



AUTO TUNE PID CONTROLLER

SPECIFICATION

Input type	Temp. Range °C	Input type	Temp. Range °C
PT100 (0.1°C)	-199.9 to 850.0	B	450 to 1800
PT100	-199 to 850	R	0 to 1768
E	-200 to 1000	S	0 to 1768
J	-200 to 1200		
K	-200 to 1372		
T	-200 to 400		

*Use external 250ohms, 0.1% for current Input
Table-1.1

INPUT

Accuracy T/C and RTD:	± (0.25% of Full Span ± 1 count)
Resolution	ADC:16 bits, Display :0.1°C / 1 Count
Sampling Rate	5 Samples/Sec
CJC Error	±3.0 °C Max
Sensor Burnout current	0.25uA
RTD excitation current	0.166mA (Approx)
Allowable wiring resistance for RTD	Maximum 15 ohms/wire (Resistance between three wires should be equal)
NMRR	> 40 dB
CMRR	> 120 dB
Temp-co	< 100ppm/°C
Input Impedance	> 1MΩ (Voltage Input), 250Ω (Current Input)
Max Voltage	20VDC

DISPLAY

PV Display	TC596 : 0.56" 7-Segment Red LED 4-Digit TC548 : 0.4" 7-Segment Red LED 4-Digit
Status Indication	Individual RED Led for Relay Status
Keys	Enter, Increment, Decrement

OUTPUT TYPE

Relay output

No. Of output	Relay-1: For PID or ON-OFF Controlling.
Type	Single Change over, Three Terminals (C,NO,NC)

Rating	10A @ 230VAC / 28VDC
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POWER SUPPLY

Standard	85-265VAC/ 100-300VDC
Power consumption	<3 VA

ENVIRONMENTAL CONDITION

Humidity(Non-Condensing)	30% to 95% RH (Non-Condensing)
Instrument Warm-up Time	Approx. 15 minutes
Ambient Temperature	0 to 55°C
Storage Temperature	0 to 80°C

PHYSICAL

Models	TC596	TC548
Front Bezel	100 mm x 100 mm	50 mm x 50 mm
Panel Cutout	92 mm x 92 mm	45 mm x 45 mm
Depth Behind The Panel	52mm	70 mm (Including Terminal)
Weight (Approx.)	160g	110g
Enclosure Material	Lid: PC, Base: ABS	PC
Enclosure Protection	IP20	
Terminal Cable Size	Barrier type terminal, cable 2.5 mm ²	

Features:

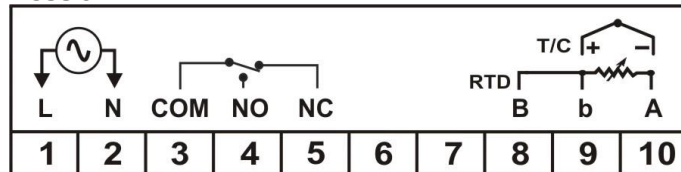
Three years calibration with Auto Zero and Auto Span.
Average Energy Demand parameter as a diagnostic feature.

ORDERING CODE

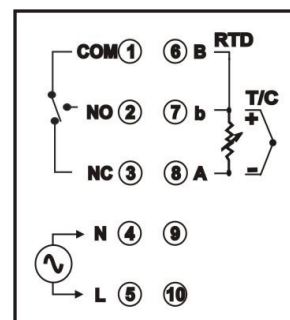
Model	Input	Power Supply	Output
TC596	1 E	U1 85-265VAC /100-300VDC	1 Relay
TC548	2 J		
	3 K		
	4 T		
	5 B		
	6 R		
	7 S		
	9 PT-100		

TERMINAL CONNECTION

TC596:

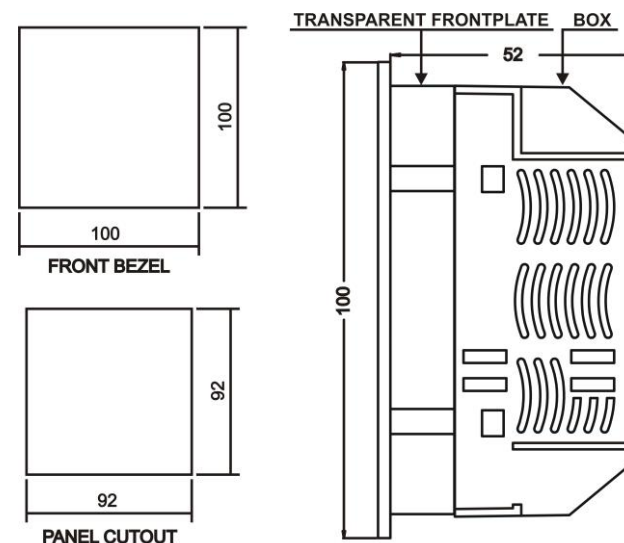


TC548:



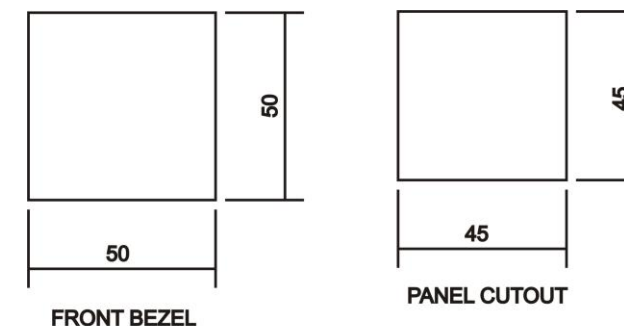
MOUNTING DETAILS

TC596:



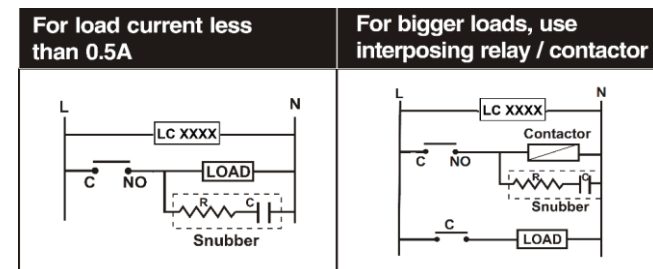
All Dimensions are in mm

TC548:



All Dimensions are in mm

LOAD CONNECTION



Electrical precautions during use: Electrical noise generated by switching of inductive loads can create momentary disruption, erratic display, latch up, data loss or permanent damage to the instrument. Use of snubber circuits across loads as shown above, is recommended.

SAFETY/WARNING PRECAUTIONS

To ensure that the device can be operated safely and all functions can be used, please read these instructions carefully.

Installation and Start-up must be carried out by qualified personnel only. The relevant county-specific regulations must also be observed.

Before start-up it is particularly important to ensure:

- Terminal wiring: check that all cables are correctly connected according to the connection diagram
- All wiring must confirm to appropriate standards of good practice and local codes and regulations. Wiring must be suitable for voltage, current and temperature rating of the system.
- Unused control terminals should not be used as jumper points as they may be internally connected, which may cause damage to the unit.

WARRANTY

Warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Masibus is not liable for special, indirect or consequential damages or for loss of profit or for expenses sustained as a result of a device malfunction, incorrect application or adjustment Masibus' total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

FRONT KEYS DESCRIPTION

Functions	Key press
To enter into Set-point mode	Press key to entering into Set-point mode. Set-point is changed by using or Keys. Then Press Key to Store the Set-point.
To enter into lock mode	Press & Keys for 3 seconds to enter into Lock mode.
To enter in to run mode	Press & Keys to enter into Run mode from menu mode.

FRONT PANEL DESCRIPTION

Symbol	Function
	In run mode Press Increment key to view ambient temperature. In run mode press Increment key for 3 seconds to entering into conf mode. In Menu mode it increments the value of any parameters.
	In run mode Press Decrement key to view average energy. In run mode press Decrement key for 3 seconds to entering into tune mode. It only allows to entering into tune mode if control output is PID. In Menu mode it decrements the value of any parameters.
	In run mode Press enter key to entering in to set-point mode. In menu mode it stores the value of parameters.

PV	Display Process Value. Display parameter name when user set parameter.
RL	ON when Relay is energized & OFF otherwise.

PARAMETER SETTINGS

Display	Name	Description	Default Value	Shows only if
C1.SP (C1.sp)	Control Set Point 1	Range Depending on PV sensor type selected	100	-

TUNE Mode

NOTE: This Menu appear for COP (Control Output Type) PID

A.TUN (A.tun)	Auto Tune	Auto Tuning Process yes / no	NO	COP is PID
PB (Pb)	Proportional Band	0 to 9999(B,R,S,RTD 1 deg°C) or 0.0 to 999.9 (E,J,K,T,RTD 0.1 deg°C)	160.0	COP is PID
TI (ti)	Integral Time	0 to 1000	175	COP is PID
TD (td)	Derivative Time	0 to 180	40	COP is PID
CT (ct)	Cycle Time	Adjust Cycle Time 1 - 300 sec	10	COP is PID
MR (mr)	Manual Reset	To Prevent Overshoot (-50% to +50%) of PB	-40%	COP is PID
TIL (til)	Integral Inhibit Low	0 to 100	100	COP is PID
O.DIR (odir)	Output Direction	Reverse/Direction	0 (REV)	COP is PID

CONF Mode

INPT (inpt)	INPUT Type	As per table 1.1	TC E	
ZERO (zero)	Zero	Any value within the Input Range & less the SPAN Value.	-200	If TC E
SPAN (span)	Span	Any value within the Input Range & greater the ZERO Value.	1000	If TC E
DP (dp)	Decimal Point	1/ 0.1	1	
*FLTR (fltr)	Filter	Filter for PV Input(0 to 5)	3	
OFST (ofst)	Offset	Offset to be added in PV	0	

		value - 100.0 to 100.0		
OPES (opes)	OPEN Sensor Status	Set Control O/P when Input OPEN condition. DOWN /UP	UP	
COP (cop)	Control Output Type	PID/ONOF P id / onof	PID Type	
TSP (tsp)	Type of Set Point	L-ON / H-ON Lower ON Higher ON	L-ON	Control Type (COP) is ON-OFF.
HY (hy)	Hysteresis	Hysteresis Value (in °C) for Relay during ON-OFF type Control. 1 to 250	1	Control Type (COP) is ON-OFF.
A.CJC (acjc)	Auto Cold Junction Compensation	NO / YES	YES	Input Type is TC.
F.CJC (fcjc)	Fix cold junction Compensation	0 to 60.0 °C	0.0	Input Type is TC & A.CJC is NO.
PASS (pass)	Password	Password protection for calibration mode & factory default	1	
VERS (vers)	Version	Shows the Version of the Current Firmware	-	

*The value of FLTR will determine the ability of filtering noise. When a large value is set, the measurement input is stabilized but the response speed is slow. "FLTR" should be set to 0 or 1 to short the response time.

LOCK Mode

L.SET (l.set)	To lock/Unlock the Set Point	Lock/Unlock	Unlock	
L.CON (l.con)	To lock/Unlock the conf menu parameters	Lock/Unlock	Unlock	
L.TUN (l.tun)	To lock/Unlock the tune menu parameters	Lock/Unlock	Unlock	COP is PID

CONTROL FUNCTION

ON/OFF Control (For L-ON Mode): The relay is 'ON' up to the set temperature and cuts 'OFF' above the set temperature. As the temperature of the system drops, the relay is switched 'ON' at a temperature slightly lower than the set point.

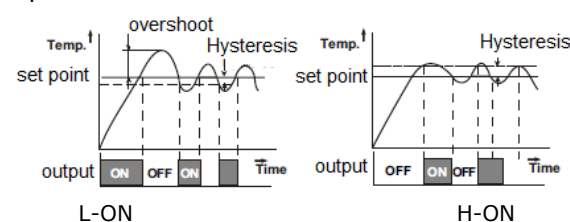


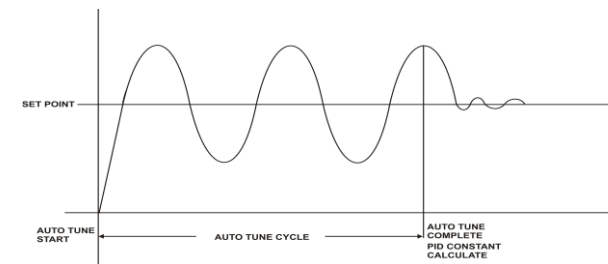
Figure 1.1: Typical Relay operation

HYSTERESIS: The difference between the temperatures at which relay switches 'ON' and at which the relay switches 'OFF' is the hysteresis or dead band.

PID Control

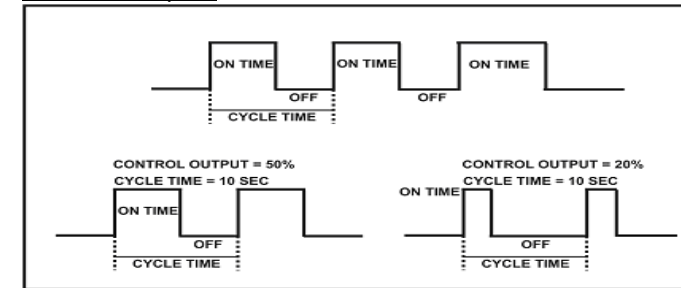
Auto Tuning: The Auto tuning process is performed at set point. Temperature will oscillate around the set point during tuning process. Set a set point to a lower value if overshooting around the normal process value is likely to cause damage. To start the auto tuning process, set the desired set point, select the parameter A.TUN in TUNE menu and set it to YES. During Auto tuning lower display (SV) will flash "AT" message. After auto tune procedure is completed, the message will be removed and controller will revert back to the PID control by using the new calculated PID values. The PID values obtained are stored in the nonvolatile memory.

AUTO TUNE FUNCTION:



Manual Reset: After some time the process temperature settles at some point and there is a difference between the set temperature & the controlled temperature. This difference can be removed by setting the manual reset value equal & opposite to the offset. Range for the manual reset is -50.0% to +50.0% of proportional band.

Cycle Time: The Cycle time for output is the time where the output is on for percentage of that time and off for a percentage of that time, creating a portioning effect. The cycle time is only used where PI, PD or PID control action is used. The shorter the cycle time, the higher the proportionate resolution is, and better is the control.
For Relay output: Set to 10 to 300 seconds or more
For SSR output: Set to 1 to 60 seconds or more

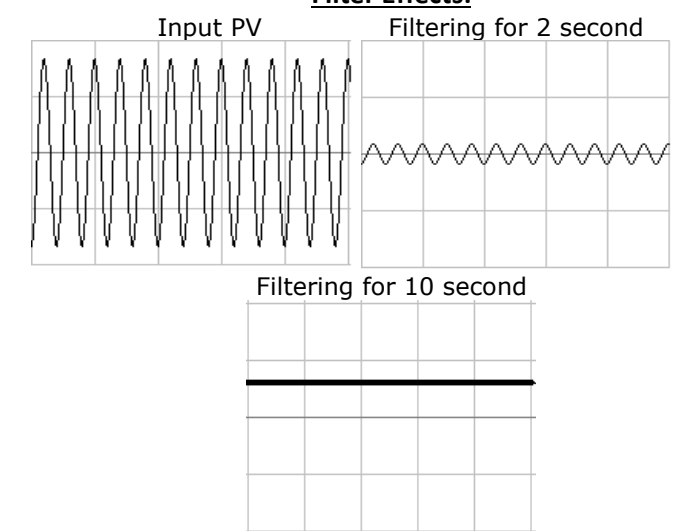


USER GUIDE

PV bias for input correction: PV bias is used for normal operation. This function can be used for adjustment to compensate for differences in measurement reading.

Settable Digital Filter: In certain application the process value is too unstable to be read. To improve this, a programmable low pass filter incorporated in the controller can be used. This is a first order IIR filter with time constant.

Filter Effects:



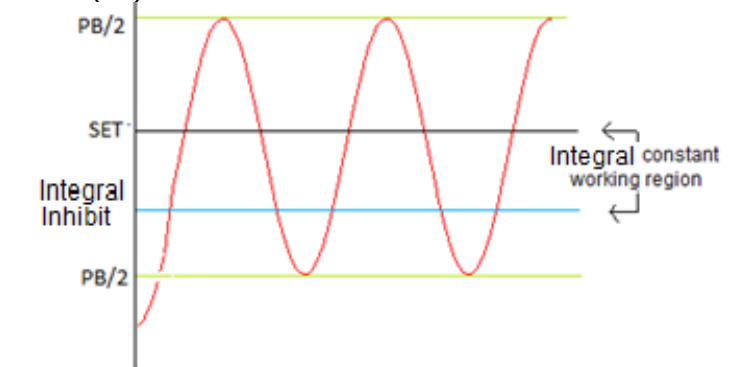
Settable manual reset to prevent overshoot: Virtually no process requires precisely 50% output on single output controls or 0% output on two output controls. Because of this many older control designs incorporated an adjustment called manual reset (also called offset on some controls). This adjustment allows the user to redefine the output requirement at the set point. A proportioning control without manual reset or Integral time will settle out somewhere within the proportioning band but likely not on the setpoint.

Some controls use manual reset (as a digital user programmable value), this allows the user to preprogram the approximate output requirement at the setpoint to allow for quicker settling at set point when Automatic reset (Integral time) set to zero. For PI and PID control, set MR to prevent overshoot. Range for the manual reset is -50% to +50% of Proportional band.

Integral Inhibit: The Value of Integral Inhibit is in a percentage of PB.

To accurate control a process at some defined set point we use PID control. But some of the processes, overshoot can occur during controlling. To overcome this type of issue we can use Integral Inhibit parameter in such type of process to control overshoot.

By use of integral inhibit "I" term (Integral constant) function is limited in specific region of Proportional band(PB).



For operation manual please visit www.masibus.com Specifications are subject to change without notice due to Continuous improvements.

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