - 0.1</i> (Heating or Cooling Control)	%	<i>0000</i> <i>-1000</i>
			<i>-100.0</i> to <i>000.0</i> (Heating&Cooling Control)		
400115(0072)	<i>H-lv</i>	MV High-limit Set Value	<i>L-lv + 0.1</i> to <i>100.0</i> (Heating or Cooling Control)	%	<i>1000</i> <i>1000</i>
			<i>000.0</i> to <i>100.0</i> (Heating&Cooling Control)		
400116(0073)	<i>rRU</i>	Ramp Up Change Rate	0 to 999: <i>000</i> to <i>999</i> (Temperature H, Analog)	°C/°F/ Digit	<i>000</i>
			0 to 9999: <i>000.0</i> to <i>999.9</i> (Temperature L)		
400117(0074)	<i>rRD</i>	Ramp Down Change Rate	0 to 999: <i>000</i> to <i>999</i> (Temperature H, Analog)	°C/°F/ Digit	<i>0000</i>
			0 to 9999: <i>000.0</i> to <i>999.9</i> (Temperature L)		
400118(0075)	<i>rUt</i>	Ramp Time Unit	0: <i>5EC</i> 1: <i>ñ n</i> 2: <i>HoUr</i>	-	<i>ñ n</i>
400119 to 400150	Reserved				

## 2.4.4 Parameter 3 Group[Func: 03/06/16, RW: R/W]

No(Address)	Parameter	Description	Set Range	Unit	Factory Default
400151(0096)	<i>I n - t</i>	Input Type	Refer the turn of input specifications	-	<i>t C t . 1</i>
400152(0097)	<i>U n i t</i>	Sensor Temperature Unit	0: °C 1: °F	-	°C
400153(0098)	<i>L - r G</i>	Analog Low-limit Input Value	Minimum Range to <i>H - r G</i> - F.S.10%	Digit	0000
400154(0099)	<i>H - r G</i>	Analog High-limit Input Value	<i>L - r G</i> +F.S.10% to Maximum Range	Digit	1000
400155(009A)	<i>d o t</i>	Scaling Decimal Point	0: 0 1: 0.0 2: 0.00 3: 0.000	-	.0
400156(009B)	<i>L - S C</i>	Low-limit Scale Value	F.S.	-	0000
400157(009C)	<i>H - S C</i>	High-limit Scale Value	F.S.	-	1000
400158(009D)	<i>d U n t</i>	Display Unit	0: °C 1: °F 2: °F o 3: o F F	-	°C
400159(009E)	<i>I n - b</i>	Input Correction	-999 to 999: -999 to 0999 -1999 to 9999: -1999 to 9999	Digit	0000
400160(009F)	<i>n R u F</i>	Input Digital Filter	1 to 1200: 000.1 to 1200	Sec.	000.1
400161(00A0)	<i>L - S u</i>	SV Low-limit Set Value	Input Low-limit Value( <i>L - S C</i> ) to <i>H - S u</i> - 1Digit	°C/°F	-200
				%F.S.	0000
400162(00A1)	<i>H - S u</i>	SV High-limit Set Value	<i>L - S u</i> + 1Digit to Input High-limit Value( <i>H - S C</i> )	°C/°F	1350
				%F.S.	1000
400163(00A2)	<i>o - F t</i>	Control Output Operation Mode	Standard Type	0: <i>H E R t</i> 1: <i>C o o L</i>	<i>H E R t</i>
			Heating & Cooling Type	0: <i>H E R t</i> 1: <i>C o o L</i> 2: <i>H - C</i>	<i>H - C</i>
400164(00A3)	<i>C - n d</i>	Control Type	Standard Control	0: <i>P I d</i> 1: <i>o n o F</i>	<i>P I d</i>
			Heating & Cooling Control	0: <i>P P</i> 1: <i>P o n</i> 2: <i>o n P</i> 3: <i>o n o n</i>	<i>P P</i>
400165(00A4)	<i>R t t</i>	Auto-tuning Mode	0: <i>t U n 1</i> 1: <i>t U n 2</i>	-	<i>t U n 1</i>
400166(00A5)	<i>o U t 1</i>	OUT1 Control Output Selection	0: <i>55 r</i> 1: <i>C U r r</i>	-	<i>55 r</i>
400167(00A6)	<i>o I S r</i>	OUT1 SSR Output Type	0: <i>5 t n d</i> 1: <i>C Y C L</i> 2: <i>P H R 5</i>	-	<i>5 t n d</i>
400168(00A7)	<i>o I n R</i>	OUT1 Current Output Range	0: 4-20 1: 0-20	-	4-20
400169(00A8)	<i>o U t 2</i>	OUT2 Control Output Selection	0: <i>55 r</i> 1: <i>C U r r</i>	-	<i>55 r</i>
400170(00A9)	<i>o 2 n R</i>	OUT2 Current Output Range	0: 4-20 1: 0-20	-	4-20
400171(00AA)	<i>H - t</i>	Heating Control Time	Relay output, SSR drive output (standard ON/OFF, phase, cycle control): 000.1 to 1200	Sec.	0200
400172(00AB)	<i>C - t</i>	Cooling Control Time	Current output, SSR drive output: 000.1 to 1200		
400173 to 400200	Reserved				



### 2.4.5 Parameter 4 Group[Func: 03/06/16, RW: R/W]

No(Address)	Parameter	Description	Set Range	Unit	Factory Default
400201(00C8)	AL-1	Alarm Output 1 Operation Mode	0: OFF 1: du[[ 2: ]]du 3: ]du[ 4: [du] 5: Pu[[ 6: ]]Pu 7: LbR 8: SbR 9: HbR	-	du[[
400202(00C9)	AL1t	Alarm Output 1 Option	0: AL-R 1: AL-b 2: AL-C 3: AL-d 4: AL-E 5: AL-F	-	AL-R
400203(00CA)	ALHY	Alarm Output 1 Hysteresis	1 to 100: 00.1 to 100 (Temperature H, Analog) 1 to 1000: 000.1 to 1000 (Temperature L)	Digit	00.1
400204(00CB)	ALn	Alarm Output 1 N.O./N.C.	0: no 1: nC	-	no
400205(00CC)	ALon	Alarm Output 1 ON Delay Time	0 to 3600: 0000 to 3600	Sec.	0000
400206(00CD)	ALoF	Alarm Output 1 OFF Delay Time	0 to 3600: 0000 to 3600	Sec.	0000
400207(00CE)	AL-2	Alarm Output 2 Operation Mode	0: OFF 1: du[[ 2: ]]du 3: ]du[ 4: [du] 5: Pu[[ 6: ]]Pu 7: LbR 8: SbR 9: HbR	-	]]du
400208(00CF)	AL2t	Alarm Output 2 Option	0: AL-R 1: AL-b 2: AL-C 3: AL-d 4: AL-E 5: AL-F	-	AL-R
400209(00D0)	ALHY	Alarm Output 2 Hysteresis	1 to 100: 00.1 to 100 (Temperature H, Analog) 1 to 1000: 000.1 to 1000 (Temperature L)	Digit	00.1
400210(00D1)	ALn	Alarm Output 2 N.O./N.C.	0: no 1: nC	-	no
400211(00D2)	ALon	Alarm Output 2 ON Delay Time	0 to 3600: 0000 to 3600	Sec.	0000
400212(00D3)	ALoF	Alarm Output 2 OFF Delay Time	0 to 3600: 0000 to 3600	Sec.	0000
400213(00D4)	LbRt	LBA Time	0 to 9999: 0000 to 9999	Sec.	0000
400214(00D5)	Reserved				
400215(00D6)	LbRb	LBA Band	1 to 9999: 000 to 999 (Temperature H)	°C/°F	002
			1 to 9999: 000.0 to 999.9 (Temperature L)	°C/°F	002.0
			1 to 9999: 000.0 to 1000.0 (Analog)	%F.S.	000.2
400216(00D7)	ALn1	Analog Transmission Output 1 Mode	0: Pu 1: Su 2: H-nu 3: [-nu	-	Pu
400217(00D8)	FSL1	Transmission Output 1 Low-limit Value	F.S.	°C/°F/-	-200
400218(00D9)	F5H1	Transmission Output 1 High-limit Value	F.S.		1350
400219(00DA)	ADR5	Communication Address	1 to 99: 01 to 99	-	01
400220(00DB)	bPS	Communication Speed	0: 24 1: 48 2: 96 3: 192 4: 384	X100 bps	96
400221(00DC)	PRtY	Communication Parity Bit	0: none 1: Even 2: odd	-	none
400222(00DD)	StP	Communication Stop Bit	0: 1 1: 2	Bit	2
400223(00DE)	rStt	Communication Response Waiting Time	5 to 99: 5 to 99	Ms	20
400224(00DF)	CoW	Communication Write	0: EnR 1: dl5R	-	EnR
40225(00E0)	AL-3	Alarm Output 3 Operation Mode	0: OFF 1: du[[ 2: ]]du 3: ]du[ 4: [du] 5: Pu[[ 6: ]]Pu 7: LbR 8: SbR 9: HbR	-	]]du
40226(00E1)	AL3t	Alarm Output 3 Option	0: AL-R 1: AL-b 2: AL-C 3: AL-d 4: AL-E 5: AL-F	-	AL-R

No(Address)	Parameter	Description	Set Range	Unit	Factory Default
40227(00E2)	<i>A3HY</i>	Alarm Output 1 Hysteresis	1 to 100: 00.1 to 100.0(Temperature H, Analog) 1 to 1000: 000.1 to 1000.0(Temperature L)	Digit	00.1
40228(00E3)	<i>A3n</i>	Alarm Output 3 N.O./N.C.	0: no 1: nC	-	no
40229(00E4)	<i>A3on</i>	Alarm Output 3 ON Delay Time	0 to 3600: 0000 to 3600	Sec.	0000
40230(00E5)	<i>A3oF</i>	Alarm Output 3 OFF Delay Time	0 to 3600: 0000 to 3600	Sec.	0000
40231(00E6)	<i>Aan2</i>	Analog Transmission 2 mode	0: P <sub>u</sub> 1: S <sub>u</sub> 2: H- <sub>n</sub> u 3: C- <sub>n</sub> u	-	P <sub>u</sub>
40232(00E7)	<i>F5L1</i>	Transmission Output 2 Low-limit Value	F.S.	°C/°F/-	-200
40233(00E8)	<i>F5H1</i>	Transmission Output 2 High-limit Value	F.S.		1350
400234 to 400250	Reserved				

## 2.4.6 Parameter 5 Group[Func: 03/06/16, RW: R/W]

No(Address)	Parameter	Description	Set Range	Unit	Factory Default
400251(00FA)	<i>an5u</i>	Multi SV	0: 1 1: 2 2: 4	EA	1
400252(00FB)	<i>di-1</i>	Digital Input Key	0: StOP 1: ALrE 2: Rt 3: oFF	-	StOP
400253(00FC)	<i>di-1</i>	DI-1 Input Terminal Function	0: oFF 1: StOP 2: ALrE 3: nAn 4: an5u	-	oFF
400254(00FD)	<i>di-2</i>	DI-2 Input Terminal Function			
400255(00FE)	<i>itnu</i>	Manual Control, Initial MV	0: RUto 1: Prnu	-	RUto
400256(00FF)	<i>Prnu</i>	Manual Control, Preset MV	0000 to 1000(Standard Control) 1000 to 1000(Heating & Cooling Control)	%	0000
400257(0100)	<i>Ernu</i>	Sensor Error, MV	0000 to 1000(Standard Control) 1000 to 1000(Heating & Cooling Control)	%	0000
400258(0101)	<i>Stnu</i>	Control Stop, MV	0000 to 1000(Standard Control) 1000 to 1000(Heating & Cooling Control)	%	0000
400259(0102)	<i>StAL</i>	Control Stop, Alarm Output	0: Cont 1: oFF	-	Cont
400260(0103)	<i>USER</i>	User Level	0: Stnd 1: HI GH	-	Stnd
400261(0104)	<i>init</i>	Parameter Initialization	0: no 1: YES	-	no
400262(0105)	<i>LC5u</i>	SV Setting Lock	0: oFF 1: on	-	oFF
400263(0106)	<i>LC.P1</i>	Parameter 1 Group Lock			
400264(0107)	<i>LC.P2</i>	Parameter 2 Group Lock			
400265(0108)	<i>LC.P3</i>	Parameter 3 Group Lock			
400266(0109)	<i>LC.P4</i>	Parameter 4 Group Lock			
400267(010A)	<i>LC.P5</i>	Parameter 5 Group Lock			
400268(010B)	<i>Pyd</i>	Password Setting	0000: OFF 0002 to 9999: Password Set Range (*0001: read-only password)	-	0000
400269 to 400300	Reserved				

## 2.4.7 User parameter group[Func: 03/06/16, RW: R/W]

The user parameter group can have up to 30 parameters.

No(Address)	Parameter	Description	Set Range	Unit	Factory Default
400301(012C)	PARAMETER	Parameter 0	Set range by each parameter	-	-
400302(012D)		Parameter 1			
400303(012E)		Parameter 2			
400304(012F)		Parameter 3			
400305(0130)		Parameter 4			
400306(0131)		Parameter 5			
400307(0132)		Parameter 6			
400308(0133)		Parameter 7			
400309(0134)		Parameter 8			
400310(0135)		Parameter 9			
400311(0136)		Parameter 10			
400312(0137)		Parameter 11			
400313(0138)		Parameter 12			
400314(0139)		Parameter 13			
400315(013A)		Parameter 14			
400316(013B)		Parameter 15			
400317(013C)		Parameter 16			
400318(013D)		Parameter 17			
400319(013E)		Parameter 18			
400320(013F)		Parameter 19			
400321(0140)		Parameter 20			
400322(0141)		Parameter 21			
400323(0142)		Parameter 22			
400324(0143)		Parameter 23			
400325(0144)		Parameter 24			
400326(0145)		Parameter 25			
400327(0146)		Parameter 26			
400328(0147)		Parameter 27			
400329(014F)		Parameter 28			
400330(0150)		Parameter 29			
400331 to 400350	Reserved				

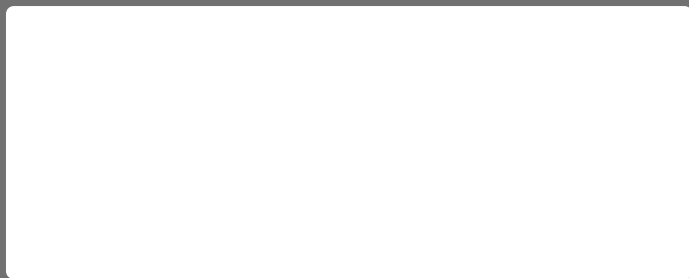


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