GTC12S

Digital Temperature Controller
User Manual

GMT Endüstriyel Elektronik San. ve Tic. Ltd. Şti.

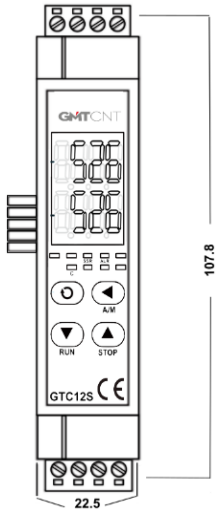
Key Features

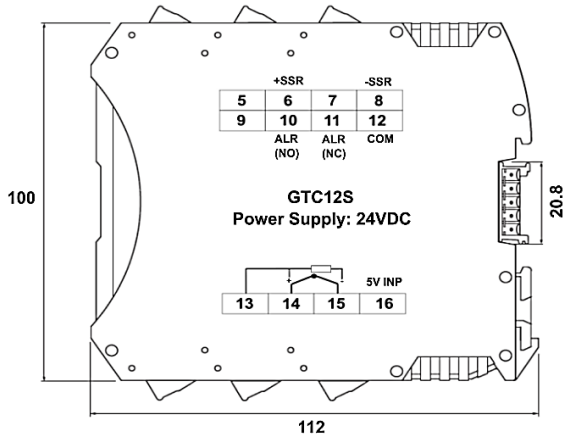
- Digital calibration technology for input measurement, various thermocouples and RTDs can be used.
- Auto tuning (AT) control.
- It provides e-sufficiency and ease of installation.
- User-friendly working interface.
- **24VDC** Power supply
- Improved anti-interference ability for work in adverse industrial environments.

Technical Specifications

Power supply: 24VDC (-15%, +10%)
Power consumption: ≤5W
Supported sensor types: Termokupl: J ,K, S, R, E, T, B, N, WRe3-WRe25, WRe5-WRe26,Cu50, Pt100
DC Voltage: 0 ~ 5V, 1 ~ 5V, 0 ~ 1V, 0 ~ 100mV, 0 ~ 20mV, 0 ~ 500mV vb.
DC Current: 4~20mA (with external 250Ω shunt resistor)
Reading range:J(0~1000°C), K(-50~1300°C),S ve R (-50~1700°C),T(-200~+350°C),E(0~800°C),B(200~1800°C),N(0~1300°C),Cu50(-50~+150°C), Pt100(-200~+600°C)
Measurement accuracy: 0.25%FS ±1 measured unit
Control period: 0.24~300.0 seconds can be selected and this value must be in integers of 0.5 seconds.
Control mode: On-Off control mode (dead band adjustable). Fuzzy logic PID control, automatic adjustment with AI-PID (advanced artificial intelligence algorithm).
Output features: SSR (12VDC/30mA)
Sampling period: It can take 8 samples per second. When the FILt=0 digital filter parameter is set, the response time can be set to 0.5 seconds.
Alarm function: Upper limit, lower limit, deviation upper limit and deviation lower limit
Electromagnetic compatibility (EMC): According to IEC61000-4-4 ±4KV/5KHz; 4KV according to IEC61000-4-5.
Insulation withstand voltage: Between terminals ≥600V.
Working conditions: Temperature -10~60°C, Moisture ≤90%RH
Communication: Modbus RTU (RS485) 9600,8,None,1
Installation information: DIN Rail Mounting

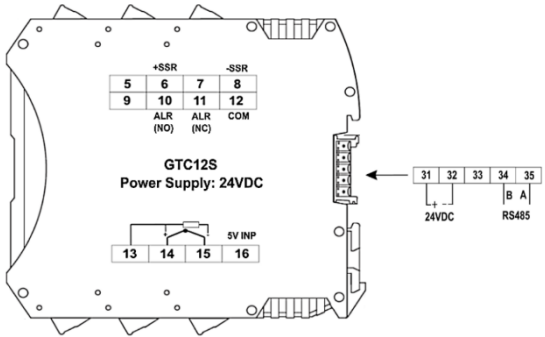
Dimensions(mm)





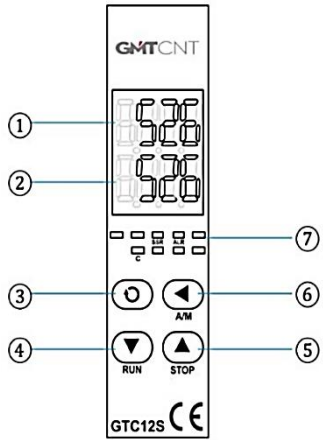
Terminal connections

If the input is 0~5V/1~5V, terminal blocks 16 are connected to "+", terminal blocks 15 are connected to "-".
If the input is 500mV or below, terminal blocks 14 are connected to "+" and terminal blocks 15 are connected to "-".
Input DC current 4~20mA (250Ω shunt resistor is converted to 1~5V) Terminal Block No. 16 "+" Terminal Blockage 15 is used with "-" connection.
The common port for alarm output is designated as "COM" normally closed port (ALR NC) and normally open port (ALR NO).
The supply and communication ports of the device are located on the port shown in the image.



Front panel and keypad descriptions

1: The parameter code and PV are displayed.
2: The parameter value is displayed as SV.
3: Adjustment button, access to parameter table, and parameter change.
4: Decrease in value button (Start/Hold key)
5: Value increase button (Stop button)
6: Value, digit slider setpoint sets the active cursor status for .
7: Led indicators, used during operation according to the feature/condition of the relevant led indicator change in state.



Messages and their explanations appearing on the screen;
orAL: Input measurement value is out of range. Incorrectly defined input type or disconnected thermocouple or short circuit condition
HIAL: High limit alarm
LoAL: Low limit alarm
HdAL: Deviation high alarm
LdAL: Deviation low alarm
StoP: Program in stop state
Hold: Program in standby state

Parameter Settings

In basic display status, press (SET) and hold for about 2 seconds can access Field Parameter Table. Press (SET) can go to the next parameter; press (◁)、(▽) or (△) can modify a parameter. Press and hold (◁) can return to the previous parameter. Press (◁) (don't release) and then press (SET) key simultaneously can escape from the parameter table. The instrument will escape automatically from the parameter table if no key is pressed within 25 seconds, and the change of the last parameter will not be saved.

In Field Parameter Table, (SET) till the last field parameter Loc appears. Setting Loc=808 and then press (SET) can access System Parameter Table.

Short-cut operation

Set point editing: Press (◁) to start to edit set point. Then press (◁), (▽) or (△) to adjust SV value.

Run the program: Press and hold (▽) key for about 2 seconds until the lower display window displays the "run" message.

Stop the program: Press and hold (△) key for about 2 seconds until the lower display window displays the "StOP" message.

Auto Tuning: Press (◁) for 2 seconds, “At” parameter will appear. Press (△) to change the value of “At” from “oFF” to “on”, then press (SET) to activate the auto-tuning process. (If SPr parameter is set to be effective and the instrument is at the limit of increasing rate, auto-tuning will be paused temporary.) During auto tuning, the lower display blinks with “At”. After two fluctuating cycles by on-off control, the instrument will obtain the

optimal PID control parameter value. If you want to quit from auto tuning, press and hold the ◁ key for about 2 seconds until the "At" parameter appear again. Change “At” from “on” to “oFF”, press ↺ to confirm, then the auto tuning process will be cancelled.

Determination of the display conditions of the parameters with the parameter lock (Loc)

The device parameter menu can be customized and the display conditions of some parameter groups can be set. If you want to access the entire parameter table, this is only possible by entering the password entry into the "Loc" parameter. The following table provides details.

Loc	SV Set Point	AT Autotune	Field Parameter	Full Parameter	Short-cut RUN/HOLD/STOP	Program Step Time & Temp
0	√	√	√	X	√	√
1	√	X	√	X	X	√
2	X	X	√	X	√	X
3	X	X	√	X	X	X
4~255	X	X	X	X	X	X
808	√	√	√	√	√	√

Loc "808" is the master password. Entering this value in the loc parameter provides access to all parameters.

Parameter Table

PV : Proses value, SV: Set value

Parameter	Name	Description	Setting Range
HIAL	High limit alarm	Alarm turns on when PV>HIAL Alarm turns off when PV<HIAL-AHYS, Set to the maximum value to disable the alarm.	-9990～ +32000
LoAL	Low limit alarm	Alarm turns on when PV<LoAL Alarm turns off when PV>LoAL+AHYS Set to the minimum value to disable the alarm.	
HdAL	Deviation high alarm	Alarm turns on when PV-SV>HdAL; Alarm turns off when PV-SV<HdAL-AHYS Set to the maximum value to disable the alarm.	
LdAL	Deviation low alarm	Alarm turns on when PV-SV<LdAL Alarm turns off when PV-SV>LdAL+AHYS Set to the minimum value to disable the alarm.	-9990～ +32000

<table>
<tr><td>AHYS</td><td>Alarm hysteresis</td><td>Also known as dead band or lag. To avoid frequent alarm on-off action caused by
the fluctuation of PV. Usage of AHYS is shown above.</td><td>0～2000</td></tr>
<tr><td>AdIS</td><td>Alarm display</td><td>oFF : No alarm message shown in the lower display even there is an alarm
on : Alternately showing alarm message and value in the lower display when there is an alarm</td><td>oFF/on</td></tr>
<tr><td>AOP</td><td>Alarm output allocation</td><td>
<table>
<tr><th>Alarm / Out</th><th>LdAL(x1000)</th><th>HdAL(x100)</th><th>LoAL(x10)</th><th>HIAL(x1)</th></tr>
<tr><td>None</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>AL1</td><td>3</td><td>3</td><td>3</td><td>3</td></tr>
</table>
3333
Örnek AOP durumu : 0/LdAL - 0/HdAL - 3/LoAL - 3/HIAL
It is seen that HdAL and LdAL are not used as alarm output, LoAL and HIAL alarm are directed to AL1 output.</td><td></td></tr>
<tr><td>CtrL</td><td>Control Mode</td><td>onoF: on-off control, for situation not requiring high precision
APId: advanced artificial intelligence PID control. (Recommended)
nPId: standard PID algorithm with anti integral-saturation function (no integral when PV-SV > proportional band)</td><td>onoF
APId
nPId</td></tr>
</table>

Srun	Running Status	**run:** The run (program) is active. **StoP:** The work (program) is stopped. The main screen continues to flash "StoP" in the second line. **HoLd:** The control and/or program is paused. **Note:** HoLd operation cannot be activated directly via the keypad. In order to do this, this step must first be selected from the Srun parameter.	run StoP HoLd
Act	Acting Method	**rE:** The increase in the measured variable (e.g. the value read from the sensor) is observed with a decrease in output (decrease in the frequency of SSR activation). It can be preferred when heating is controlled. **dr:** The increase in the measured variable (e.g. the value read from the sensor) is observed with an increase in output (increase in the frequency of SSR activation). It can be preferred when cooling control is done.	rE dr
At	Auto tuning	**oFF:** The Auto tuning function is off. **on:** Auto-tuning active, PID values are calculated automatically. **FoFF:** The auto adjustment function is off, it cannot be reactivated with the keypad.	oFF / on / FoFF
P	Proportional Band	Proportional band in PID and APID control.	1~32000
I	Integral time	Integral time is inert if I=0.	0～9999 second
d	Derivative time	If the derivative time is set to d=0, there is no derivative effect.	0～999.9

			second
Ctl	Control Period	Entering a small value in the content of this parameter can improve the accuracy of the check. For SSR, this value can usually be set in the range of 0.5~3 sec. It is recommended that the Ctl value be 1/5 – 1/10 of the derivation time.	0.2～300.0 second
CHYS	Control output hysteresis	The CHYS parameter is the parameter used to prevent the SSR's frequent on-off motion. For example, in a heating system, the output is turned off when the PV > SV state is in place, and the outlet is turned on when the PV<SV-CHYS state is in place. For the cooling system, which is another method, the output is closed when the status is PV<SV, and the output is turned on when PV>SV+CHYS is present.	0～2000

InP	Defining the Input Type (Sens)	**InP**	**Input type**	**InP**	**Input type**	0～37
		0	**K type**	**21**	**Pt100**	
		1	**S type**	**22**	**Pt100 (-80～+300.00℃)**	
		2	**R type**	**25**	**0～75mV voltage input**	
		3	**T type**	**26**	**0～80ohm res. input**	
		4	**E type**	**27**	**0～400ohm res. input**	
		5	**J type**	**28**	**0～20mV voltage input**	
		6	**B type**	**29**	**0～100mV voltage input**	
		7	**N type**	**30**	**0～60mV voltage input**	
		8	**WRe3-WRe25**	**31**	**0～1V voltage input**	
		9	**WRe3-Wre26**	**32**	**0.2～1V voltage input**	
		10	**None**	**33**	**1～5V voltage input**	
		12	**F2 radiation type pyrometer**	**34**	**0～5V voltage input**	
		17	**K (0～300.00℃)**	**35**	**-20～+20mV**	
		18	**J (0～300.00℃)**	**36**	**-100～+100mV**	
		19	**Ni120**	**37**	**-5～+5V**	
		20	**Cu50**	**39**	**20~100mV**	

dPt	Screen resolution	Four formats (0, 0.0, 0.00, 0.000) can be selected. Only 0 or 0.0 resolution can be selected for thermocouple or RTD sensor input, and the internal resolution is 0.1. When using type S thermocouple, it is recommended that dPt = 0. If the inp parameter is 17.18 or 22, the resolution can be selected as 0.0 or 0.00.	0 / 0.0 / 0.00 / 0.000
ScL	Lower limit of signal scale	The lower limit scale of the input is defined.	-9990～ +32000
ScH	Upper limit of signal scale	The upper limit scale of the input is defined.	
Scb	Input offset setting	It is the offset parameter used to compensate for the error caused by the input signal or cold junction compensation of the thermocouple. Setting this value incorrectly will result in a measurement error.	-1999～ +4000
FILt	PV input filter	Input is the parameter in which the filter value can be entered. When this parameter is set to a large value, the measurement input is fixed, but the response speed is slowed down. If conditions with high interference are present, you can gradually increase the parameter "FILt" to avoid instant fluctuation of the measured value. The unit of the FILt parameter is seconds.	0～40
Fru	Frequency and temperature scale	50C: 50Hz, Display °C, 50F: 50Hz, Display °F or 60C: 60Hz, Display °C. , 60F: 60Hz, Display °F	50C, 50F, 60C, 60F
OPt	Main out type	SSr : Solid State Relay	SSr

OPL	Lower limit of output	Lower limit of output	-110～ +110%
OPH	Upper limit of output	Upper limit of output. Limits the maximum output when a PV<OEF requirement is met. OPH must be entered larger than OPL.	0～110%
OEF	OPH operating range	When PV<OEF, the upper limit of the output is OPH, when it is PV>OEF, the upper limit of the output is 100%. For example, to prevent the temperature from rising too quickly, we can set this parameter to OEF = 150.0 (°C) and OPH = 30 (%) for a 30% operation below 150 °C.	-999～ +3200
Addr	Device communication address (ID)	If more than one device will be used on the same communication line, this parameter should be set differently for each device	0～80
bAud	Baud rate	Baud rate is the parameter from which the input is made. Communication parameters in the factory settings; Modbus RTU 9600,8,None,1 is adjusted.	0～19.2K
AF	Advanced function parameters	For advanced functions, the AF parameter is used. The AF value is calculated as follows; AF=Ax1 + Bx2 + Cx4 + Dx8 + Ex16 + Fx32 + Gx64 + Hx128 A=0, HdAL and LdAL deviation work as upper and lower limit alarms;	0～255

		A=1, HdAL and LdAL work as upper and lower limit alarms. Two high and low limit alarms are also activated B=0, Alarm and control hysteresis works as one-sided hysteresis; B=1, In bilateral hysteresis. C=0, Panel led, indicates the output value. C=1, Indicates the light bar process value (only for tools with light bars). D=0, Loc=808 can access the entire parameter table. D=1 can access the Loc=PASd parameter table. E=0 in normal operation at HIAL and LoAL E=1, HIAL AND LoAL are used with deviation high alarm and deviation low alarm. F=0, Precision control mode, built-in control resolution is set for display 10 times. In linear input mode, the maximum screen value is 3200 units. F=1, Wide range display mode, this option can be selected when the value is greater than 3200. G=0, When the thermocouple or RTD input lights up, the PV value increases and triggers the high limit alarm. G=1, When the thermocouple or RTD input lights up, the PV value will increase and the high limit alarm will be active for 30 seconds. Note: AF=0 is recommended for normal use.	

PASd	Password	PASd=0~255 or AF. When D=0, the Loc=808 setting can be entered into the entire parameter table. PASd=256 ~ 9999 and AF. When D=1, only Loc=PASd can access the entire parameter table. Please set the PASd carefully, if the password is lost you will not be able to access the parameter table again.	0～9999
SPL	Low limit setting for SV	Minimum value that can be entered for SV	-999～+3000
SPH	High limit setting for SV	Maximum value that can be entered for SV	
PonP	Operating state when power is cut off and re-energized, or at the time of the first energization	Cont: Continues to run the program from the last breakpoint. If the STOP state was active before the power failure, the program will remain in the STOP state after the power is restarted. StoP: The program/run stops after the power restarts. run1: If the device is not in the "STOP" state before the power failure, the program will start running. dASt: Resumes running the program from the last breakpoint. If there is any deviation alarm, it will stop working. Hold: In all cases, the device goes into the HoLd state after the power is restored. If it was in the StoP state before the power outage, it will remain in the StoP state after the power comes in.	Cont / StoP / run1 / dASt / HoLd

EP1～EP8	Field parameters definitions	Define 1~8 field parameters for parameters commonly used when loc lock is applied. If there are no or less than 8 field parameters, please set to nonE.	

Prevention of the alarm state at the moment of the first energization

In some cases, fault alarm conditions may occur at the time of the first energization. In a heating system, at the moment when the device is first energized, the temperature read is much lower than the set point. In this case, the device may give a low limit alarm/error. Because it is normal to expect the device to give an error when the specified low deviation and limit errors are set, but it will also give an error at the first energy specified moment, there is a parameter that can be set separately to prevent this situation. This parameter is the "Act" parameter and if the content is set to rEbA or drba, alarm conditions that may occur during the first energization are prevented. The device will issue a warning/alarm when the alarm conditions occur again.

The parameter values in the factory settings of the device are as shown in the table below;

Parameter	Value	Parameter	Value
HIAL	3200	**SCH**	3200
LoAL	-999	**Scb**	0
HdAL	3200	**FILt**	1
LdAL	-999	**OPt**	SSR
AHYS	2	**OPH**	100
AdLS	On	**OEF**	3200
AOP	3333	**Addr**	1
nonc	0	**bAud**	9600
CtrL	APID	**AF**	32
Srun	Hold	**AFC**	0
Act	rE	**SPL**	0
At	OFF	**SPH**	3200
P	25.0		
I	100		
d	50		
Ctl	2.0		
CHYS	2		
InP	0		
dPt	0.0		
SCL	0		

Modbus Map

No	Adress (4X)	Data type	Explanation	Detail
1	1	Word	Set Value **SV**	-
2	75	Word	Prosess Value **PV**	-
3	2	Word	HIAL: High limit alarm	See the parameter table for details.
4	3	Word	LoAL : Low limit alarm	See the parameter table for details.
5	11	Word	Ctl: Control period	See the parameter table for details.
6	7	Word	CTRL: Control Mode	ON-OFF(0), APID(1), nPID(2), PoP(3), SoP(4)
7	30	Word	Autotune	(0)oFF, (1)oN , (2)FoFF
8	28	Word	Srun: Work status	RUN(0), STOP(1) , HOLD(2)
9	12	Word	Inp: Sensor type	See the parameter table for details
10	29	Word	CHYS: Control output hysteresis	See the parameter table for details
11	8	Word	P	Proportional Band
12	9	Word	I	Integral Time
13	10	Word	d	Derivative Time
14	20	Word	OPH: Output high limit	%
15	78	Word	SSR output	The 8th bit of the Word field represents the SSR output. This bit is "1" in the output off state and "0" in the on state.
16	78	Word	ALR Relay output	The 10th bit of the Word field represents the ALR output. This bit is "1" in the output off state and "0" in the on state.

Note: Communication parameters in the factory settings; Modbus RTU 9600,8,None,1 is adjusted.

Maintenance

Device maintenance and repair should be carried out by trained technical personnel. Unauthorized intervention may result in personal injury and/or damage to the device. Please contact our company for the repair of defective devices.

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