

High accuracy standard temperature controller



Technical Support Manual



Thank you very much for selecting Autonics products. For your safety, please read the following before using.

Preface

Thank you very much for selecting Autonics products.

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.

Technical Support 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 home-page (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 homepage.

Technical Support Manual Symbols

Symbol	Description
Note	Supplementary information for a particular feature.
Å Warning	Failure to follow instructions can result in serious injury or death.
A Caution	Failure to follow instructions can lead to a minor injury or product damage.
Ex.	An example of the concerned feature's use.
×1	Annotation mark.

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:

\Lambda Warning	Warning	Failure to follow the instructions may lead to a serious injury or accident.
	1	
A Caution	Caution	Failure to follow the instructions may lead to a minor injury or accident.



 Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)

Failure to follow this instruction may result in personal injury, fire, or economic loss.

- The unit must be installed on a device panel before use.
 Failure to follow this instruction may result in electric shock.
- Do not connect, repair, or inspect the unit while connected to a power source.
 Failure to follow this instruction may result in electric shock.
- Check the input power specifications and terminal polarity for correct connecting the power source.

Failure to follow this instruction may result in fire.

Do not disassemble or modify the unit. Please contact us if necessary.
 Failure to follow this instruction may result in electric shock or fire.



- Do not use the unit outdoors.
 Failure to follow this instruction may result in shortening the life cycle of the unit, or electric shock.
- When connecting the power input and relay output cables, use AWG20 (0.5mm²) cables.
 Failure to follow this instruction may result in fire due to contact failure.
- Use the unit within the rated specifications.
 Failure to follow this instruction may result in shortening the life cycle of the unit, or fire.
- Do not use loads beyond the rated switching capacity of the relay contact.
 Do not use water or oil-based detergent when cleaning the unit. Use dry cloth to clean the unit.
- Do not use water or oil-based detergent when cleaning the unit. Use dry cloth to clean the unit.

Failure to follow this instruction may result in electric shock or fire.

- Do not use the unit where flammable or explosive gas, humidity, direct sunlight, radiant heat, vibration, or impact may be present.
 Failure to follow this instruction may result in fire or explosion.
- Keep dust and wire residue from flowing into the unit.
 Failure to follow this instruction may result in fire or product damage.
- Check the polarity of the measurement input contact before wiring the temperature sensor.
 Failure to follow this instruction may result in fire or explosion.
- For installing the unit with reinforced insulation, use the power supply unit which basic level is ensured.

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1 System

1.1 Version

Software	Version	Note
Operations	Windows 7	
GX Works2	1.545T	Release : 2016.03.29

1.2 Connections



1.3 Communication cable connection

TK4 Series	Cable connection		PLC (QJ71C24N)
			SDB
RS – 485 (-)		 	SDA
			RDB
KS – 485 (+)			RDA

2 Communication Setting

2.1 TK4 Series Setting

1st Supply power to the TK unit. Press the MODE key to enter parameter setting group.

Parameter	Display	Setting	Note
Communication address	Adr S	0 to 04	User setting
Communication speed	6P5	384	Same as PLC
Communication parity bit	Prty	nonE	Same as PLC
Communication stop bit	SEP	2	Same as PLC
Communication response waiting time	r 5 <u>4</u> .E	20	User setting
Communication write	Coñ Y	E n.A	Fixed

2nd Enter PRr 4 and set the communication settings as below.







OUT

<Comm. stop bit setting >

<Comm. response waiting time setting >



<Comm. write setting >

- * When entering the parameter, press the MODE key shortly and it moves to next parameter.
- * Hold the MODE key over 3 sec while in setting mode to return to RUN mode.
- * Hold the MODE key for 1.5 sec while in setting mode to move to other parameter group.
- * Press the MODE key after the setting and it is saved.
- * If there is no additional key operation within 30 sec after entering into setting mode, it will be automatically returned to RUN mode and previous set value will be remained.

2.2 GX-Works2 Setting (Network)

1st Add I/F Module as "QJ71C24N" and set communication setting at "Switch setting".



	Item	CH1	CH2			
	Operation setting	Independent 🗸 🗸	Independent			
	Data Bit	7	8			
	Parity Bit	None	None			
Transmission	Even/odd parity	Odd	Odd			
Setting	Stop bit	1	2			
	Sum check code	None	None			
Online Change		Disable	Enable			
	Setting modifications	Disable	Enable			
Communica	ation rate setting	Auto Setting	38400bps			
Communicati	on protocol setting	MELSOFT Connection	Predefined protocol			
Station numb	er setting (0 to 31)	0				
This dialog setting is linked to the Switch Setting of the PLC parameter. Default value will be shown in the dialog if the Switch Setting an out-of-range value.						

2nd Run [Tool - intelligent Function Module Tool – Serial Communication Module – Predefined

Protocol Support Function] on menu.



3rd Enter present value (PV) reading protocol and setting value (SV) writing protocol.

🗐 MELSO	FT Series < Predef	ined Protocol Su	pport Function> - [Protocol	Setting - TK4_MELSEC Q	(1EH4) Protocol Setup.pcf]		
: <u>F</u> ile	<u>E</u> dit M <u>o</u> dule R	lead/Write <u>T</u> ool	De <u>b</u> ugging Support Fund	tion <u>W</u> indow			_ @ >
i 🗅 🖻	💾 📭 🕞 😼						
Protocol No.	Manufacturer	Model	Protocol Name	Communication Ty	pe -> Send <- Receive	Packet Name	Packet Setting
1 -	Schneider Electri	MODBUS	04:RD IN Registers	Send&Receive			
					->	04:RD IN Registers	Variable Set
					<-(1)	NOR/04:RD IN Registers	Variable Set
					<-(2)	ERR/04:RD IN Registers	Variable Set
2	Schneider Electri	MODBUS	06:WR Single Register	Send&Receive			
					->	06:WR Single Register	Variable Set
					<-(1)	NOR/06:WR Single Register	 <u>Variable Set</u>
					<-(2)	ERR/06:WR Single Register	Variable Set
Add							
			5 N 11 D 1				
Protocol	in Predefined Protoc	col Library	Editable Protocol				
	Protoco	ol Line	Protoc	col Line			
	Send P	acket Line	Send	Packet Line			
	Receiv	e Packet Line	Recei	ve Packet Line			
Protocols	2/128 Pack	ets 6/256	Packet Data Area Usage 1.4	1% Module for De	bugging		CAP NUM SCRL

4th Packet setting

▶ PV reading transmiting/receving protocol: 04. RD IN Registers Setting

<Send. 04:RD IN Registers Packet Setting>

ket Setting				2
rotocol No.	1	Protocol Name	14:RD IN Registers	
acket Type	Send Packet	Packet Name	14:RD IN Registers	
lement List				
Element No.	Element Type	Element Name	Element Setting	
Element No.	Element Type Non-conversion Variable	Element Name	Element Setting [D500-D500](Fixed Length/1Byte/Lower/Upper Byte/No Swap)	
Element No. 1	Element Type Non-conversion Variable Static Data	Element Name Slave Address Function Code	Element Setting [D500-D500](Fixed Length/1Byte/Lower/Upper Byte/No Swap) 04(1Byte)	
Element No. 1 2 3	Element Type Non-conversion Variable Static Data Non-conversion Variable	Element Name Slave Address Function Code Starting Address	Element Setting [D500-D500](Fixed Length/1Byte/Lower/Upper Byte/No Swap) 04(1Byte) [D501-D501](Fixed Length/2Byte/Lower/Upper Byte/Swap)	
Element No. 1 2 3 4	Element Type Non-conversion Variable Static Data Non-conversion Variable Non-conversion Variable	Element Name Slave Address Function Code Starting Address Quantity of Input Registers	Element Setting [D500-D500](Fixed Length/1Byte/Lower/Upper Byte/No Swap) 04(1Byte) [D501-D501](Fixed Length/2Byte/Lower/Upper Byte/Swap) [D502-D502](Fixed Length/2Byte/Lower/Upper Byte/Swap)	

Element No.	Element Name	Setting	Note
1	Slave Address	D500	Target address (device)
2	Function Code	04(HEX)	Function Code
3	Starting Address	D501	Start address (memory)
4	Quantity of Input Registers	D502	No. of requested readings
5	Error Check	Fixed	CRC16

E.g.) When reading 2 values within Input Register 301001(03E8 H) to 301002(03E9 H) of Slave(address 1) at Master,

Slave	Starting Addr		No. of Points		No. of Points		Error Check(CRC16)	
Address	FUNCTION	High	Low	High	Low	Low	High	
01H	04H	03H	E8H	00Н	02H	F1 H	BB H	
<		CRC10	6					

<Receive(1). NOR / 04:RD IN Registers Packet Setting >

Packet Setting	-			X
Protocol No.	1	Protocol Name	04:RD IN Registers	
Packet Type	Receive Packet	Packet Name	NOR/04:RD IN Registers	
Packet No.	1			
Element List				
Element No.	Element Type	Element Name	Element Setting	
1	Non-conversion Variable	Slave Address	[D510-D510](Fixed Length/1Byte/Lower/Upper Byte/No Swap)	
2	Static Data	Function Code	04(1Byte)	
3	Length	Byte Count	(Object element4-4/HEX/1Byte)	
4	Non-conversion Variable	Input Registers	[D999][D1000-D1124](Variable Length/250Byte/Lower/Upper Byte/Swap)	
5	Check Code	Error Check	(Object element1-4/CRC MOD)	

Element No.	Element Name	Setting	Note
1	Slave Address	D510	Target address (device)
2	Function Code	04(HEX)	Function Code
3	Byte Count	Fixed	No. of received byte
4		D999	Data length
4	input Registers	D1000	Received data
5	Error Check	Fixed	CRC16

E.g.) When $301001(0000 \text{ H})$ value of Slave(address 1) is "10" and $301002(0001 \text{ H})$ value is	E.g.) When	1 301001(0000 H) value of Slave(addre	ss 1) is "10" and 301002	(0001 H) value is "20
---	------------	-----------------	------------------------	--------------------------	-----------------------

Slave		Byte Count	Data		Data		Error Check(CRC16)	
Address			High	Low	High	Low	Low	High
01 H	04 H	04 H	00 H	0A H	00 H	14 H	db h	89 H
← CRC16 →								

<Receive(2). ERR / 04:RD IN Registers Packet Setting >

					<u> </u>
Protoco	ol No.	1	Protocol Name	04:RD IN Registers	
Packet	Туре	Receive Packet	Packet Name	ERR/04:RD IN Registers	
Packet	No.	2			
Elemen	nt List				
Ele	ement No.	Element Type	Element Name	Element Setting	
1		Non-conversion Variable	Slave Address	[D520-D520](Fixed Length/1Byte/Lower/Upper Byte/No Swap)	
2		Static Data	Error Code	84(1Byte)	
3		Non-conversion Variable	Exception Code	[D1125-D1125](Fixed Length/1Byte/Lower/Upper Byte/No Swap)	
4		Check Code	Error Check	(Object element1-3/CRC MOD)	

Element No.	Element Name	Setting	Note
1	Slave Address	D520	Target address (device)
2	Error Code	84(HEX)	Error Code
3	Exception Code	D1125	Error content
4	Error Check	Fixed	CRC16

* Exception Response - Error code

Code number	Error	Description
01 H	ILLEGAL FUNCTION	Not supported command.
02 H	ILLEGAL DATA ADDRESS	Starting Address of the queried data is inconsistent with transmittable address from the device.
03 H	ILLEGAL DATA VALUE	Numbers of queried data are inconsistent with the numbers of transferable data from device.
04 H	SLAVE DEVICE FAILURE	Not properly complete the queried command.

E.g.) Output status response of the not-exist coil 01001(03E8 H) about address 1

Slave Function+		Execution Code	Error Check(CRC16)		
Address	80 H		Low	High	
01 H	81 H	02 H	C1	91	
← − − − − − − − − − − − − − − − − − − −					

As the above table, the response of Exception Code is 02H.

▶ SV reading transmint/receive protocol: 06. WR Single Register

<Send. 06:WR Single Register Packet Setting>

Packet Setting	-			×	
Protocol No.	2	Protocol Name	06:WR Single Register		
Packet Type	Send Packet	Packet Name	06:WR Single Register		
Element List					
Element No.	Element Type	Element Name	Element Setting		
1	Non-conversion Variable	Slave Address	[D503-D503](Fixed Length/1Byte/Lower/Upper Byte/No Swap)		
2	Static Data	Function Code	06(1Byte)		
3	Non-conversion Variable	Register Address	[D504-D504](Fixed Length/2Byte/Lower/Upper Byte/Swap)		
4	Non-conversion Variable	Register Value	[D1500-D1500](Fixed Length/2Byte/Lower/Upper Byte/Swap)		
5	Check Code	Error Check	(Object element1-4/CRC MOD)		

Element No.	Element Name	Setting	Note
1	Slave Address	D503	Target address (device)
2	Function Code	06(HEX)	Function Code
3	Register Address	D504	Target address (memory)
4	Register Value	D1500	Write data
5	Error Check	Fixed	CRC16

E.g.) When writing "10" on Holding Register 400001(0000 H) of Slave(address 1) at Master,

Slave	Function	Register Address		Preset Data		Error Check(CRC16)	
Address		High	Low	High	Low	Low	High
01 H	06 H	00 H	00 H	00 H	0A H	09 H	CD H
← CRC16 − →							

acket Setting	-		
Protocol No.	2	Protocol Name	06:WR Single Register
Packet Type	Receive Packet	Packet Name	NOR/06:WR Single Register
Packet No.	1	_	
Element List			
Element No.	Element Type	Element Name	Element Setting
1	Non-conversion	Slave Address	[DE20_DE20](Eived Length / 1Pute / Length / Upper, Pute / No. Swop)
<u>k.l</u>	j variabie	Jalave muuress	[D000_D000](Fixed Length/TDyte/Lower/Opper Dyte/No owap/
2	Static Data	Function Code	06(1Byte)
2	Static Data Non-conversion Variable	Function Code Register Address	06(1Byte) [D531-D531](Fixed Length/2Byte/Lower/Upper Byte/Swap)
2 3 4	Variable Static Data Non-conversion Variable Non-conversion Variable	Function Code Register Address Register Value	06(1Byte) 06(1Byte) [D531-D531](Fixed Length/2Byte/Lower/Upper Byte/Swap) [D532-D532](Fixed Length/2Byte/Lower/Upper Byte/Swap)

<Receive(1). NOR / 06:WR Single Register Packet Setting>

Element No.	Element name	Setting	Note
1	Slave Address	D530	Target address (device)
2	Function Code	06(HEX)	Function Code
3	Register Address	D531	Target address (memory)
4	Register Value	D532	Write data
5	Error Check	Fixed	CRC16

When single writing (F/C 06) is completed normally, the received response packet from low device is same as the transmit packet of Master device.

E.g.) When writing "10" on Holding Register 400001(0000 H) of Slave(address 1) at Master,

Slave Address	Function	Register Address		Preset Data		Error Check(CRC16)	
		High	Low	High	Low	Low	High
01 H	06 H	00 H	00 H	00 H	0A H	09 H	CD H
< CRC16→							

<Receive(2). ERR / 06:WR Single Register Packet Setting >

Protocol No. 2 Protocol Name 06:WR Single Register Packet Type Receive Packet Packet Name ERR/06:WR Single Register Packet No. 2 Bement List Element Type Element Name Element Setting Non-conversion Slave Address [D540-D540](Fixed Length/1Byte/Lower/Upper Byte/No Swap) 2 2 Static Data Error Code 86(1Byte) 1	Packet Setting	-			×	
Packet Type Receive Packet Packet Name ERR/06:WR Single Register Packet No. 2 Element List Element	Protocol No.	2	Protocol Name	06:WR Single Register		
Packet No. 2 Element List Element Type Element Name Element Setting No. Non-conversion Slave Address [D540-D540](Fixed Length/1Byte/Lower/Upper Byte/No Swap) 2 Static Data Error Code 86(1Byte)	Packet Type	Receive Packet	Packet Name	ERR/06:WR Single Register		
Element List Element Type Element Name Element Setting No. Non-conversion Slave Address [D540-D540](Fixed Length/1Byte/Lower/Upper Byte/No Swap) 2 Static Data Error Code 86(1Byte)	Packet No.	2				
Element No. Element Type Element Name Element Setting 1 Non-conversion Variable Slave Address [D540-D540](Fixed Length/1Byte/Lower/Upper Byte/No Swap) 2 Static Data Error Code 86(1Byte)	Bement List					
Non-conversion Slave Address [D540-D540](Fixed Length/1Byte/Lower/Upper Byte/No Swap) 2 Static Data Error Code 86(1Byte)	Element No.	ement Element Type Element Name		Element Setting		
2 Static Data Error Code <u>86(1Byte)</u>	1	Non-conversion Variable	Slave Address	[D540-D540](Fixed Length/1Byte/Lower/Upper Byte/No Swap)		
Non-conversion	2 Static Data		Error Code	86(1Byte)		
3 Variable Exception Code [D1126-D1126](Fixed Length/1Byte/Lower/Upper Byte/No Swap)	3	Non-conversion Variable Exception Code		[D1126-D1126](Fixed Length/1Byte/Lower/Upper Byte/No Swap)		
4 Check Code Error Check (Object element 1-3/CRC MOD)	4	Check Code Error Check		(Object element1-3/CRC MOD)		

Element No.	Element Name	Setting	Note	
1	Slave Address	D540	Target address (device)	
2	Error Code	86(HEX)	Error Code	
3	Exception Code	D1126	Error content	
4	Error Check	Fixed	CRC16	

* Exception Response - Error code

Code number	Error name	Description		
01 H	ILLEGAL FUNCTION	Not supported command.		
02 H	ILLEGAL DATA ADDRESS	Starting Address of the queried data is inconsistent with transmittable address from the device.		
03 H	ILLEGAL DATA VALUE	Numbers of queried data are inconsistent with the numbers of transferable data from device.		
04 H	SLAVE DEVICE FAILURE	Not properly complete the queried command.		

E.g.) Output status response of the not-exist coil 01001(03E8 H) about address 1

Slave	Function +80 H	Exception Code	Error Check(CRC16)		
Address			Low	High	
01 H	81 H	02 H	C1	91	
← CRC16 − →					

As the above table, the response of Exception Code is 02H.

5th Download the set protocol setting on [Module Read/Write - write to Module] menu.

6	MELSOF	FT Seri	es <f< th=""><th>Predefi</th><th>ned Proto</th><th>ocol Sup</th><th>oport</th><th>Function> - [Protocol 9</th><th>Setting - TK4_MELSEC Q(1E#4) P</th></f<>	Predefi	ned Proto	ocol Sup	oport	Function> - [Protocol 9	Setting - TK4_MELSEC Q(1E#4) P
	🔁 <u>F</u> ile	<u>E</u> dit	Mo	dule R	ead/Write	Tool	De	bugging Support Funct	ion <u>W</u> indow
🗄 🗅 🖻 📳 📑 🚚 Read from Module					from Mo	dule			
ľ			-	<u>W</u> rite	e to Modu	ıle			
	Protocol No.	Mar		Mod	<u>u</u> le Verific	ation		Protocol Name	Communication Type
L	<u>1</u>	Schne	ider I	Electri	MODBUS		04:RE	DIN Registers	Send&Receive
L	2	Schne	ider I	Electri	MODBUS		06:WI	R Single Register	Send&Receive
	Add								

2.3 GX-Works2 Program

1st The order of communication program is as below.

[Requests reading address 1 PV]→[Receiving address 1 PV]→[Requests reading address 2 PV]→ ••• →[Requests reading address 4 PV]→[Receiving address 4 PV]→

[Requests reading address 1 PV]→[Receiving address 1 PV]→ ••• (repeat continously)

※ Requests writing SV: occurs one time when SV Trigger is on.

E.g.) [Requests reading address 1 PV]→[Receiving address 1 PV]

 \rightarrow M1202:ON \rightarrow [Requests writing address 3 SV] \rightarrow [Completes writing address 3

SV normally] \rightarrow M5001:ON \rightarrow M1202:OFF \rightarrow [Requests reading address 2 PV] \rightarrow ••••



3rd SV writing program



4th SV setting value change





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Any proposal for a product improvement and development: Product@autonics.com

Dimensions or specifications on this manual are subject to change and some models may be discontinued without notice.

www.autonics.com

- Corporate Headquarters

 Bansong-ro, 513 Beon-gil, Haeundae-gu, Busan, South Korea 48002

 Overseas Business Headquarters

 #402-303, Bucheon Techno Park, 655, Pyeongcheon-ro, Wonmi-gu, Bucheon, Gyeonggi-do, South Korea 14502
 Tel: 82-32-610-2/30/ Fax: 82-32-329-0728 / E-mail: sales@autonics.com

 Brazil Autonics do Brasil Comercial Importadora Exportadora Ltda

 Tel: 55-11-2307-5480 / Fax: 55-41-2309-7784 / E-mail: comercial@autonics.com, br
 China Autonics do Brasil Comercial Importadora Exportadora Ltda

 Tel: 86-21-5422-5969 / Fax: 86-21-5422-5961 / E-mail: comercial@autonics.com,

 India Autonics Automation India Private Limited

 Tel: 62-21-808-8814/5 / Fax: 62-21-8088-4442(4440) / E-mail: india@autonics.com

 Indonesia PT. Autonics Indonesia

 Tel: 62-21-8088-8814/5 / Fax: 62-21-8088-4442(4440) / E-mail: indonesia@autonics.com

 Japan Autonics Japan Corporation

 Tel: 62-7805-7109 / Fax: 62-21-8088-4442(440) / E-mail: indonesia@autonics.com

 Malaysia Mal-Autonics Sensor Sdn. Bhd.

 Tel: 62-7805-7109 / Fax: 62-35-1603-0712 / E-mail: walaysia@autonics.com

 Malaysia Autonics Corp. Russia Representative Office

 Tel/Fax: 7-495-660-10-88 / E-mail: russia@autonics.com

 Markico Autonics Mexico S.A. DE C.V

 Tel: 52-55-5207-0019 / Fax: 52-55-1663-0712 / E-mail: walaysia@autonics.com

 Maxia Autonics Corp. Russia Representative Office

 Tel/Fax: 7-495-660-10-88 / E-mail: russi@@utonics.com

 Maxia Autonics Otomasyon Ticaret Ltd. Sti.
 Tel: 90-216-365-9117/34 / Fax: 90-216-365-9112 / E-mail: inder@autonics.com

 USA Autonics USA, Inc.

 Tel: 1-847-680-8160 / Fax: 1-847-680-8156 / E-mail: wietnam@autonics.com

 USA Autonics USA, Inc.

 Tel: 1-