SHIMAX

DIGITAL CONTROLLER

NEW **MAC10**SERIES

MAC10A	MAC10B	MAC10C	MAC10D	MAC10E
(W96×H96mm)	(W48×H96mm)	(W72×H72mm)	(W48×H48mm)	(W22.5×H94mm)

Compact & Low Cost Digital Controller

■ Feature

● **Space-saving design** : MAC10A to D : Panel depth is 62 to 65mm
  MAC10E : 22.5mm Width

● **Accuracy** : ±(0.3%FS+1 digit)

● **Sampling Period** : 0.25sec

● **Additional Functions** : Event output, Communication, Analog output

■ Event Output

Table of Allotment Function

Function	Character	Remark
No allotment	non	
Upper limit absolute value alarm	HA	
Lower limit absolute value alarm	LA	
Scaling over alarm	So	Operates when signals such as HHHH, LLLL, B, are shown
Upper limit deviation alarm	Hd	
Lower limit deviation alarm	Ld	
Within deviation alarm	Cd	
Out deviation alarm	od	
RUN signal	run	Operates while FIX in operation.

Output rating: Contact Normal open (1a) 240V AC 2A (Resistance load) EV1- EV2 in common

■ Event Timer function

```
                    ON
EVENT  _____|‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
STATUS          |    OFF time   ON time
                |    0~600      1~600
EVENT           |_____      _____
RELAY  ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾|_____|
                         ON    OFF
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Unit : min,sec,hour

■ Input range

In MAC10E, Current input(4-20mA) is included in Multi input.

Input Type			Code	Measuring Range	
				Unit Code ℃ (°C)	Unit Code °F (°F)
Multi input	Thermo Couple	K	H1	0 ~ 1200	0 ~ 2200
			H2	0.0 ~ 800.0	0 ~ 1500
			H3	−199.9 ~ 400.0	−300 ~ 700
		J	J1	0 ~ 600	0 ~ 1100
			J2	0.0 ~ 600.0	0 ~ 1100
		E	E1	0 ~ 700	0 ~ 1300
			E2	0.0 ~ 700.0	0 ~ 1300
		T	t1	−199.9 ~ 200.0	−300 ~ 400
			t2	−199.9 ~ 350.0	−300 ~ 660
		B	b1	0 ~ 1800	0 ~ 3300
		R	r1	0 ~ 1700	0 ~ 3100
		S	S1	0 ~ 1700	0 ~ 3100
		Wre5-26	S-26	0 ~ 2300	0 ~ 4200
		N	n1	0 ~ 1300	0 ~ 2300
	Resistance Bulb Pt100		P1	−100.0 ~ 200.0	−150.0 ~ 400.0
			P2	−100 ~ 200	−150 ~ 400
			P3	−199.9 ~ 300.0	−330 ~ 570
			P4	−200 ~ 300	−330 ~ 570
			P5	−199.9 ~ 600.0	−330 ~ 1100
			P6	−200 ~ 600	−330 ~ 1100
	Voltage(mV)	0~50	A1		
		0~20	A2	Scaling Range : -1999 ~ 9999	
		0~10	A3	Span : 10 ~ 10000	
		−10~10	A4	Decimal point : non, 0.1, 0.01, 0.001	
	Current(mA)	4~20	AA1		
		0~20	AA2	Not available in MAC10E.	

Thermo couple K,J,E,T,B,R,S,N : JIS/IEC, Wre5-26 : Product of Hoskins Mfg.
Resistance bulb Pt100 : JIS/IEC

* Note on Thermo couple *
In B, Accuracy is not guaranteed below 600℃, And accuracy is ±0.5%FS for 600~800℃.
In K and T,Accuracy is ±0.5%FS for -100~0℃, And ±1.0%FS if it is below -100℃.
Setup of factory shipment is : Multi input : K1(0-1200℃)
                              Current input : 4-20mA(0.0-100.0)

■ Communication

Serial communication to a personal computer/
sequence can be performed by RS-485.

MAC10

MODBUS ASCII/RTU → personal computer etc.

■ Analog Output

Choose from PV, SV, and OUT 1

MAC10

4~20mA DC → external equipment, recorder etc.

— 2 —

■Specification

Display

■Display accuracy : ± (0.3%FS +1 digit) CJ error is not included
In B, Accuracy is not guaranteed below 600℃, And accuracy is ±0.5%FS for 600〜800℃.
In K and T, Accuracy is ±0.5%FS for -100〜0℃, And ±1.0%FS if it is below -100℃.

■Accuracy
maintenance range : 23 ± 5℃

■Display range : -10%〜110% of measuring range

■Display resolution : depends on measuring range and scaling.

■Input scaling : possible at the time of electric current and Voltage input -1999〜9999
(Span 10〜10000 count, No decimal point at the position of decimal 0.1, 0.01, 0.001)

Setup

■Setting system : by four front keys (MENU ▽ △ ENT).

■SV setting range : the same as a measuring range.

■Setting lock : communication and a key setup (four - level)

Operation classification	Level	Content of lock
Communication & key setup	OFF	no lock
	1	execution SV, manual numerical change, and change of key lock level are possible
	2	manual numerical change as well as change of key lock level are possible
	3	change of key lock level is possible
	5	change of key lock level and basic screens are possible

■SV setting limiter : the same as measuring range (lower limit < upper limit).

■Setup of unit : possible to set up at the time of sensor input, ℃, °F

Input

■Multi input
●Thermocouple
input resistance : 500kΩ and more, external resistance tolerance level 100Ω or less
Influence of lead
resistance : ±0.15μV/Ω or less
Burnout : Standard equipment (up scale or down scale)
Measuring range : See "Measuring range character table"
Reference junction
Compensation accuracy : ±2℃ (ambient temperature 18〜28℃)
At the time of vertical plural proximity attachment ±3℃
±3℃ (ambient temperature 0〜50℃)
At the time of vertical plural proximity attachment ±4℃

＊Immediately after switching on a power supply, accuracy is not covered
by warranty. It reaches in accuracy within 30 minutes after the power
supply is switched on.

Tracking of
reference junction : below the ambient temperature of 0.5℃ / min, compensation accuracy
of reference junction ±2℃

●Resistance bulb
stipulated current : approx. 0.16 mA
Lead wire resistance
tolerance level : 5Ω or less per wire (resistance of three lines should be equal)
Influence of lead
resistance : ±0.3℃/Ω or less (per wire)
Measuring range : See "Measuring range character table"
●Voltage (mv)
Input resistance : more than 500kΩ
Influence of lead
resistance
temperature : ±0.15μV/Ω or less
Input voltage range : See "Measuring range character table"
●Electric current input (mA)
Reception resistance : MAC10AtoD: 60Ω or less (built-in)
MAC10E:110Ω or less (built-in)
Input current range : See "Measuring range character table"

■Sampling period : 0.25 second
■PV filter : 0〜100 seconds
■PV offset compensation : ± 500 unit
■PV gain compensation : ± 5.00%

Control

■Control system : PID control with auto tuning function, or ON-OFF operation

■Proportional band (P) : OFF and 0.1〜999.9% of measuring range
(ON-OFF operation by OFF setup)

■ON-OFF
differential gap (DF) : 1〜999 unit

■Integration time (I) : OFF, 1〜6000 seconds
(PD operation by OFF setup)
■Derivative time (D) : OFF, 1〜3600 seconds
(PI operation by OFF setup)
} P operation if both I and D are OFF

■Manual reset (MR) : ± 50.0% (I = effective at the time of OFF setup)
■Output limiter (OL,OH) : 0.0〜100.0% (OL< OH) (setting resolution 0.1)
■Soft start : OFF, 0.5〜120.0 seconds (setting resolution 0.5)
■Proportional period : 0.5〜120.0 seconds (setting resolution 0.5)
■Control output
characteristic : RA (heating) or DA (cooling)
■Manual output : 0.0〜100.0% (setting resolution 0.1)

● Control Output 1

■Contact : Normal open (1a) 240V AC 2A (resistance load)
■Voltage pulse
(SSR drive) : 12V(10〜15V) DC MAX 20mA
■Electric current : 4〜20mA DC 500Ω or less of load resistance, display accuracy ±1%
(23℃±5℃)
load regulation ±0.2%, resolution about 1/10000
■Motor control
(Contact) : Normal open (1a x2) 240V AC 1A (resistance load)

● Motor control parameters

■ Feedback potentiometer : Unusable (Floating control only)
■ Dead band : 0.1 〜 20.0%
■ Hysteresis : 0.1 〜 10.0%
■ Travel time : 5 〜 300 second
■ Reverse rotation wait : 0 〜 10 second

● Option

● Event 1-2 : One or Two-point set
■output rating : contact normal open (1a) 240V AC 2A (resistance load)
(EV1,EV2 and common)
■Event type : See "Event output Allotment function table"
■Setting range : upper-limit absolute value alarm, lower limit absolute value alarm
within measuring range
upper limit deviation alarm, lower limit deviation alarm -1999〜2000 unit
within deviation alarm, out deviation alarm 0〜2000 unit

● Communication function

■Communication type : EIA standard RS-485
■Communication method : Two-wire system half duplex multidrop (bus) system
■Transmission speed : 9600, 19200 bps
■Data format : Start 1bit, stop 1, 2bit, data length 7, 8 bits, No parity, odd or even number
■Slave address : 1〜255
■Parameter
preservation mode : Choose from RAM, MIX, and EEP mode
■Protocol : MODBUS ASCII, MODBUS RTU protocol
■The number of
connection : A maximum of 32 equipments (depends on conditions. A host included)

● Analog output
■Output type : Choose from PV, SV, and OUT 1
■Output rating : 4〜20mA DC 500Ω or less of load resistance, display accuracy ±0.3%
(Accuracy maintenance range 23℃±5℃)
Load regulation ±0.05%. Resolution about 1/50,000
■Scaling function : Equipped (limit depends on output type)
Analog output lower limit < analog output upper limit
■Output limiter : 0.0〜100% (reverse setup is possible)

● General specification

■Data retention : Non-volatile memory (EEPROM)
Write endurance:1,000,000 cycles at 23℃ (Device rating)
■Momentary stop
dead time : within 0.02 second. Should have no influence with 100% dip
■Environmental condition for use
Temperature : 0〜50℃
Humidity : Below 85% RH (no condensation)
Height : Altitude 2000m or under
Category : Ⅱ
Degree of
contamination : 2
■Storage temperature
conditions : -20〜65℃
■Electric supply voltage : 100-240V(90-264V) AC 50/60Hz
■Power consumption : 100-240V AC Maximum 9 VA
■Insulation Class : Class I equipment
■Input noise
cleaning ratio : Normal 50 dB or more
■Impulse-proof noise : Power supply Normal 100ns / 1μs ±1500V
■Insulation resistance : Between input and output, and power terminal 500V, DC 20MΩ
■Electric strength : Between input and relay output, and power supply terminal
1800V AC For1 minute
: Functional isolation 500V AC For 1 minute
■Material of case : PPE, PC
■Case color : light gray
■Outside dimension
MAC10A : W96×H96×D69mm (Depth of panel is 65mm)
MAC10B : W48×H96×D66mm (Depth of panel is 62mm)
MAC10C : W72×H72×D69mm (Depth of panel is 65mm)
MAC10D : W48×H48×D66mm (Depth of panel is 62mm)
MAC10E : W22.5×H94×D85.9mm
■Thickness of panel : 1.2〜2.8mm
(Continued on the following page)

■Fitting hole size

Attachment hole size of horizontal plural proximity attachment
N = the number of equipment

MAC10A : W92×H92mm　　W (96×N−4) mm　H92
MAC10B : W45×H92mm　　W (48×N−3) mm　H92
MAC10C : W68×H68mm　　W (72×N−4) mm　H68
MAC10D : W45×H45mm　　W (48×N−3) mm　H45

■Mass　　MAC10A : About 220g
　　　　　MAC10B : About 160g
　　　　　MAC10C : About 160g
　　　　　MAC10D : About 120g
　　　　　MAC10E : About 130g

■Isolation

　　　――― is basic insulation.　　――― is functional insulation.
　　　----------- is un-insulating.

When control output is Contact, Voltage pulse, or Current :

| Power Supply		
Measurement input (PV)	System	control output (contact)
		control output (voltage pulse / Electric current)
Communication / Analog output		event output 1 (EV 1)
		event output 2 (EV 2)

When control output is contact for motor control :

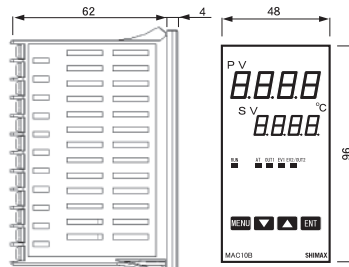| Power Supply		
Measurement input (PV)	System	event output 1 (EV 1)
		Control output 1 (Open)
Communication / Analog output		Control output 2 (Close)

■External Dimension
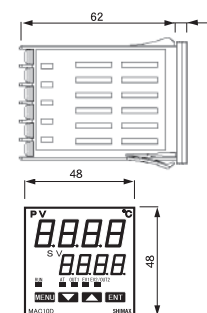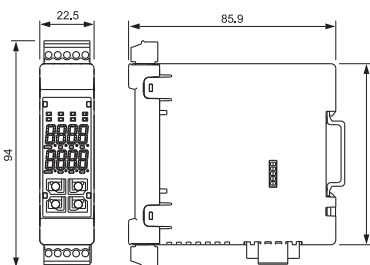
MAC10A, MAC10C 96X96, 72x72　　　unit: mm

The figure shown MAC10A.
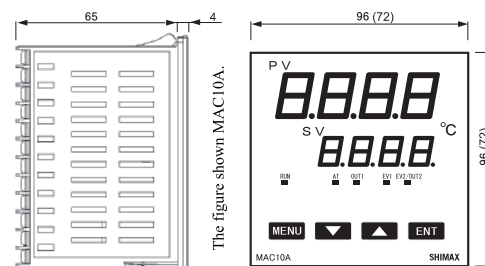
MAC10B 48X96

MAC10D 48X48

MAC10E

■Order code table

Item	Code		Specification
1. Series	MAC10A—		96×96mm size　Digital controller
	MAC10B—		48×96mm size　Digital controller
	MAC10C—		72×72mm size　Digital controller
	MAC10D—		48×48mm size　Digital controller
	MAC10E—		DIN rail mounting Digital controller
2. Input	MAC10 A〜D	M	Thermocouple (K, J, E, T, B, R, S, N, Wre5-26) Resistance bulb (Pt 100) Specified current about 0.16mA Voltage (mV)
		I	Current (4〜20mA, 0〜20mA) Reception resistance 60Ω or less
	MAC10E	M	Thermocouple (K, J, E, T, B, R, S, N, Wre5-26) Resistance bulb (Pt 100) Specified current about 0.16mA Voltage (mV) Current(4〜20mA) Reception resistance 110 Ω or less
3. Control Output 1		C	Contact 1a 240V AC 2A (Resistance load)
		S	Voltage pulse (SSR drive voltage) 12V(10〜15V) DC 20mA MAX
		I	Current 4〜20mA DC Maximum load resistance 500Ω
		Y	Contact for Motor control 1a x2 240V AC 1A (Resistance load)
4. Power Supply		F—	100〜240V AC 50/60Hz
5. Event Output		N	None
		1	Event output 1 (one point) Contact 1a 240V AC 2A(Resistance load)
		2	Event output 1, 2 (two points) Contact 1a 240V AC 2A(Resistance load)
6. Option		N	None
		R	RS485
		T	Analog output (Current) 4〜20mA DC Maximum load resistance 500Ω

When Control Output 1 is 'Y', Event Output 2 is not available.

SHIMAX CO.,LTD.