TK Series

Simultaneous Heating&Cooling Output PID Temperature Controllers

Communication Manual　MCT-TKC1-V2.2-EN

Autonics

Contents

Thank You for Purchasing The Product

Thank you for purchasing Autonics products.
Please familiarize yourself with the information contained in the **Safety Considerations** section before using this product.
This manual contains information about the product and its proper use, and should be kept in a place where it will be easy to access.

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.

- This manual is not provided as part of the product package. Please visit our website (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 our 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 website.

Manual Symbols

⚠ Failure to follow instructions can result in serious injury or death.

🔔 Failure to follow instructions can lead to a minor injury or product damage.

✏ Supplementary information for a particular feature.

📖 An example of the concerned feature's use.

🔖 Important information of the concerned feature's use.

1. Modbus RTU Protocol

Modbus is an industrial protocol developed in 1979 for serial communication between devices. Its functionality has gradually expanded to allow implementation in TCP/IP and UDP environments, and it is now widely used for simple, stable, and efficient communication in various network environments. This protocol has become the standard communication method in industrial automation systems, SCADA (Supervisory Control and Data Acquisition systems), and other industrial networks.

Modbus RTU transmits data in a continuous binary format, making it more efficient and faster than ASCII transmission. The frame structure does not clearly distinguish the start and end, but defines the start and end by leaving a silent interval (3.5 character times) between frames.

> For more detailed information about Modbus protocol, refer to the documentation provided by the developer.

1.1. Function Code Frame Structure

1.1.1. 01 (0x01) Read Coil Status

Reads the ON/OFF status of output (0X reference, coil) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x01 (Read Coil Status)
Starting address	2-byte	Starting address of the coil to be read
Quantity of coils	2-byte	Number of coils
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Starting address		Quantity of coils		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x01 (Read Coil Status)
Byte count	1-byte	Number of bytes in the returned data
Coil status	**N**-byte	The status of the requested coils is represented. Each coil's status is represented by 1 bit, and 8 coil statuses are grouped into 1 byte. • N = number of coils / 8 • If the remainder is not zero when divided by 8: N = N + 1
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Byte count	Coil status	CRC check	
1-byte	1-byte	1-byte	**N** × byte	Low	High
				1-byte	1-byte
CRC-16					

1.1.2. 02 (0x02) Read Input Status

Reads the ON/OFF status of input (1X reference) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x02 (Read Input Status)
Starting address	2-byte	Starting address of the input to be read
Quantity of inputs	2-byte	Number of inputs
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Starting address		Quantity of inputs		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x02 (Read Input Status)
Byte count	1-byte	Number of bytes in the returned data
Input status	**N**-byte	The status of the requested inputs is represented. Each input's status is represented by 1 bit, and 8 input statuses are grouped into 1 byte. • N = number of inputs / 8 • If the remainder is not zero when divided by 8: N = N + 1
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Byte count	Input status	CRC check	
				Low	High
1-byte	1-byte	1-byte	**N** × byte	1-byte	1-byte
CRC-16					

1.1.3. 03 (0x03) Read Holding Registers

Reads the binary data of holding registers (4X reference) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x03 (Read Holding Registers)
Starting address	2-byte	Starting address of the first register to be read
Quantity of registers	2-byte	Number of registers
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Starting address		Quantity of registers		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x03 (Read Holding Registers)
Byte count	1-byte	Number of bytes in the returned data (Number of registers read × 2-byte)
Register value	N × 2-byte	The values of the requested registers are represented. Each register is represented by 2 bytes. • N is determined by the number of requested registers.
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Byte count	Register value		CRC check	
1-byte	1-byte	1-byte	High	Low	Low	High
			1-byte	**1-byte**	1-byte	1-byte
CRC-16						

1.1.4. 04 (0x04) Read Input Registers

Reads the binary data of input registers (3X reference) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x04 (Read Input Registers)
Starting address	2-byte	Starting address of the first input register to be read
Quantity of input registers	2-byte	Number of input registers
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Starting address		Quantity of input registers		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x04 (Read Input Registers)
Byte count	1-byte	Number of bytes in the returned data (Number of registers read × 2-byte)
Register value	N × 2-byte	The values of the requested input registers are represented. Each register is represented by 2 bytes. • N is determined by the number of requested registers.
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Byte count	Register value		CRC check	
1-byte	1-byte	1-byte	High	Low	Low	High
			1-byte	**1-byte**	1-byte	1-byte
CRC-16						

1.1.5. 05 (0x05) Force Single Coil

Forces a single coil (0X reference) to either ON (0xFF00) or OFF (0x0000) status in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x05 (Force Single Coil)
Coil address	2-byte	Address of the coil to be forced
Force data	2-byte	Sets or resets the coil. (0xFF00 = ON, 0x0000 = OFF)
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Coil address		Force data		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x05 (Force Single Coil)
Coil address	2-byte	Address of the coil that was forced
Force data	2-byte	The status of the coil is represented. (0xFF00 = ON, 0x0000 = OFF)
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Coil address		Force data		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

1.1.6. 06 (0x06) Preset Single Register

Writes the binary data to a single holding register (4X reference) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x06 (Preset Single Register)
Register address	2-byte	Address of the register to be preset
Preset data	2-byte	Value to be preset
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Register address		Preset data		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x06 (Preset Single Register)
Register address	2-byte	Address of the register that was preset
Preset data	2-byte	Value preset to the register
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Register address		Preset data		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

1.1.7. 16 (0x10) Preset Multiple Registers

Writes the binary data continuously to multiple holding registers (4X reference) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x10 (Preset Multiple Registers)
Starting address	2-byte	Starting address of the first register to be preset
Quantity of registers	2-byte	Number of registers to be preset
Byte count	1-byte	Number of bytes for the register values to be preset (Number of registers to be preset × 2-byte)
Register values	N × 2-byte	The values of the registers to be preset are represented. • N is determined by the number of registers to be preset.
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave addr.	Func. code	Starting addr.		Quantity of registers		Byte count	Register values		CRC check	
		High	Low	High	Low		High	Low	Low	High
1-byte	1-byte	1-byte	1-byte	1-byte	1-byte	1-byte	**1-byte**	**1-byte**	1-byte	1-byte
CRC-16										

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x10 (Preset Multiple Registers)
Starting address	2-byte	Starting address of the first register that was preset
Quantity of registers	2-byte	Number of registers that were preset
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Starting address		Quantity of registers		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Except when downloading parameters with predefined minimum, maximum, or default values based on the input specifications in the PC loader program, it is recommended to use Preset Single Register rather than Preset Multiple Registers when connecting to external devices such as PLCs or graphic panels.

1.2. Exception Handling

In case of a communication error, the slave device sets the highest bit of the received function code to 1 in its response. It then sends only the exception code, without including any data related to the original request.

Exception response frame

Slave address	Function code + 0x80	Exception code	CRC check
1-byte	1-byte	1-byte	2-byte
CRC-16			

Exception codes

Exception code	Code name	Description
01	ILLEGAL FUNCTION	If the command is not supported.
02	ILLEGAL DATA ADDRESS	If the requested data address is invalid. (e.g. The data address does not exist or the address range is incorrect.)
03	ILLEGAL DATA VALUE	If the requested data value is invalid. (e.g. The data value is out of the allowable range.)
04	SLAVE DEVICE FAILURE	If the parameter is locked, communication write is prohibited, or the command cannot be processed correctly.
06	SLAVE DEVICE BUSY	If the device is in a state where it cannot execute the requested command.

2. Modbus Mapping Table

2.1. Read Coil Status (Func 01) / Write Single Coil (Func 05)

No(Address)	Parameter	Description	Default
000001 (0000)	RUN/STOP	Control output Run/Stop 0: RUN, 1: STOP	0: RUN
000002 (0001)	Auto-Tuning Execute	Auto-tuning ON/OFF 0: OFF, 1: ON	0: OFF
000003 to 000050	Reserved		

2.2. Read Discrete Inputs (Func 02)

No(Address)	Parameter	Description	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 (Func 04)

No(Address)	Parameter	Description	Default
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"
300106(0069)	-	Model Name 2	"4"
300107(006A)	-	Model Name 3	"14"
300108(006B)	-	Model Name 4	"RR"
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)	Reserved		
300116(0073)	Reserved		
300117(0074)	Reserved		
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 ~ 9999 31000: OPEN 30000: HHHH (High) -30000: LLLL (Low) °C/°F/-	-

No(Address)	Parameter	Description	Default
301002(03E9)	-	Decimal point location 0: 0, 1: 0.0, 2: 0.00, 3: 0.000	-
301003(03EA)	-	Indicator Unit 0: °C, 1: °F, 2: %, 3: OFF	-
301004(03EB)	SV	SV Setting Value Within L-SV to H-SV °C/°F/-	0000
301005(03EC)	H-MV	Heating Side MV 0 to 1000: H0.0 to H100 %	-
301006(03ED)	C-MV	Cooling Side MV 0 to 1000: C0.0 to C100 %	-
301007(03EE)	Refer to **301007 (03EE) Bit data**		-
301008(03EF)	-	Heater Current Value Monitoring 0.0 to 50.0	-

301007 (03EE) Bit data

Bit	Parameter	Description
Bit 0	°C Indicator	Unit Indicator 0: OFF, 1: ON
Bit 1	°F Indicator	Unit Indicator 0: OFF, 1: ON
Bit 2	% Indicator	Unit Indicator 0: OFF, 1: ON
Bit 3	OUT1 Indicator	Control Output 1 Indicator 0: OFF, 1: ON
Bit 4	OUT2 Indicator	Control Output 2 Indicator 0: OFF, 1: ON
Bit 5	AT Indicator	Auto-tuning Indicator 0: OFF, 1: ON
Bit 6	SV1 Indicator	Multi SV1 Indicator 0: OFF, 1: ON
Bit 7	SV2 Indicator	Multi SV2 Indicator 0: OFF, 1: ON
Bit 8	SV3 Indicator	Multi SV3 Indicator 0: OFF, 1: ON
Bit 9	AL1 Indicator	Alarm Output 1 Indicator 0: OFF, 1: ON
Bit A	AL2 Indicator	Alarm Output 2 Indicator 0: OFF, 1: ON
Bit B	MAN Indicator	Manual Control Indicator 0: OFF, 1: ON
Bit C	DI-I Input	DI-1 Input Status 0: OFF, 1: ON
Bit D	DI-2 Input	DI-2 Input Status 0: OFF, 1: ON
Bit E	-	0
Bit F	-	0

2.4. Read Holding Register (Func 03) / Write Single Register (Func 06) / Write Multiple Registers (Func 16)

2.4.1. Parameter 0 Group (Func: 03/06/16)

MV Monitoring/Manual Control Setting Group

No(Address)	Parameter	Description	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: H0.0 to H100 %	-
400003(0002)	C-MV	Cooling MV 0 to 1000: C0.0 to C100 %	-
400004(0003)	-	Auto/Manual Control 0: AUTO, 1: MAN	0: AUTO
400005 to 400050	Reserved		

2.4.2. Parameter 1 Group (Func: 03/06/16)

No(Address)	Parameter	Description	Default
400051(0032)	R-S	Control Output Run/Stop 0: RUN, 1: STOP	0: RUN
400052(0033)	SV-N	Multi SV Number 0: SV-0, 1: SV-1, 2: SV-2, 3: SV-3	0: SV-0
400053(0034)	CT-A	Heater Current Monitoring 0~500: 00.0~50.0 (display range) A	0
400054(0035)	AL1.L	Alarm Output 1 Low-limit Set Value Deviation Alarm: -F.S. to F.S. Absolute Value Alarm: Within the display range ℃/℉/-	1550
400055(0036)	AL1.H	Alarm Output 1 High-limit Set Value Deviation Alarm: -F.S. to F.S. Absolute Value Alarm: Within the display range ℃/℉/-	1550
400056(0037)	AL2.L	Alarm Output 2 Low-limit Set Value Deviation Alarm: -F.S. to F.S. Absolute Value Alarm: Within the display range ℃/℉/-	1550
400057(0038)	AL2.H	Alarm Output 2 High-limit Set Value Deviation Alarm: -F.S. to F.S. Absolute Value Alarm: Within the display range ℃/℉/-	1550
400058(0039)	SV-0	Set Value(SV)-0 Within L-SV to H- SV ℃/℉/-	0000
400059(003A)	SV-1	Set Value(SV)-1 Within L-SV to H- SV ℃/℉/-	0000
400060(003B)	SV-2	Set Value(SV)-2 Within L-SV to H- SV ℃/℉/-	0000
400061(003C)	SV-3	Set Value(SV)-3 Within L-SV to H- SV ℃/℉/-	0000

No(Address)	Parameter	Description	Default
400062(003D)	AL3.L	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)	AL3.H	Alarm Output 3 High-limit Set Value Deviation Alarm: -F.S. to F.S. Absolute Value Alarm: Within the display range °C/°F/-	1550
400064 to 400100	Reserved		

2.4.3. Parameter 2 Group (Func: 03/06/16)

No(Address)	Parameter	Description		Default
400101(0064)	AT	Auto-tuning Run/Stop 0: OFF, 1: ON		0: OFF
400102(0065)	H-P	Heating Proportional Band 1 to 9999: 000.1 to 999.9 °C/°F/%		010.0
400103(0066)	C-P	Cooling Proportional Band 1 to 9999: 000.1 to 999.9 °C/°F/%		010.0
400104(0067)	H-I	Heating Integral Time 0 to 9999: 0000 to 9999 Sec		0000
400105(0068)	C-I	Cooling Integral Time 0 to 9999: 0000 to 9999 Sec		0000
400106(0069)	H-D	Heating Derivative Time 0 to 9999: 0000 to 9999 Sec		0000
400107(006A)	C-D	Cooling Derivative Time 0 to 9999: 0000 to 9999 Sec		0000
400108(006B)	DB	Dead_Overlap Band	-999 to 999 (Temp.H) °C/°F	0000
			-199.9 to 999.9 (Temp.L) °C/°F	000.0
			-99.9 to 99.9 (Analog) %F.S.	000.0
400109(006C)	REST	Manual Reset 0 to 1000: 000.0 to 100.0 %		050.0
400110(006D)	H.HYS	Heating Hysteresis 1 to 100: 001 to 100 (Temp.H, Analog) 1 to 1000: 000.1 to 100.0 (Temp.L) Digit		002
400111(006E)	H.OST	Heating OFF Offset 0 to 100: 000 to 100 (Temp.H, Analog) 0 to 1000: 000.0 to 100.0 (Temp.L) Digit		000

No(Address)	Parameter	Description		Default
400112(006F)	C.HYS	Cooling Hysteresis 1 to 100: 001 to 100 (Temp.H, Analog) 1 to 1000: 000.1 to 100.0 (Temp.L) Digit		002
400113(0070)	C.OST	Cooling OFF Offset 0 to 100: 000 to 100 (Temp.H, Analog) 0 to 1000: 000.0 to 100.0 (Temp.L) Digit		000
400114(0071)	L-MV	MV Low-limit Set Value	[Heating or Cooling Control] 000.0 to H-MV - 0.1 %	000.0
			[Heating&Cooling Control] -100.0 to 000.0 %	-100.0
400115(0072)	H-MV	MV High-limit Set Value	[Heating or Cooling Control] L-MV+0.1 to 100.0 %	100.0
			[Heating&Cooling Control] 000.0 to 100.0 %	100.0
400116(0073)	RAMU	Ramp Up Change Rate 0 to 999: 000 to 999 (Temp.H, Analog) 0 to 9999: 000.0 to 999.9 (Temp.L) ℃/℉/Digit		000
400117(0074)	RAMD	Ramp Down Change Rate 0 to 999: 000 to 999 (Temp.H, Analog) 0 to 9999: 000.0 to 999.9 (Temp.L) ℃/℉/Digit		000
400118(0075)	R.UNT	Ramp Time Unit 0: SEC, 1: MIN, 2: HOUR		1: MIN
400119 to 400150	Reserved			

2.4.4. Parameter 3 Group (Func: 03/06/16)

No(Address)	Parameter	Description		Default
400151(0096)	IN-T	Input Type Refer to **Input Type and Using Range**		0: KCA.H
400152(0097)	UNIT	Sensor Temperature Unit 0: °C, 1: °F		0: °C
400153(0098)	L-RG	Analog Low-limit Input Value Minimum Range to H-RG - F.S.10%		00.00
400154(0099)	H-RG	Analog High-limit Input Value L-RG+F.S.10% to Maximum Range		10.00
400155(009A)	DOT	Scaling Decimal Point 0: 0, 1: 0.0, 2: 0.00, 3: 0.000		1: 0.0
400156(009B)	L-SC	Low-limit Scale Value -1999 to 9999		000.0
400157(009C)	H-SC	High-limit Scale Value -1999 to 9999		100.0
400158(009D)	D.UNT	Display Unit 0: °C, 1: °F, 2: %, 3: OFF		0: °C
400159(009E)	IN-B	Input Correction -999 to 999: -999 to 0999 (Temp.H, Analog) -1999 to 9999: -199.9 to 999.9 (Temp.L) °C/°F/-		0000
400160(009F)	MAV.F	Input Digital Filter 1 to 1200: 000.1 to 120.0 Sec		000.1
400161(00A0)	L-SV	SV Low-limit Set Value	Input Low-limit Value(L-SC) to H-SV-1Digit (Temp.) °C/°F	-200
			Input Low-limit Value(L-SC) to H-SV-1Digit (Analog) %F.S.	000.0
400162(00A1)	H-SV	SV High-limit Set Value	L-SV+1Digit to Input High-limit Value(H-SC) (Temp.) °C/°F	1350
			L-SV+1Digit to Input High-limit Value(H-SC) (Analog) %F.S.	100.0

No(Address)	Parameter	Description		Default
400163(00A2)	O-FT	Control Output Operation Mode	[Standard Type] 0: HEAT, 1: COOL	0: HEAT
			[Heating & Cooling Type] 0: HEAT, 1: COOL, 2: H-C	2: H-C
400164(00A3)	C-MD	Control Type	[Standard Control] 0: PID, 1: ONOF	0: PID
			[Heating & Cooling Control] 0: P.P, 1: P.ON, 2: ON.P, 3: ON.ON	0: P.P
400165(00A4)	ATT	Auto-tuning Mode 0: TUN1, 1: TUN2		0: TUN1
400166(00A5)	OUT1	OUT1 Control Output Selection 0: SSR, 1: CURR		1: CURR
400167(00A6)	O1.SR	OUT1 SSR Output Type 0: STND, 1: CYCL, 2: PHAS		0: STND
400168(00A7)	O1.MA	OUT1 Current Output Range 0: 4-20, 1: 0-20		0: 4-20
400169(00A8)	OUT2	OUT2 Control Output Selection 0: SSR, 1: CURR		1: CURR
400170(00A9)	O2.MA	OUT2 Current Output Range 0: 4-20, 1: 0-20		0: 4-20
400171(00AA)	H-T	Heating Control Time	[Relay output model] 000.1 to 120.0 Sec	020.0
			[SSR drive output model] 000.1 to 120.0 Sec	002.0
			[Current output model] 001.0 to 120.0 Sec	002.0
400172(00AB)	C-T	Cooling Control Time	[Relay output model] 000.1 to 120.0 Sec	020.0
			[SSR drive output model] 000.1 to 120.0 Sec	002.0
			[Current output model] 001.0 to 120.0 Sec	002.0

Input Type and Using Range

Setting	Input type	Decimal	Display	Use range (°C)	Use range (°F)
0	K (CA)	1	Ի Ը Ꭿ.Η	-200 ~ 1,350	-328 ~ 2,462
1	K (CA)	0.1	Ի Ը Ꭿ.L	-199.9 ~ 999.9	-199.9 ~ 999.9
2	J (IC)	1	J Ꮖ Ը.Η	-200 ~ 800	-328 ~ 1,472
3	J (IC)	0.1	J Ꮖ Ը.L	-199.9 ~ 800.0	-199.9 ~ 999.9
4	E (CR)	1	Ε Ը ⌐.Η	-200 ~ 800	-328 ~ 1,472
5	E (CR)	0.1	Ε Ը ⌐.L	-199.9 ~ 800.0	-199.9 ~ 999.9
6	T (CC)	1	Ƚ Ը Ը.Η	-200 ~ 400	-328 ~ 752
7	T (CC)	0.1	Ƚ Ը Ը.L	-199.9 ~ 400.0	-199.9 ~ 752.0
8	B (PR)	1	Ƅ Ρ ⌐	0 ~ 1,800	32 ~ 3,272
9	R (PR)	1	⌐ Ρ ⌐	0 ~ 1,750	32 ~ 3,182
10	S (PR)	1	Ϛ Ρ ⌐	0 ~ 1,750	32 ~ 3,182
11	N (NN)	1	∩ ∩ ∩	-200 ~ 1,300	-328 ~ 2,372
12	C (TT)	1	Ը Ƚ Ƚ	0 ~ 2,300	32 ~ 4,172
13	G (TT)	1	Ɠ Ƚ Ƚ	0 ~ 2,300	32 ~ 4,172
14	L (IC)	1	L Ꮖ Ը.Η	-200 ~ 900	-328 ~ 1,652
15	L (IC)	0.1	L Ꮖ Ը.L	-199.9 ~ 900.0	-199.9 ~ 999.9
16	U (CC)	1	Ʉ Ը Ը.Η	-200 ~ 400	-328 ~ 752
17	U (CC)	0.1	Ʉ Ը Ը.L	-199.9 ~ 400.0	-199.9 ~ 752.0
18	Platinel II	1	Ρ L Ꮖ Ꮖ	0 ~ 1,390	32 ~ 2,534
19	Cu50 Ω	0.1	Ը Ʉ Ϛ	-199.9 ~ 200.0	-199.9 ~ 392.0
20	Cu100 Ω	0.1	Ը Ʉ Ꮖ0	-199.9 ~ 200.0	-199.9 ~ 392.0
21	JPt100 Ω	1	J Ρ Ƚ.Η	-200 ~ 650	-328 ~ 1,202
22	JPt100 Ω	0.1	J Ρ Ƚ.L	-199.9 ~ 650.0	-199.9 ~ 999.9
23	DPt50 Ω	0.1	ⅆ Ρ Ƚ Ϛ	-199.9 ~ 600.0	-199.9 ~ 999.9
24	DPt100 Ω	1	ⅆ Ρ Ƚ.Η	-200 ~ 650	-328 ~ 1,202
25	DPt100 Ω	0.1	ⅆ Ρ Ƚ.L	-199.9 ~ 650.0	-199.9 ~ 999.9
26	Nickel120 Ω	1	∩ Ꮖ Ꮖ2	-80 ~ 200	-112 ~ 392
27	0 ~ 10 V	Set decimal point	Ꭿ Ʉ Ꮖ	0 ~ 10 V	
28	0 ~ 5 V	Set decimal point	Ꭿ Ʉ 2	0 ~ 5 V	
29	1 ~ 5 V	Set decimal point	Ꭿ Ʉ 3	1 ~ 5 V	
30	0 ~ 100 mV	Set decimal point	Ꭿ ∩ Ʉ Ꮖ	0 ~ 100 mV	
31	0 ~ 20 mA	Set decimal point	Ꭿ ∩ Ꭿ Ꮖ	0 ~ 20 mA	
32	4 ~ 20 mA	Set decimal point	Ꭿ ∩ Ꭿ 2	4 ~ 20 mA	

2.4.5. Parameter 4 Group (Func: 03/06/16)

No(Address)	Parameter	Description	Default
400201(00C8)	AL-1	Alarm Output 1 Operation Mode 0: OFF, 1: DVCC, 2:]]DV, 3:]DVC, 4: CDV] 5: PVCC, 6:]]PV, 7: LBA, 8: SBA, 9: HBA	1: DVCC
400202(00C9)	AL1.T	Alarm Output 1 Option 0: AL-A, 1: AL-B, 2: AL-C, 3: AL-D 4: AL-E, 5: AL-F	0: AL-A
400203(00CA)	A1.HY	Alarm Output 1 Hysteresis 1 to 100: 001 to 100(Temp.H, Analog) 1 to 1000: 000.1 to 100.0(Temp.L) Digit	001
400204(00CB)	A1.N	Alarm Output 1 N.O./N.C. 0: NO, 1: NC	0: NO
400205(00CC)	A1.ON	Alarm Output 1 ON Delay Time 0 to 3600: 0000 to 3600 Sec	0000
400206(00CD)	A1.OF	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: DVCC, 2:]]DV, 3:]DVC, 4: CDV] 5: PVCC, 6:]]PV, 7: LBA, 8: SBA, 9: HBA	2:]]DV
400208(00CF)	AL2.T	Alarm Output 2 Option 0: AL-A, 1: AL-B, 2: AL-C, 3: AL-D 4: AL-E, 5: AL-F	AL-A
400209(00D0)	A2.HY	Alarm Output 2 Hysteresis 1 to 100: 001 to 100(Temp.H, Analog) 1 to 1000: 000.1 to 100.0(Temp.L) Digit	001
400210(00D1)	A2.N	Alarm Output 2 N.O./N.C. 0: NO, 1: NC	0: NO
400211(00D2)	A2.ON	Alarm Output 2 ON Delay Time 0 to 3600: 0000 to 3600 Sec	0000
400212(00D3)	A2.OF	Alarm Output 2 OFF Delay Time 0 to 3600: 0000 to 3600 Sec	0000
400213(00D4)	LBA.T	LBA Time 0 to 9999: 0000 to 9999 Sec	0000

No(Address)	Parameter	Description		Default
400214(00D5)	Reserved			
400215(00D6)	LBA.B	LBA Band	1 to 9999: 000 to 999 (Temp.H) °C/°F	002
			1 to 9999: 000.0 to 999.9 (Temp.L) °C/°F	002.0
			1 to 9999: 000.0 to 100.0 (Analog) %F.S.	000.2
400216(00D7)	AO.M1	Analog Transmission Output 1 Mode 0: PV, 1: SV, 2: H-MV, 3: C-MV		0: PV
400217(00D8)	FS.L1	Transmission Output 1 Low- limit Value F.S.		-200
400218(00D9)	FS.H1	Transmission Output 1 High-limit Value F.S.		1350
400219(00DA)	ADRS	Communication Address 1 to 99: 01 to 99		01
400220(00DB)	BPS	Communication Speed 0: 24, 1: 48, 2: 96, 3: 192, 4: 384 bps		2: 96
400221(00DC)	PRTY	Communication Parity Bit 0: NONE, 1: EVEN, 2: ODD		0: NONE
400222(00DD)	STP	Communication Stop Bit 0: 1, 1: 2 Bit		1: 2
400223(00DE)	RSW.T	Communication Response Waiting Time 5 to 99: 5 to 99 ms		20
400224(00DF)	COMW	Communication Write 0: EN.A, 1: DIS.A		0: EN.A
400225(00E0)	AL-3	Alarm Output 3 Operation Mode 0: OFF, 1: DVCC, 2:]]DV, 3:]DVC, 4: CDV], 5: PVCC, 6:]]PV, 7: LBA, 8: SBA, 9: HBA		0: OFF
400226(00E1)	AL3.T	Alarm Output 3 Option 0: AL-A, 1: AL-B, 2: AL-C, 3: AL-D 4: AL-E, 5: AL-F		0: AL-A

No(Address)	Parameter	Description	Default
400227(00E2)	A3.HY	Alarm Output 1 Hysteresis 1 to 100: 001 to 100 (Temp.H, Analog) 1 to 1000: 000.1 to 100.0 (Temp.L) Digit	001
400228(00E3)	A3.N	Alarm Output 3 N.O./N.C. 0: NO, 1: NC	0: NO
400229(00E4)	A3.ON	Alarm Output 3 ON Delay Time 0 to 3600: 0000 to 3600 Sec	0000
400230(00E5)	A3.OF	Alarm Output 3 OFF Delay Time 0 to 3600: 0000 to 3600 Sec	0000
400231(00E6)	AO.M2	Analog Transmission 2 mode 0: PV, 1: SV, 2: H-MV, 3: C-MV	0: PV
400232(00E7)	FS.L1	Transmission Output 2 Low-limit Value F.S.	-200
400233(00E8)	FS.H1	Transmission Output 2 High-limit Value F.S.	1350
400234 to 400250	Reserved		

2.4.6. Parameter 5 Group (Func: 03/06/16)

No(Address)	Parameter	Description	Default
400251(00FA)	MT.SV	Multi SV 0: 1, 1: 2, 2: 4 EA	0: 1
400252(00FB)	DI-K	Digital Input Key 0: STOP, 1: AL.RE, 2: AT, 3: OFF	0: STOP
400253(00FC)	DI-1	DI-1 Input Terminal Function 0: OFF, 1: STOP, 2: AL.RE, 3: MAN 4: MT.SV	0: OFF
400254(00FD)	DI-2	DI-2 Input Terminal Function 0: OFF, 1: STOP, 2: AL.RE, 3: MAN 4: MT.SV	0: OFF
400255(00FE)	IT.MV	Manual Control, Initial MV 0: AUTO, 1: PR.MV	0: AUTO
400256(00FF)	PR.MV	Manual Control, Preset MV 000.0 to 100.0(Standard Control) -100.0 to 100.0(Heating & Cooling Control) %	000.0
400257(0100)	ER.MV	Sensor Error, MV 000.0 to 100.0(Standard Control) -100.0 to 100.0(Heating & Cooling Control) %	000.0
400258(0101)	ST.MV	Control Stop, MV 000.0 to 100.0(Standard Control) -100.0 to 100.0(Heating & Cooling Control) %	000.0
400259(0102)	ST.AL	Control Stop, Alarm Output 0: CONT, 1: OFF	0: CONT
400260(0103)	USER	User Level 0: STND, 1: HIGH	0: STND
400261(0104)	INIT	Parameter Initialization 0: NO, 1: YES	0: NO
400262(0105)	LC.SV	SV Setting Lock 0: OFF, 1: ON	0: OFF
400263(0106)	LC.P1	Parameter 1 Group Lock 0: OFF, 1: ON	0: OFF
400264(0107)	LC.P2	Parameter 2 Group Lock 0: OFF, 1: ON	0: OFF

No(Address)	Parameter	Description	Default
400265(0108)	LC.P3	Parameter 3 Group Lock 0: OFF, 1: ON	0: OFF
400266(0109)	LC.P4	Parameter 4 Group Lock 0: OFF, 1: ON	0: OFF
400267(010A)	LC.P5	Parameter 5 Group Lock 0: OFF, 1: ON	0: OFF
400268(010B)	PWD	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)

The user parameter group is the dedicated function for DAQMaster.

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

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