

DIGITAL CONTROLLER

TTM-509

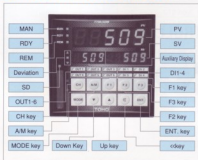
Feasible to control 2 inputs maximum per unit
The versatile function, high accuracy $\pm 0.1\%$ and high speed sampling cycle 50ms will expand the wide application range

Features

- **High accuracy · High speed sampling cycle**
High accuracy: $\pm 0.1\%$, high speed sampling cycle: 50ms
- **Variety inputs**
2 inputs can be equipped upon request and variety of input type.
1/100°C can be indicated for 4 wire RTD and RTD.
- **The various controls can be performed per unit**
2 inputs control, cascade control, remote SP, positioning proportional control and so on are selectable by parameters setting.
- **SD card available**
The data log function for recording measurement values and various statuses is installed. The stored data is taken into personal computer and it is readable by EXCEL, etc.
- **Variety outputs**
Main control outputs and event outputs can be allocated into multiple functions. (Main outputs: 2, auxiliary outputs: 4)
- **MODBUS protocol available**
The current TTM protocol and MODBUS protocol additionally available.
- **Infrared communication function equipped**
Wireless communication can be performed by using infrared.
- **2ch CT input**
The disconnection under three-phase circuit wires can be detected by using 2ch CT input.
- **Memory bank function**
8 types of control parameters can be stored which is changed by DI and communication.

- **Self-tuning PID (Heating/Cooling)**
The optimum PID constant against control object is automatically calculated. PID constant is calculated when making alteration of setting value, or it is corrected when disturbance/hunting etc occurred.
- **Blind function**
At the request, desirable parameter screen is only displayed and set up.
- **Simplified timer**
ON/OFF setting control is available after some certain interval. Function of ON/OFF alarm output is independently usable.
- **Priority display**
Demanding parameter screens are monitored and set up under operational mode screen. (max. 36 screens)
- **Multiple inputs**
Thermocouple, RTD, voltage, current(1-5VDC shunt resistance 250 Ω). Types of input can be changed by parameter setting.
- **Key allocation function**
AT start/stop, RUN/READY, Timer start/stop, Event start/stop and etc can be allocated into [FUNC1] [FUNC2] [FUNC3].
- **Deviation monitor function**
The deviation status can be checked in front monitor.
- **Manual control (Balance-less & Bump-less)**
Manual output function is applicable for versatile applications of instrumentation systems.
- **Digital PV filter**
For abrupt alteration of input value, filter effect is operational on software.
- **PID over-shoot protection**
It is functional to inhibit PID over-shoot.

Front Panel & Key Operation



MAN	MAN lamp Lights when remote action	A/M key	A/M key Use when switching auto and manual
RDY	RDY lamp Lights when ready status	F1	F1 key Executes a set function in FUNC setting
REM	REM lamp Lights when remote action	F2	F2 key Executes a set function in FUNC setting
Deviation	Deviation lamp ▲: Deviation high limit lamp ■: Deviation range lamp ▼: Deviation low limit lamp Indicates status between PV and SV	F3	F3 key Executes a set function in FUNC setting
		MODE	MODE key Use when switching displays
		▼	▼ key Use when decreasing setting values Push 1s-10s : 1digit/100ms Push 10s-20s : 10 digits/100ms Push 20s or over : 100 digits/100ms
SD	SD card lamp Blinks when SD card accesses Lights when SD card is inserted		
OUT1-6	OUT1-6 lamp Lights when output is ON		
PV	PV 7seg Measurement values-character display	▲	▲ key Use when increasing setting values Push 1s-10s : 1digit/100ms Push 10s-20s : 10 digits/100ms Push 20s or over : 100 digits/100ms
SV	SV 7seg Measurement values-monitor display		
Auxiliary Display	Auxiliary display 7seg Indicates CH etc		
DI1-4	DI1-4 lamp Light when input is ON	cKey	cKey Use when changing setting values
CH	CH key Use when changing display channels	ENT.	ENT. key Use when deciding setting data

Specifications

Input PV1, 2 common	Thermocouple	K, J, T, E, R, S, B, N, (JIS C 1602-1995) U, L, (DIN) W5RE/W26RE, PR40, /PR20, PL1E (ASTM)
	R.T.D.	Pt100, μ Pt100, (JIS C 1604-1997) Pt1000 External resistance 10 Ω or less
	Voltage	0-1VDC, 0-5VDC, 1-5VDC, 0-10VDC, 0-10mVDC(input resistance 1m Ω or over)
	Current	4-20mADC (External input resistance 250 Ω)
	Potentiometer(PV2 only) 4 wire RTD(PV1 only)	135 Ω Pt100 (JIS C 1604-1997)
Display	PV characters display	5 digits, 7 segments, 2 colors LED: Red - Green 14.2mm(H)
	SV - setting values	5 digits, 7 segments, LED Red 8mm(H)
	Auxiliary display	4 digits, 7 segments, LED Orange 8mm(H)
	Each functions display	LED Red(OUT1-6; Deviation high - low, 50 card), LED Green(MAN, RDY, Remote, D1-4, Deviation range)
Control type	PID	Proportional band(P1) 0.0-200.0% of setting limiter span
	Auto-tuning	Cooling proportional band(P2) 0.00-10.00eP1(Heating/Cooling action)
	Self-tuning	Integral time(I) 0-3600sec. (0: Integral action OFF)
		Deviation time(D) 0-3600sec. (0: Deviation action OFF)
		Proportional cycle(T1, T2) 1-120sec. Dead band(DB) Thermocouple/R.T.D.: 100-100, Voltage - Current: 1000-1000
Main output	ON / OFF	Control sensitivity(C1, C2) Thermocouple/R.T.D.: 0-999, Voltage - Current: 0-99999
	Relay contact	250VAC, 3A(Load resistance), 1a contact
	Open collector	24VDC 100mA
	SSR drive voltage	0-12VDC(Load resistance: 600 Ω or more)
	Voltage Current	1-5VDC, 0-5VDC, 0-10VDC(Load resistance: 1K Ω or more), 0-1VDC(Load resistance 500 Ω or more) 4-20mADC(Load resistance 600 Ω or less)
Auxiliary output	Relay contact	250VAC, 3A(Load resistance), 1a contact
	Open collector	24VDC 100mA
Sampling cycle		0.05sec/Output change period is the same
Setting and indication accuracy	Thermocouple/R.T.D./Voltage/Current Potentiometer	Refer to the table of input, and range of scale FS \pm (0.5%+1 digit)
Memory element	Potentiometer	EEPROM
Power supply		100VAC-240VAC, 50/60Hz
Weight		Less than 800g
Power consumption		Less than 17VA
Accessories		Instruction manual and installation attachment
Standard operating condition		23 $^{\circ}$ C \pm 2 $^{\circ}$ C, 45%-75%RH
Limit range of operating ambient condition		0-50 $^{\circ}$ C, 20-90%RH(Under non-condensation)
Limit range of storage ambient condition		-25-27 $^{\circ}$ C, 5-95%RH(Under non-condensation and non-freezing)
International standard		CE/UL/cUL marking
Function	Max/min value inter(M1, M1, M2, M2)	0.0-10.0: Current/Voltage/100.0/110.0: Current/Voltage/%
	Setting limiter(SL1, SLH)	SV setting range low limit-SV setting range high limit
	Control mode switch (CNT)	PID type(Normal/reverse) ON/OFF(Normal/reverse)
	PV correction setting 0 point(PVS)	Thermocouple -99.99 $^{\circ}$ C or -99.999 $^{\circ}$ C, R.T.D. -99.99 $^{\circ}$ C or -99.999 $^{\circ}$ C, Current/Voltage -9999.9999 $^{\circ}$ C
	PV correction setting gain(PVG)	0.500-2.000 times
	Input filter(PdF)	0.0-99.9sec
	Blind function	No indication available for non-required display
	Priority display	Arbitrary parameter screens are shifted to indication of operation mode by key. (max. 36 screens)
	Key allocation function	AT start/stop, RUN/READY, Timer start/stop, Event start/stop etc can be allocated into each FUNC key
	Timer operation mode	0m:00s-59m:59s 0h:00m-99h:59m Accuracy: setting time \pm (1.5%+0.5sec)
	Watchdog function	Data checked by EEPROM (E=0), A/D converter check (Er1), and Auto-tuning check (Er2), Built-in watchdog timer
	Initial setting function	Parameters setting can be returned to initial setting.
	Memory bank	8 types of parameters setting can be stored(only control setting)
	Buzzer	Buzzer can be sounded by event and by key operation
	Deviation monitor	Deviation status is displayed
Other functions		Polygonal line approximation, Extraction square root

Options

	Specification	Specification
Event output(AL)	Function/PV contact output(8 modes), special contact output(3 modes), additional functions(3 modes) Setting range: 99.9-999.9 or -1999.9999(°C) Sensitivity: 0.0-999.9 or 0-99999(°C) Contact polarity is selectable, either normal open or normal close	Communication RS-485 conformable, Multi-drop 2 line system 131 stations max RS-232C conformable, 3 line system 1:1 Communication Parameter: 8BC check-NON-8BC check, 7 bits/8bits, Non-parity/odd number/even number, stop-bit 1/2 Communication Speed: 1200/2400/4800/9600/19200 BPS Communication Address: 1-99 Response delay time: 0-250msec Protocol: TOHO TTM protocol, MODBUS(RTU/ASCII)
DI	Function(SV2) settable: OFF, SV2, Auto Manual settable: OFF, Manual, Run/Ready settable: OFF, Ready, Normal Reverse settable: OFF, Normal, Normal(SV2) Reverse(SV2) settable: OFF, Normal(SV2), Time start/stop: OFF, Counting Input Set/Min/Max: 1mV-500mV, OFF voltage: 60C max, On: current: 5mA max/Permissible resistance value between contacts: 0-133 Ω max, OFF-500 Ω min	Infrared communication Analog output Data log SV card/Formated FAT 16 only, 15999sec, Calendar backup: 10years
CT input	Setting range: 0-3A AC, 0-10A AC 2 points, Accuracy: 0.5% Setting resolution: 1A	Voltage to sense the 12VDC 50mA max accuracy \pm 150VDC
Heating/Cooling	Refer to the specification of output control	

Input and Range (Thermocouple & R.T.D. switchable by key)

Thermocouple	Setting Range/Display Range		Measurement Accuracy
	Non-decimal point	Decimal point	
K	°C -200 -1370 -2000 -1370.0		(±0.1% or ±0.1°C of PV)±1 digit either of bigger numerical value is taken, ±1TC±1 digit under -100°C
J	°C -200 -1200 -2000 -1200.0		(±0.1% or ±0.5°C of PV)±1 digit either of bigger numerical value is taken, ±1TC±1 digit under -100°C
T	°C -200 -400 -2000 -400.0		(±0.1% or ±0.5°C of PV)±1 digit either of bigger numerical value is taken, ±1TC±1 digit under -100°C
E	°C -200 -1000 -2000 -1000.0		(±0.1% or ±0.5°C of PV)±1 digit either of bigger numerical value is taken, ±1TC±1 digit under -100°C
R	°C -50 -1768 -500 -1768.0		(±0.1% or ±1.0°C of PV)±1 digit either of bigger numerical value is taken, ±1TC±1 digit under -100°C
S	°C -50 -1768 -500 -1768.0		(±0.1% or ±1.0°C of PV)±1 digit either of bigger numerical value is taken, ±1TC±1 digit under -100°C
B	°C 0 -1800 0 -1800.0		(±0.1% or ±1.0°C of PV)±1 digit either of bigger numerical value is taken, No regulation under 400°C
N	°C -200 -1300 -2000 -1300.0		(±0.1% or ±1.0°C of PV)±1 digit either of bigger numerical value is taken, ±2.0C±1 digit under -100°C
U	°C -200 -400 -2000 -400.0		(±0.1% or ±1.0°C of PV)±1 digit either of bigger numerical value is taken, ±2.0C±1 digit under 0°C
L	°C -200 -900 -2000 -900.0		(±0.1% or ±1.0°C of PV)±1 digit either of bigger numerical value is taken, ±2.0C±1 digit under 0°C
W5Re-W26Re	°C -200 -2300 -2000 -2300.0		(±0.2% or ±1.0°C of PV)±1 digit either of bigger numerical value is taken.
PR40-PR20	°C 0 -1880 0 -1880.0		±0.4C±1 digit No regulation under 800°C
PL8	°C 0 -1390 0 -1390.0		(±0.1% or ±0.5°C of PV)±1 digit either of bigger numerical value is taken.

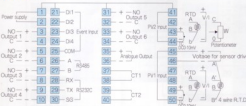
R.T.D.	Setting Range/Display Range		Measurement Accuracy
	Non-decimal point	Decimal point	
Pt1000	°C -200 -850 -2000 -850.0		
	°C -120 -120 -120.0 -120.0		
°C -120 -120 -120.0 -120.0			
°C -200 -510 -2000 -510.0			(±0.1% or ±0.5°C of PV)±1 digit either of bigger numerical value is taken.
°C -120 -120 -120.0 -120.0			However, if the decimal point position is second place at the display, ±0.2%±1 digit of PV
°C -200 -510 -2000 -510.0			
°C -120 -120 -120.0 -120.0			
°C -200 -510 -2000 -510.0			(±0.1% or ±0.2°C of PV)±1 digit either of bigger numerical value is taken.
°C -120 -120 -120.0 -120.0			However, if the decimal point position is second place at the display, ±0.2%±1 digit of measurement temp. range
°C -120 -120 -120.0 -120.0			

Current / Voltage	Setting Range/Display Range		Measurement Accuracy
	Non-decimal point	Decimal point	
0-1VDC V			±0.1%±1 digit of FS
0-5VDC V			
1-5VDC V	-1999-99999	Decimal point can be changed by key	
0-10VDC V	(Display range under 30000)		
0-10mVDC mV			
4-20mA DC mA			±0.1%±1 digit of FS

Powermeter	%	-10-110	±0.5%±1 digit of FS
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Operation

Wiring

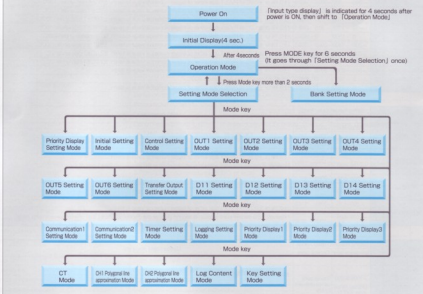


Terminals

Relay Output	C: Common, NO: Normal Close
DI	No polarity, however terminal No. 21-24 will be + when input with open collector
Communication	T(RA), T(RB) do not re-wiring the terminal Not possible to use RS-485 and RS-232C at same time
SG	Use as signal ground of communication
SSR drive voltage	Connect + _v input of SSR side directly
CT	Connect specific CT (heater current detector) directly
R.T.D. input	Connect A,B,B terminals with care
Potentiometer Voltage	Connect with care on polarity of + & -
Output	Connect with care on polarity of + & -
Current / Voltage output	Connect with care on polarity of + & -

Operation Flow

- In operation mode, display will be changed to [Setting Mode Selection.] by pressing MODE key for 3 sec. Setting categories should be selected by ▲/▼, and setting mode of each categories will be changed by pushing ENT. key

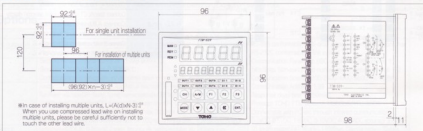


Output Function Allocation

R.T.D.	OUT1	OUT2	OUT3	OUT4	OUT5	OUT6	Transfer
CH1 Main Output	○	○	○	○	○	○	×
CH1 Sub Output	○	○	○	○	○	○	×
CH2 Main Output	○	○	○	○	○	○	×
CH2 Sub Output	○	○	○	○	○	○	×
Analogue Output	OP1	OP1	×	×	×	×	○
Event1 Output	○	○	○	○	○	○	×
Event2 Output	○	○	○	○	○	○	×
Event3 Output	○	○	○	○	○	○	×
Event4 Output	○	○	○	○	○	○	×
Event5 Output	○	○	○	○	○	○	×
Event6 Output	○	○	○	○	○	○	×

- : Possible to allocate function
- *1 : Output type can allocate only voltage or current output.

Panel Cut and Dimension



Ordering Information

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Input1	0	Thermocouple - R.T.D. - Voltage - Current Multiple Input					
	1	4 wire R.T.D. Pt100					
Input2	N	Nil					
	0	Thermocouple - R.T.D. - Voltage - Current - Potentiometer Multiple Input	Not available when 4 wire R.T.D. Pt100 is selected in Input1				
OUT1	N	Nil					
	R	Relay contact					
	P	SSR drive voltage					
	A	Open collector					
	K	Voltage 0-1VDC					
	J	Voltage 0-5VDC					
	F	Voltage 1-5VDC					
	G	Voltage 0-10VDC					
	I	Current 4-20mA DC					
OUT2	N	Nil					
	R	Relay contact					
	P	SSR drive voltage					
	A	Open collector					
	K	Voltage 0-1VDC					
	J	Voltage 0-5VDC					
	F	Voltage 1-5VDC					
	G	Voltage 0-10VDC					
	I	Current 4-20mA DC					
OUT3,4	N	Nil					
	R	Relay contact (Common Independent)					
	P	SSR drive voltage					
	A	Open collector					
	K	Voltage 0-1VDC					
	J	Voltage 0-5VDC					
	F	Voltage 1-5VDC					
	G	Voltage 0-10VDC					
	I	Current 4-20mA DC					
OUT5,6	N	Nil					
	A	Open collector					
	R	Relay contact (Common Independent)					
Option(Plural No. available)	N	Nil					
	M	Communication(RS-485/RS-232C)					
	D1	CT1 - CT2 Input Measurement Range : 0-50A	Option (D2) is not selectable				
	D2	CT1 - CT2 Input Measurement Range : 0-120A	Option (D1) is not selectable				
	E	Event Input					
	T	Infrared communication					
	Q	Voltage for sensor drive		Not available when 4-wire R.T.D. Pt100 is selected			
	L	Data log function		No SD card			
	K	Transf. Output 0-1VDC	J	Transf. Output 0-5VDC	F	Transf. Output 1-5VDC	Only one can be selected from J, K, F, G, I
	G	Transf. Output 0-10VDC	I	Transf. Output 4-20mA DC			
Power		Nil	100-240VAC				