

CE Rohs	Instruction Manual / 使用手冊 RS-485 Communication Protocol	F-56
	NT series Temperature controller / 溫度控制器	

Thank you very much for using FOTEK NT series temperature controller  
Please read this instruction manual before operating it to avoid from the malfunction.  
非常感謝您採用 FOTEK NT 系列溫度控制器，  
使用前務必詳讀本使用手冊以防止無法正常使用！

## ■ Communication data / 通訊協定

Communication standard	EIA - RS 485	Communication speed (bps)	9600 or 19200 or 38400
Communication protocol	RS=0 : 「MODBUS-RTU code」 RS=1 : 「MODBUS-ASCII code」	Communication station No.	Id No. = 01H ~ FFH (Id No. = 01 ~ 255)
Data configuration	bit=0 : 「701」; bit=1 : 「7E1」; bit=2 : 「8N1」 bit=3 : 「801」; bit=4 : 「8E1」; bit=5 : 「8N2」		
Function code	「03」: Read ; 「06」: Single write ; 「10」: Multi-write		

## ■ Error response code (錯誤回應碼):

### \* Message format / 資料格式

RS = 0 : MODBUS - RTU code				
Function	Station No.	Function code	Error code	FCS
Read	01H ~ FFH	83H	01H ~ 06H	CRC-16
Write	01H ~ FFH	86H	01H ~ 06H	CRC-16

RS = 1 : MODBUS - ASCII code						
Function	Start code	Station No.	Function code	Error code	FCS	Stop code
Read	3AH	30H 31H ~ 36H 33H	38H 33H	30H 31H ~ 30H 36H	LRC	0DH 0AH
Write	3AH	30H 31H ~ 36H 33H	38H 36H	30H 31H ~ 30H 36H	LRC	0DH 0AH

Error code					
Error code		Description (說明)	Error code		Description (說明)
MODBUS - RTU	01H	Command error (指令錯誤)	MODBUS - RTU	04H	Data error (資料值錯誤)
MODBUS - ASCII	03H 31H		MODBUS - ASCII	30H 34H	
MODBUS - RTU	02H	Address overflow error (位址錯誤)	MODBUS - RTU	05H	CRC or LRC error
MODBUS - ASCII	30H 32H		MODBUS - ASCII	30H 35H	
MODBUS - RTU	03H	Data overflow error (資料長度錯誤)	MODBUS - RTU	06H	Parity error
MODBUS - ASCII	30H 33H		MODBUS - ASCII	30H 36H	

## ■ Address of parameter register/參數儲存位址 【Address Base: Protocol (Base 0)】

Address	Description	Address	Description	Address	Description
<u>00 01H</u> (40001)	Lck : Lock setting Range : 0 ~ 3	<u>00 0FH</u> (40015)	CT : Cycle time Range : 0000~0099S	<u>00 1FH</u> (40031)	bPS : Baud rate Refer to Communication speed
<u>00 02H</u> (40002)	AL1 : #1 alarm Range : -0099~0999	<u>00 10H</u> (40016)	HYS : Hysteresis Range : 0000~9999	<u>00 20H</u> (40032)	bit : Data configuration Refer to Data configuration
<u>00 03H</u> (40003)	AL2 : #2 alarm Range : -0099~0999	<u>00 11H</u> (40017)	At : Auto-tuning setting 0=Controlling ; 1=Auto-tuning	<u>00 21H</u> (40033)	Ft : Filter time Range : 1~50 db : PV > ((SV+db) Out2 flick ON Range : 0~9999
<u>00 04H</u> (40004)	tnr : Process timer (Read) Refer to Alarm mode	<u>00 12H</u> (40018)	Tu : Auto-tuning bias Range : 0000~0999	<u>00 22H</u> (40034)	Non-use
<u>00 05H</u> (40005)	ALH : Hysteresis Range : 0 ~ 999	<u>00 13H</u> (40019)	P : Proportion band Range : 0000~0999	<u>00 23H</u> (40035)	SV : Setting value Range : -9999~9999
<u>00 06H</u> (40006)	t : Flicker timer Range : 0~99s	<u>00 14H</u> (40020)	I : Integral time Range : 0000~3999	<u>0024H</u> (40036)	ON_OFF : Controller ON/OFF 0000=ON ; 0001=OFF
<u>00 07H</u> (40007)	SLH : High limit of set Range : 0000~9999	<u>00 15H</u> (40021)	D : Derivative time Range : 0000~3999	<u>00 25H</u> (40037)	M_A : Auto/Manual selecting 0=Auto ; 1=Manual
<u>00 08H</u> (40008)	Out : Limit of out Range : 0 ~ 100	<u>00 16H</u> (40022)	GAin : Range : 0.0~9.9	<u>00 26H</u> (40038)	SV _ Un : Display selecting 0=SV ; 1=Un
<u>0009H</u> (40009)	nUn : Manual output volume Range : 0~100	<u>00 17H</u> (40023)	Int : Input type 0=Pt ; 1=K ; 2= J ; 3=R ; 4=S 5=T ; 6=B ; 7=E ; 8=N ; 9=L	<u>00 27H</u> (40039)	SV2 : Soft start selecting Range : 0~9999
<u>00 0AH</u> (40010)	Hb : Current setting Range : 0~99.99	<u>00 18H</u> (40024)	Unt : Unit selecting 0=℃ ; 1=℉	<u>00 40H</u> (40064)	SV : Setting value Range : -999~9999
	dSPH : Max. display value Range : -1999~9999	<u>00 19H</u> (40025)	dP : Decimal point setting 0=Non ; 1=One decimal	<u>00 41H</u> (40065)	PV : Process value (Read) Range : -9999~9999
<u>00 0BH</u> (40011)	CtL : Min. CT value Range : -9.99~99.99	<u>00 1AH</u> (40026)	Sht : Input shift Range : -0999 ~ 0099	<u>00 42H</u> (40066)	Un : Output volume (Read) Range : 0 ~ 100
	dSPL : Min. display value Range : -1999~9999	<u>00 1BH</u> (40027)	H_C : Heating-cooling selecting 0= Heating ; 1= Cooling	<u>00 43H</u> (40067)	Ctu : Process current value Range : 0~99.99 (Read)
<u>00 0CH</u> (40012)	Cth : Max. CT value Range : 0~99.99	<u>00 1CH</u> (40028)	ALt : Alarm mode Range : 00 ~ 18	<u>00 44H</u> (40068)	Status of Out1/Out2/AL1/AL2 Refer to Status of Out/AL1/AL (Read)
<u>00 0DH</u> (40013)	rAP : Ramp control Range : 0 ~ 9999℃/minute	<u>00 1DH</u> (40029)	Id : Station No. Range : 01H ~ FFH	<u>00 45H</u> (40069)	AL1 : #1 alarm Range : -999~9999
<u>00 0EH</u> (40014)	Lot : Min. output volume Range : 0 ~ 100	<u>00 1EH</u> (40030)	RS : Communication mode Refer to Communication mode	<u>00 46H</u> (40070)	AL2 : #2 alarm Range : -999~9999
				<u>00 47H</u> (40071)	HB : Current setting Range : 0~99.99
				<u>00 48H</u> (40072)	Status of Alarm Refer to Status of Alarm (Read)

### ※ Status of Out1/Out2/AL1/AL2 【00 44H (40068)】

Data bit : <u>0 0 0 0</u>							
Data bit	Output status	Data bit	Output status	Data bit	Output status	Data bit	Output status
<u>0 0 0 1</u> (H0001)	Out 1 ON	<u>0 0 1 0</u> (H0002)	Out 2 ON	<u>0 1 0 0</u> (H0004)	AL 1 ON	<u>1 0 0 0</u> (H0008)	AL 2 ON

### ※ Status of Alarm 【00 48H (40072)】

Data bit : <u>0 0 0 0</u>							
Data bit	Alarm status	Data bit	Alarm status	Data bit	Alarm status	Data bit	Alarm status
<u>0 0 0 1</u> (H0001)	「FFF」	<u>0 0 1 0</u> (H0002)	「...」	<u>0 1 0 0</u> (H0004)	「HtEr」	<u>1 0 0 0</u> (H0008)	「OhEr」

## ■ Address of parameter register/參數儲存位址 【Address Base: PLC (Base1)】

Address	Description	Address	Description	Address	Description
<u>00 01H</u> (40002)	Lck : Lock setting Range : 0 ~ 3	<u>00 0FH</u> (40016)	CT : Cycle time Range : 0000~0099S	<u>00 1FH</u> (40032)	bPS : Baud rate Refer to Communication speed
<u>00 02H</u> (40003)	AL1 : #1 alarm Range : -0099~0999	<u>00 10H</u> (40017)	HYS : Hysteresis Range : 0000~9999	<u>00 20H</u> (40033)	bit : Data configuration Refer to Data configuration
<u>00 03H</u> (40004)	AL2 : #2 alarm Range : -0099~0999	<u>00 11H</u> (40018)	At : Auto-tuning setting 0=Controlling ; 1=Auto-tuning	<u>00 21H</u> (40034)	Ft : Filter time Range : 1~50 db : PV > (SV+db) Out2 flick ON Range : 0~9999
<u>00 04H</u> (40005)	tnr : Process timer (Read) Refer to Alarm mode	<u>00 12H</u> (40019)	Tu : Auto-tuning bias Range : 0000~0999	<u>00 22H</u> (40035)	Non-use
<u>00 05H</u> (40006)	ALH : Hysteresis Range : 0 ~ 999	<u>00 13H</u> (40020)	P : Proportion band Range : 0000~0999	<u>00 23H</u> (40036)	SV : Setting value Range : -0999~9999
<u>00 06H</u> (40007)	t : Flicker timer Range : 0~99s	<u>00 14H</u> (40021)	I : Integral time Range : 0000~3999	<u>00 24H</u> (40037)	ON_OFF : Controller ON/OFF 0000=ON ; 0001=OFF
<u>00 07H</u> (40008)	SLH : High limit of set Range : 0000~9999	<u>00 15H</u> (40022)	D : Derivative time Range : 0000~3999	<u>00 25H</u> (40038)	M_A : Auto/Manual selecting 0=Auto ; 1=Manual
<u>00 08H</u> (40009)	Out : Limit of out Range : 0 ~ 100	<u>00 16H</u> (40023)	GAin : Range : 0.0~9.9	<u>00 26H</u> (40039)	SV _ Un : Display selecting 0=SV ; 1=Un
<u>00 09H</u> (40010)	nUn : Manual output volume Range : 0~100	<u>00 17H</u> (40024)	Int : Input type 0=Pt ; 1=K ; 2=J ; 3=R ; 4=S 5=T ; 6=B ; 7=E ; 8=N ; 9=L	<u>00 27H</u> (40040)	SV2 : Soft start selecting Range : 0~9999
<u>00 0AH</u> (40011)	Hb : Current setting Range : 0~99.99	<u>00 18H</u> (40025)	Unt : Unit selecting 0=°C ; 1=°F	<u>00 40H</u> (40065)	SV : Setting value Range : -999~9999
	dSPH : Max. display value Range : -1999~9999	<u>00 19H</u> (40026)	d P : Decimal point setting 0=Non ; 1=One decimal	<u>00 41H</u> (40066)	PV : Process value (Read) Range : -0999~9999
<u>00 0BH</u> (40012)	CtL : Min. CT value Range : -9.99~99.99	<u>00 1AH</u> (40027)	Sht : Input shift Range : -0999 ~ 0099	<u>00 42H</u> (40067)	Un : Output volume (Read) Range : 0 ~ 100
	dSPL : Min. display value Range : -1999~9999	<u>00 1BH</u> (40028)	H_C : Heating-cooling selecting 0= Heating ; 1= Cooling	<u>00 43H</u> (40068)	Ctu : Process current value Range : 0~99.99 (Read)
<u>00 0CH</u> (40013)	Cth : Max. CT value Range : 0~99.99	<u>00 1CH</u> (40029)	ALt : Alarm mode Range : 00 ~ 18	<u>00 44H</u> (40069)	Status of Out1/Out2/AL1/AL2 Refer to Status of Out/AL1/AL (Read)
<u>00 0DH</u> (40014)	rAP : Ramp control Range : 0 ~ 9999°C/minute	<u>00 1DH</u> (40030)	Id : Station No. Range : 01H ~ FFH	<u>00 45H</u> (40070)	AL1 : #1 alarm Range : -999~9999
<u>00 0EH</u> (40015)	Lot : Min. output volume Range : 0 ~ 100	<u>00 1EH</u> (40031)	RS : Communication mode Refer to Communication mode	<u>00 46H</u> (40071)	AL2 : #2 alarm Range : -999~9999
				<u>00 47H</u> (40072)	HB : Current setting Range : 0~99.99

\* Status of Out1/Out2/AL1/AL2 【00 44H (40068)】

Data bit : <u>0 0 0 0</u> <u>0 0 0 0</u>							
Data bit	Output status	Data bit	Output status	Data bit	Output status	Data bit	Output status
<u>0 0 0 1</u> (H0001)	Out 1 ON	<u>0 0 1 0</u> (H0002)	Out 2 ON	<u>0 1 0 0</u> (H0004)	AL 1 ON	<u>1 0 0 0</u> (H0008)	AL 2 ON

## ■ Message format / 資料格式

**Ex** : 「Read the **PV** value of No.01 controller ; **PV**=100」 and 「Write the **SV** value of No.01 controller ; **SV**=100」

【Station No.= 01H , PV address = 0041H 、 PV = 100 ( 64H ) , SV address = 0040H】

讀取 # 1 溫控器的「PV」值時 PV 是「100」; 改寫 # 1 溫控器的「SV」值為「100」

【站號= 01H , PV 位址 = 0041H 、 PV = 100 ( 64H ) , SV 位址= 0040H , SV = 100 ( 64H )】

### § Communication code : 「RS=0 : MODBUS – RTU code」

Read command	Station No.	Function code	Address	Data batches	CRC		
	01H	03H	00H 41H	00H 01H	D4 1E		
Read response	Station No.	Function code	Data byte counts*	Data	CRC		
	01H	03H	02H	00H 64H	AFH 00H		
Write command	Station No.	Function code	Address	Data	CRC		
	01H	06H	00H 40H	00H 64H	89 F5		
Write response	Station No.	Function code	Address	Data	CRC		
	01H	06H	00H 40H	00H 64H	89 F5		
All write command	Station No.	Function code	Address	Data	CRC		
	00H	06H	00H 40H	00H 64H	89 71		
All write response	Station No.	Function code	Address	Data	CRC		
	00H	06H	00H 40H	00H 64H	89 71		
Multi-write command	Station No.	Function code	Address	Data batches	Data byte counts	Data	CRC
	01H	10H	00H 40H	00H 01H	02H	00H 64H	
Multi-write response	Station No.	Function code	Address	Data batches	Data byte counts	Data	CRC
	01H	10H	00H 40H	00H 01H	02H	00H 64H	

Note : 1. It may write same value to all stations, please set station No. to 00H.

2. It may write multi-batches data by function code 10H.

### § Communication code : 「RS=1 : MODBUS – ASCII code」

Read command	Start code	Station No.	Function code	Address	Batches of data	LRC	Stop code
	3AH	30H 31H	30H 33H	30H 30H 34H 31H	30H 30H 30H 31H		0DH 0AH
Read response	Start code	Station No.	Function code	Data byte counts*	Data	LRC	Stop code
	3AH	30H 31H	30H 33H	30H 32H	30H 30H 36H 34H		0DH 0AH
Write command	Start code	Station No.	Function code	Address	Data	LRC	Stop code
	3AH	30H 31H	30H 36H	30H 30H 34H 30H	30H 30H 36H 34H		0DH 0AH
Write response	Start code	Station No.	Function code	Address	Data	LRC	Stop code
	3AH	30H 31H	30H 36H	30H 30H 34H 30H	30H 30H 36H 34H		0DH 0AH

Data byte counts\* : 2 ASCII code byte = 1 data byte

## ◆ Remarks

Symbol	ASCII code	Description	Symbol	ASCII code	Description	Symbol	ASCII code	Description
@	40	Start code	C	43	Hex	4	34	Hex / BCD
R	52	Read	D	44	Hex	5	35	Hex / BCD
W	57	Write	E	45	Hex	6	36	Hex / BCD
CR	0D	Stop code	F	46	Hex	7	37	Hex / BCD
-	2D	Minus	1	31	Hex / BCD	8	38	Hex / BCD
A	41	Hex	2	32	Hex / BCD	9	39	Hex / BCD
B	42	Hex	3	33		:	3A	

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規格變更恕不事先通知 **2015/8/20**