# MAC5 series DIGITAL CONTROLLER

## Feature

- **Space-saving Design :** Panel depth is 62-65mm
- **Accuracy :** ±(0.3%FS+1digit)
- **Sampling Period :** 0.25s

## Order code table

| | Item | Code | | Specifications |
|---|---|---|---|---|
| 1 | Series | MAC5A- | | 96×96mm size Digital Controller |
| | | MAC5B- | | 48×96mm size Digital Controller |
| | | MAC5C- | | 72×72mm size Digital Controller |
| | | MAC5D- | | 48×48mm size Digital Controller |
| 2 | Input | | M | Thermocouple (K, J, T, E, R, S, U, N, B, PLII, WRe5-26)<br>R.T.D. (Pt100,JPt100)<br>Voltage (0-10mV, 0-20mV, -10-10mV, 0-50mV, 0-100mV) |
| 3 | Control output 1 | | C | Contact 1a 240V AC 2A (Resistance load) |
| | | | S | Voltage pulse 12V+1～-1.5V 20mA DC (SSR drive voltage) |
| | | | I | Current 4-20mA DC Load resistance : 500Ω max |
| 4 | Power supply | | F- | 100-240V ±10%AC |
| 5 | Event output | | E | Event output 1,2 (2points) 1a 240V AC 2A (Resistance load) |
| 6 | | | N | None |
| | Control output 2 | | C | Contact 1a 240V AC 2A |
| | | | S | Voltage pulse 12V+1～-1.5V 20mA DC ( It can not be installed with Out out1 Voltage pulse "S" or Current "I") |
| | Event output | | E | Event output 3 (1point) Contact 1a 240V AC 2A (Resistance load) |
| | DI | | D | DI (1point) 5V DC 0.5mA ( It can not be installed with Out put 1 Voltage pulse "S") |

## Measuring Range Character table

| Input type | | Character | Measuring Range | |
|---|---|---|---|---|
| | | | unit code ℃ (℃) | unit code ℉ (℉) |
| Thermocouple | R | r 1 | 0 ～1700 | 0 ～3100 |
| | K | K 1 | -199.9～400.0 | -300 ～ 700 |
| | K2 | K2 | 0 ～1200 | 0 ～2200 |
| | K3 | K3 | 0.0～300.0 | 0 ～ 600 |
| | K4 | K4 | 0.0～800.0 | 0 ～1500 |
| | J | J 1 | 0 ～600 | 0 ～1100 |
| | J2 | J2 | 0.0～600.0 | 0 ～1100 |
| | T | t 1 | -199.9～200.0 | -300 ～ 400 |
| | E | E 1 | 0 ～700 | 0 ～1300 |
| | S | S 1 | 0 ～1700 | 0 ～3100 |
| *5 | U | U 1 | -199.9～200.0 | -300 ～ 400 |
| *1 | N | n 1 | 0 ～1300 | 0 ～2300 |
| *3 | B | b 1 | 0 ～1800 | 0 ～3300 |
| | Wre5-26 | 5-26 | 0 ～2300 | 0 ～4200 |
| *4 | PLⅡ | PL2 | 0 ～1300 | 0 ～2300 |

| Input type | code | Measuring Range | |
|---|---|---|---|
| | | unit code ℃ (℃) | unit code ℉ (℉) |
| Resistance bulb<br>Pt100 | P1 | -200 ～600 | -300 ～1100 |
| | P2 | -100.0～200.0 | -150.0～400.0 |
| | P3 | 0.0～100.0 | 0.0～200.0 |
| | P4 | -50.0～ 50.0 | -60.0～120.0 |
| | P5 | -100.0～300.0 | -150.0～600.0 |
| | P6 | -199.9～300.0 | -300.0～600 |
| | P7 | -199.9～600.0 | -300.0～1100 |
| | P8 | 0 ～230 | 0 ～450 |
| | JP1 | -200 ～500 | -300 ～900 |
| | JP2 | -100.0～200.0 | -150.0～400.0 |
| | JP3 | 0.0～100.0 | 0.0～200.0 |
| | JP4 | -50.0～ 50.0 | -60.0～120.0 |
| | JP5 | 100.0～300.0 | 150.0～600.0 |
| | JP6 | -199.9～300.0 | -300 ～600 |
| | JP7 | -199.9～500.0 | -300 ～900 |
| | JP8 | 0 ～230 | 0 ～450 |
| 0-10mV<br>0-100mV<br>-10-100mV<br>0-20mV<br>0-50mV | A 1 | Scaling range : -1999～9999 count<br>Span : 10～10000 count<br>Possible to change decimal point position<br>(No Decimal point, 0.1, 0.01, 0.001) | |
| | A2 | | |
| | A3 | | |
| | A4 | | |
| | A5 | | |

Thermo couple B, R, S, K, E, J, T, N : JIS／IEC
Resistance bulb Pt100 : JIS／IEC
JPt100 : former JIS

*1 thermo couple Accuracy is not guaranteed below B:400℃ (752℉)
*2 thermo couple In K, T, U, accuracy is ±0.5%FS for 0～-100℃ (-148 ) and ±1.0%FS if it is below -100℃
*3 thermo couple Wre 5-26 : Product of Hoskins Mfg. co
*4 thermo couple PLⅡ : Platinel
*5 thermo couple U : DIN43710
*Setup of factory shipment is Multi input : thermo couple

## External

MAC5A 96mm×96mm


MAC5B 48mm×96mm

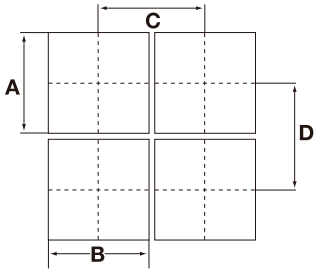

MAC5C 72mm×72mm

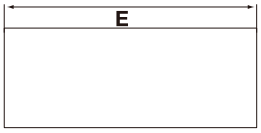

MAC5D 48mm×48mm


## Panel Cutout

Unit : mm

| | A | B | C | D | E |
|---|---|---|---|---|---|
| MAC5A | 92 $^{+0.8}_{-0}$ | 92 $^{+0.8}_{-0}$ | 96min | 96min | (96×N-4) $^{+0.8}_{-0}$ |
| MAC5B | 92 $^{+0.8}_{-0}$ | 45 $^{+0.6}_{-0}$ | 48min | 96min | (48×N-3) $^{+0.6}_{-0}$ |
| MAC5C | 68 $^{+0.7}_{-0}$ | 68 $^{+0.7}_{-0}$ | 72min | 72min | (72×N-4) $^{+0.7}_{-0}$ |
| MAC5D | 45 $^{+0.6}_{-0}$ | 45 $^{+0.6}_{-0}$ | 48min | 48min | (48×N-3) $^{+0.6}_{-0}$ |




In the case of horizontal proximity attachment
By the single hole. N: Number

Note: Proximity attachment by a single hole is possible only in the case of horizontal direction
When an apparatus that was attached in vertical direction is removed, a dedicated detachment tool is required.

# Specifications MAC5 series

## Display

**Display method Digital display :**

| | | |
|---|---|---|
| MAC5A(96×96 size) | PV red 7 segment LED | 4 figure (height of character about 20mm) |
| | SV green 7 segment LED | 4 figure (height of character about 13mm) |
| MAC5B(48×96 size) | PV red 7 segment LED | 4 figure (height of character about 12mm) |
| | SV green 7 segment LED | 4 figures (height of character about 9 mm) |
| MAC5C(72×72 size) | PV red 7 segment LED | 4 figure (height of character about 16mm) |
| | SV green 7 segment LED | 4 figures (height of character about 11mm) |
| MAC5D(48×48 size) | PV red 7 segment LED | 4 figure (height of character about 12mm) |
| | SV green 7 segment LED | 4 figures (height of character about 9mm) |

**Status display** : RUN (green), AT (green), OUT 1(green) EV1 (yellow), EV2 (yellow), OUT2／EV3 (yellow)

**Display accuracy** : ±(0.3%FS+1digit)
CJ errors not included, B thermo couple below 400℃ is not guaranteed.
Display accuracy during EMC examination is ±5%FS.

**Accuracy maintenance range** : 23±5℃

**Display range** : -10%-110% of measuring range, but Pt100's -200～600℃ is -240～680℃

**Display resolution** : Changes with measuring range and scaling .

**Input scaling** : Possible at the time of voltage input and current input -1999-9999
(span 10-10000 count, decimal point position no decimal point 0.1, 0.01, 0.001)

## Setting

**Setting system** : By four front keys (▼ ▲ MENU ENT,)

**SVSetting range** : Same with measuring range

**Setting lock**

| Key setting | OFF | No lock |
|---|---|---|
| | 1 | Execution SV and a manual numerical change are possible. And change of a key lock level is possible. |
| | 2 | Possible to change numerical value manually and key lock level. |
| | 3 | Possible to change key lock level. |
| | ＊4 | Same as 3 |

**SV setting limiter** : Same with measuring range (lower limit ＜ upper limit)

**Unit setting** : Settable at the time of sensor input ℃,°

## Input

**Thermocouple** : 500Ω or more, external resistance tolerance level 100Ω or less input resistance
Influence of lead-wire 1.2μV/10Ω

**Burnout** : Standard equipment (Up Scale only)

**Measuring range** : Refer to measuring range code table

**Compensation accuracy of reference junction** :
±1℃(ambient temperature 18-28℃)
At the time of vertical plural proximity attachment ±2℃
±2℃(ambient temperature 0-50℃)
At the time of vertical plural proximity attachment ±3℃
Several minutes after power-on, accuracy is not guaranteed.
Reaches the accuracy level within 5 minutes after power-on.

**Tracking of a reference junction** : Below the ambient temperature of 0.5℃/min, compensation accuracy of reference junction ±1℃

**Resistance bulb stipulated current resistance bulb** : Approx. 0.25mA

**Lead wire resistance tolerance level** : 5Ω or less per wire(Resistance of three lines should be equal)

**Measuring range** : Refer to measuring range code table

**Voltage (mV) Input resistor** : 500kΩ or more.

**Input voltage range** : Refer to measuring range code table.

**Voltage input (V) Input resistor** : 500kΩ or more

**Input voltage range** : Refer to measuring range code table

**Current input (mA) reception Resistance** : 250Ω(built-in)

**Input range** : Refer to measuring range code table.

**Sampling period** : 0.25 second

**PV filter** : 0-9999 second

**PV offset compensation** : ±500 unit

**PV gain correction** : ±5.00%

## Control

**Control system** : PID control with an auto tuning function or ON-OFF operation

**Proportional band (P)** : OFF and 0.1-999.9% of measuring range (ON-OFF operation by OFF setting)
(If both I and D are OFF, P operation)

**ON-OFF Differential-gap (DF)** : 1-999 unit

**Integration Time (I)** : OFF, 1-6000 seconds (PD operation by OFF setting)

**Manual Reset (MR)** : ±50.0% (effective when set as I = OFF)

**Output limiter (OL,OH)** : 0.0-100.0% (OL＜OH) (set resolution 0.1)

**Soft start** : OFF, 0.5-120.0 seconds (set resolution 0.5)

**Proportional period** : 0.5-120.0 seconds (set resolution 0.5)

**Control output characteristic** : Possible to choose either RA (heating) or DA (cooling).

**Manual output** : 0.0-100.0% (set resolution 0.1)
＊Each parameter, (P, I, D, DF, MR, OL, and OH) belongs to 1～3 categories.

**Control output 1 Contact** : normal open (1a) 240V AC 2A (resistance load)
**Voltage pulse (SSR drive)** : 12V DC+1.0--1.5V MAX20mA
Current 4-20mA DC load resistance 500Ω or less
Display accuracy±1% (accuracy maintenance range 23℃±5℃)
Load regulation ±0.2%, resolution approx. 1/12000

**Event 1・2** : 2 sets

**Output rating** : Contact Normal open (1a) 240V AC 2A (resistance load) EV1・EV2 and common Kind of event

**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, without deviation alarm 0-2000unit
Standby operation :OFF No standby operation,1 Only at the Time of Power-on, standby operation,
2 At the Time of power switch on, each alarm operating point is changed, deviation alarm's execution SV is changed, and RUN/STBY(RST) is switched over standby operation, at the time of AUTO/MAN switchover.

**Latching** : Alarm operation maintenance function (Release is done by key operation, or power OFF. In the case of release power OFF, all alarms are called off simultaneously)

**Differential gap** : 1-999 unit

**Output characteristic** : Choose from normal open (NO) or normal closing (NC).
If NC is chosen and power is turned on, relay becomes ON about 1.8 seconds and becomes OFF at event power range.

**Allotment Function** : Upper limit absolute value Alarm, Lower limit absolute value alarm, scale over alarm, Upper limit deviation value alarm, lower limit deviation value alarm. Within deviation alarm, Without deviation alarm, Run signal.

## Option

**Control output 2 (Option)** : Control output 2 is exclusive option of event 3 and DI 4.
**Contact** : normal open (1a) 240V AC 2A (resistance load)
**Voltage pulse (SSR drive)** : 12V DC+1.0--1.5V MAX20mA
Display accuracy±1% (accuracy maintenance range 23℃±5℃)
Load regulation±0.2%, resolution approx. 1/12000

**Event 3 (Option)** : Control output 2 is exclusive option of event 3 and DI 4.
Item and contents are same with event 1 and 2.

**DI (option)** : DI is exclusive selection option with control output 2, Event3
**Input rating** : 5V DC 0.5mA

**Allotment function** : 2nd SV, 3rd SV, 4th SV, Control RUN, Manual output, Auto tuning, Latching release, Super key lock.
**Input minimum retention time** : 0.25 second
**Input of operation** : Non-voltage contact or open collector

## General specification

**Temporary dead time** : no influence within 0.02 second 100% dip

**Use environmental condition** : **Temperature** : -10～55℃
**Humidity** : Below 90%RH (no dew condensation)
**Highs** : Altitude of 2000m or less

**Storage temperature Conditions** : -20～65℃

**Supply voltage** : 90-264V AC 50/60Hz

**Power consumption** : 100VAC 6VA 200VAC 8VA 240VAC 9VA

**Insulated class** : Class I apparatus

**Input noise removal ratio** : Normal 50dB or higher

**Impulse-proof noise** : Power-source Normal 100ns/1μs±1500V

**Insulation resistance** : Between input/output terminal and power supply terminal 500VDC 20MΩ or higher.

**Withstand voltage** : Between input/output terminal and power supply terminal 1500V AC 1 minute or 1800V AC 1 second

**Resistance to vibration** : Frequency 10～55～10Hz, amplitude 0.75mm (one side amplitude)… 100m/S² Direction 3 directions
Sweep speed 1 octave/minute (about 5 minutes for both-way/cycle)
Number of sweep 10 times

**Case material** : PPO or PPE

**Case color** : Right Gray

**Thickness of applied panel** : 1.2-2.8mm

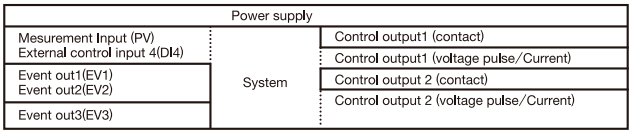
**Weight** **MAC5A** : About 200g
**MAC5B** : About 140g
**MAC5C** : About 140g
**MAC5D** : About 100g

**Panel cut out** : Refer to the front page

**Isolation** : Except for input, system and contact, all control output are no-isolation
Between event output EV1 and EV2 1 is not insulated
Others are basic insulation or functional insulation.
Refer to the following insulation block chart.

**Insulation block chart**

**Not insulation** ..... **Basic insulation**




**⚠ WARNING**
MAC5 is designed for controlling temperature, humidity, and other physical subjects in general industrial facilities. It must not be used in any way that may adversely affect safety, health, or working conditions.

**⚠ CAUTION**
To avoid damage to the connected equipment, facilities or the product itself due to a fault of this instrument, safety countermeasures must be taken before usage, such as proper installation of the fuse and the overheating protection device. No warranty, expressed or implied, is valid in the case of usage without having implemented proper safety countermeasures.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