

# DIGITAL CONTROLLER DIGITAL INDICATION ALARM METER



MA20C CONTROLLER  
48 × 24 mm



MA20I  
INDICATION ALARM METER  
48 × 24 mm



## MA20 SERIES

### Special Features

- Big display (Character height PV 11.6mm, SV 8.4mm)
- Vertical/horizontal close mounting (Applicable to IP66)
- Quick (one-touch) mounting method
- Option (analogue output, external control input, alarm output)
- Dust-proof and drip-proof structure. (Equivalent to IP66)

# Specification

## Display

- (1) Display method : Digital display PV 7-segment red LED 4 digits (Character height 11.6mm)  
SV 7-segment yellow LED 4 digits (Character height 8.4mm)  
Status display Controller AT, OUT, RUN yellow  
A1, A2 red  
A1, A2, A3 red  
Indicating alarm
- (2) Display accuracy :  $\pm(0.25\%FS + 1 \text{ digit})$  [CJ compensation excluded]  
No guarantee (the index value of B thermocouple is below 400°C)
- (3) Display accuracy range : 23°C  $\pm$  5°C
- (4) Display resolution : Depending on measuring range and scaling (Refer to Measuring range code table)
- (5) Measured value display range : -10%~110% of measuring range  
(-240~680°C in case of the measuring range of Pt-240~680°C)
- (6) Input scaling : Scaling is practicable in voltage/current inputting -1999~9999  
(span 10~10000 The place of decimal point is changeable)

## Setting

- (1) Setting method : Four key-switches on the front panel
- (2) SV setting range : Same as measuring range
- (3) Key lock : Key setting  
OFF No condition  
1 Executed SV+ key lock level alone can be changed on the basic screen  
2 Key lock level alone can be changed  
3 SV display blanking + key lock level alone can be changed  
DI setting No screen shift (fixation of the basic screen)
- (4) SV setting limit : Same as measuring range (lower limit < higher limit)
- (5) Unit setting : °C °F

## Input

- (1) Input type : Multiple input (thermocouple, R.T.D., voltage mV) voltage (V), current (mA)
- (2) Thermocouple : K, J, T, E, R, S, U, N, B  
Input impedance : 500k $\Omega$  min.  
External resistance range : 100 $\Omega$  max.  
Burnout : Standard feature (upscale)  
Cold junction temperature :  $\pm 1^\circ\text{C}$  (ambient temperature of 18~28°C range)  
Compensation accuracy :  $\pm 2^\circ\text{C}$  (ambient temperature of 0~50°C range)  
 $\pm 0.5\%FS$  (the index value of K, T, U, thermocouple is between -100 and 0°C)  
 $\pm 1.0\%FS$  (the index value of K, T, U, thermocouple is below -100°C)  
Cold junction temperature compensation accuracy  $\pm 1^\circ\text{C}$   
Cold junction temperature (the change of ambient temperature is below 0.5°C / min)
- (3) R. T. D. : Pt100 3-wire type  
Standard current : approx. 0.25 mA  
Lead wire tolerable resistance : 5 $\Omega$  max. (The 3 lead wires should have the same resistance.)  
Influence of lead wire resistance : 5 $\Omega$  max. / wire 0.3°C
- (4) Voltage : 0~10mVDC, 0~100mVDC  
1~5VDC, 0~5VDC  
Input impedance : 500k $\Omega$  min.
- (5) Current : 4~20mA, 0~20mA DC  
Receiving impedance : 250 $\Omega$  (external mounting)
- (6) Input scaling : Scaling is practicable in Voltage (mV, V) or current (mA) inputting
- (7) Sampling cycle : 0.25 sec.
- (8) PV filter : 0~100 sec.
- (9) PV bias :  $\pm 200$  unit

## Control (An indicating alarm does not have this function)

- (1) Control mode : Automatic tuning PID control / ON-OFF action
- (2) Proportional band (P) : OFF, 0.1~999.9% of measuring range (OFF setting : ON-OFF action)
- (3) Integral time (I) : OFF, 1~5000 sec. (OFF setting : P or PD action)
- (4) Derivative time (D) : OFF, 1~3600 sec. (OFF setting : P or PI action)
- (5) ON-OFF differential gap : 1~999 unit
- (6) Proportional cycle : 1~120 sec. (setting resolution 1)
- (7) Manual output : 0~100% (setting resolution 1)
- (8) Control output characteristics : RA (heating) DA (cooling)
- (9) Manual reset :  $\pm 50.0\%$  (effective in I-OFF setting)
- (10) Output limit : 0~100% (setting resolution 1)

## Control output

- (1) Control type / rating : Contact 1 a / 240V AC 2A (resistive load)  
SSR drive voltage / 12V DC + 1.0~1.5V maximum load current 20mA  
Current 4-20mA DC Maximum load resistance 500 $\Omega$

## Alarm output 1 (A controller has this function as an option.)

- An indicating alarm has this function as a standard feature.)
- (1) Alarm output rating : 1a 240V AC 2A (resistive load)
- (2) Alarm action : ON-OFF action
- (3) Alarm differential gap : 1~999 unit
- (4) Alarm type
- |                  |                 |   |   |
|------------------|-----------------|---|---|
| Controller       | : No assignment | Higher limit absolute value             | Lower limit absolute value              |
|                  |                 | Higher limit deviation                  | Lower limit deviation                   |
|                  |                 | Within higher and lower limit deviation | Beyond higher and lower limit deviation |
|                  |                 | Control loop / disconnection            | Scale over                              |
| Indicating alarm | : No assignment | Higher limit deviation                  | Lower limit absolute value              |
|                  |                 | Scale over                              |   |
- (5) Alarm setting range : Absolute value (the higher limit and lower limit) within measuring range  
Deviation (the higher limit and lower limit) -1999~2000 unit  
Higher and lower limit deviation (within and beyond) 0~2000 unit  
Control loop / disconnection 1~9999 sec.
- (6) Alarm stand-by action : Selectable from the following three  
OFF No stand-by  
1 Only at the time of power-on  
2 At the time of power-on, when executed SV is changed, and when alarm level is changed
- (7) Latching : Selectable between with or without alarm action retention
- (8) Output characteristics : Normal open, normal close  
Selectable from ON at the time of system power-on and ON in 10ms

## Alarm output 2 (Option)

- (1) Alarm output rating : 1a 240V AC 2A (resistive load)  
A controller : Alarm output 1 An indicating alarm : Alarm output 3
- (2)~(8) : Same as Alarm output 1

## Alarm output 3 (Option for an indicating alarm)

- (1) Alarm output rating : 1a 240V AC 2A (resistive load)  
Alarm output 2
- (2)~(8) : Same as Alarm output 2

## External control input (DI) (Option)

- (1) Point : Two  
(2) Rating : 12V DC 2mA / input  
(3) Assignment  
Controller : Second SV, Third SV, RUN, Automatic tuning, Latching cancellation, Super key lock  
Indicating alarm : Latching cancellation, Super key lock  
(4) Min. retention time of input : 0.25 sec.  
(5) Action input : No-voltage contact or open collector  
(6) Isolation : Basic isolation to the other input / output

## Analogue output

- (1) Output type : Selectable from PV, SV, and OUT (PV alone for an indicating alarm)  
(2) Output rating : 4~20mA DC maximum load resistance 300 $\Omega$   
(3) Scaling : Depending to input range  
(4) Limit : 0~100% (Reverse setting is practicable)

## Communication Function

- (1) Protocol : SHIMAX standard or MODBUS ASCII, MODBUS RTU protocol  
(2) Communication type : EIA standard RS-485  
(3) Communication method : Two-wire system half duplex multidrop (bus) system  
(4) Synchro system : Start/stop system  
(5) Communication range : Maximum 500m (depends on conditions)  
(6) Transmission speed : 1200, 2400, 4800, 9600, 19200, bps  
(7) Flow control : Not equipped  
(8) Data format : Start 1bit, stop 1, 2bit, data length 7.8 bits,  
No parity, odd number, even number  
(9) Communication code : ASCII code or binary code  
(10) The number of connection : A maximum of 32 equipments (depends on conditions. A host included)

## Buzzer Function

- (1) Classification : Piezobuzzer  $\Phi 12$   
(2) Acoustic pressure : Depends on rumbling pattern and on structure of the box.  
(3) Allotment : Max 3point  
(4) Operating condition : Same as alarm function  
(5) Operating pattern : Off, 1~32 patterns can be setted  
(6) Operating time : 1~100seconds or Continuation

## General specifications

- (1) Data storage : Non-volatile memory (EEPROM)
- (2) Immediate-stop action : Within 0.02 sec. There should be no influence on operation at 100% dip.
- (3) Use environment  
Temperature : 0~50°C  
Humidity : Below 90%RH (no condensation)  
Altitude : 2000m above sea level max.  
Category : II  
Pollution degree : 2  
Storage temperature : -20~65°C  
Supply voltage : 90~264V AC 50 / 60Hz or 21.6~26.4V DC / AC  
Power consumption : 100V AC : below 4VA 200V AC : below 6VA 240V AC : below 7VA  
24V AC : below 4VA 24V DC : below 3W  
Applicable standard  
Safety : EN 61010-1  
EMC : EN 61326-1  
Protective structure : IEC 60529  
Oscillation : IEC 60068
- (8) Ratio of input noise rejection : Normal mode 50dB min.
- (9) Impulse noise proof : Voltage normal 100ns / 1us  $\pm$  1500V
- (10) Protective structure : Only front panel has dust-proof and drip-proof structure. Equivalent to IP66 (Specified panel thickness 1.2, 1.6, 2.0, 2.3, 2.8, 3.2mm)
- (11) Insulation resistance : Between input / output and power supply 20M $\Omega$  min. (DC500V)
- (12) Dielectric strength : Between input / output and power supply 1500V / 1min or 1800V / 1s
- (13) Case material : PPO
- (14) Color of the case : Black
- (15) External detention : W48 $\times$ H24 $\times$ D107mm (The depth detention of panel inside is 100mm)
- (16) Panel thickness : 1.2~3.2mm (By using metal fittings, 1~4mm is also appreciable)
- (17) Panel cutout : Single mounting W45mm H22.2mm  
Plural vertical mounting W45 H(24 $\times$  )mm (Extra metal fittings are needed)  
Plural horizontal mounting W(48 $\times$  ) H22.2mm  
Vertical mounting  
Horizontal mounting  
Vertical-horizontal mounting } Refer to the panel-cut drawings
- (18) Weight : Approx. 60g (metal fittings not included)

# Order Code Table

Item	Code	Specifications	Code	Specifications	
Series	MA20C-	Din 48×24mm Digital Controller	MA20I-	Din 48×24mm Digital Indication Alarm meter	
Input	M	Thermocouple : K, J, T, E, R, S, B, U, N R. T. D. : Pt100 Voltage : 0~10, 0~100mV DC	Input	M	Thermocouple : K, J, T, E, R, S, B, U, N R. T. D. : Pt100 Voltage : 0~10, 0~100mV DC
	V	Voltage : 1~5, 0~5V DC		V	Voltage : 1~5, 0~5V DC
	I	Current : 4~20mA, 0~20mA Receiving impedance:250Ω		I	Current : 4~20mA, 0~20mA Receiving impedance:250Ω
Control output	C	Contact : 1a, Contact capacity : 240V AC 2A / resistive load			
	S	Voltage pulse : 12V 2V 20mA DC			
	I	Current : 4~20mA DC Load resistance : 500Ω max			
	V	Voltage 0~10V DC Max 2mA			
Power supply	F-	90~264V AC, 50/60Hz	Power supply	F-	90~264V AC, 50/60Hz
	L-	21.6~26.4V AC/DC, 50/60Hz		L-	21.6~26.4V AC/DC, 50/60Hz
Option	ON-	Without	Option	1N-	Alarm output 1 point
	1N-	Alarm output 1 point		2N-	Alarm output 2 points
	2N-	Alarm output 2 points		3N-	Alarm output 3 points
	0D-	External control input (DI) 2 points		1D-	Alarm output 1 point+External control input (DI) 2 points
	1D-	Alarm output 1 point+External control input (DI) 2 points		2D-	Alarm output 2 points+External control input (DI) 2 points
	0T-	Analog output : 4~20mA DC		1T-	Alarm output 1 point+Analog output : 4~20mA DC
	1T-	Alarm output 1 point+Analog output : 4~20mA DC		2T-	Alarm output 2 points+Analog output : 4~20mA DC
	0R-	Communication Function SR485		1R-	Alarm output 1point+Communication function
	1R-	Alarm output 1point+Communication function		2R-	Alarm output 2points+Communication function
	1B-	Alarm output 1point+Buzzer		1B-	Alarm output 1point+Buzzer
	2B-	Alarm output 2points +Buzzer		2B-	Alarm output 2points+Buzzer
				3B-	Alarm output 3points+Buzzer
	Remarks	0		Without	Remarks
9		With (Please consult before ordering.)	9	With (Please consult before ordering.)	

## Accessory

Item	Code
Metal fittings	ATT-01
Tool for demounting	ATT-02

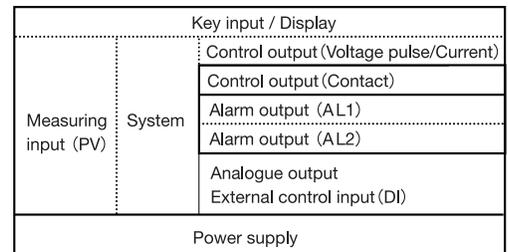
## Measuring range code table

Input type	Code	Measuring range	
		Unit code C	Unit code F
Thermo couple	K1	-199.9~400.0 °C	-300~700 °F
	K2	0~1200 °C	0~2200 °F
	J1	0~600 °C	0~1100 °F
	T1	-199.9~200.0 °C	-300~400 °F
	E1	0~700 °C	0~1300 °F
	R1	0~1700 °C	0~3100 °F
	S1	0~1700 °C	0~3100 °F
	U1	-199.9~200.0 °C	-300~400 °F
	N1	0~1300 °C	0~2300 °F
	B1	0~1800 °C	0~3300 °F
	R. T. D Pt100Ω	P1	-200~600 °C
P2		-100.0~200.0 °C	-150.0~400.0 °F
P3		0.0~100.0 °C	0.0~200.0 °F
P4		0~230°C	0~450 °F
0~10mV	M1	Scaling range : -1999~9999 count	
0~100mV	M2	Span : 10~10000 count	
1~5V	V1	decimal point changeable	
0~5V	V2		
4~20mA	V1	※At the time of current input	
0~20mA	V2	Attached external resistance 250Ω at the V code	

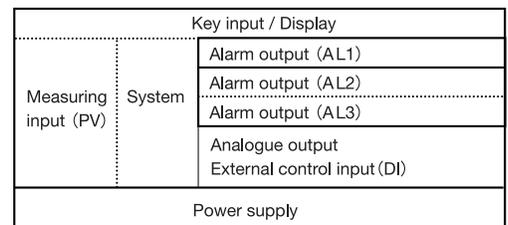
## Insulation block chart

### Controller

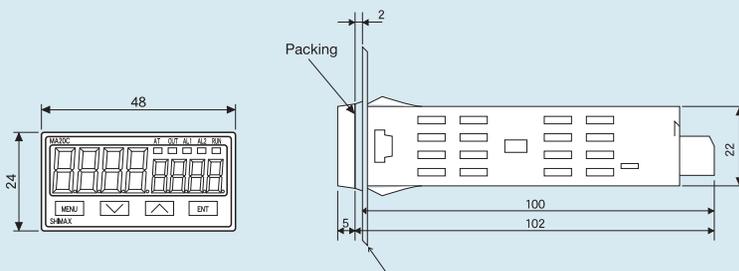
—— basic insulation      —— Functional insulation  
 ..... No insulation



### Indication Alarmmeter

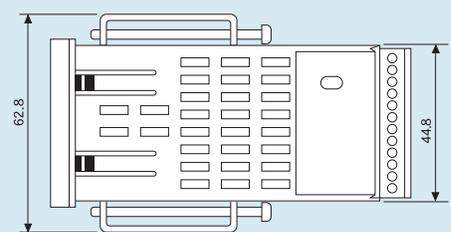


## External dimension



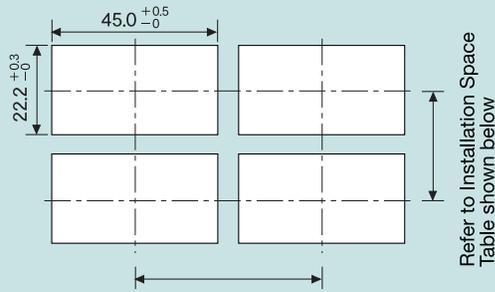
Panel (Thickness of applicable 1.2~3.2mm, 1~4mm with metal fittings)

## External View of Installation with Metal fittings



## Panel Cutout (unit:mm)

Individual Installation for one unit and more than one unit closely mounted each in one hole

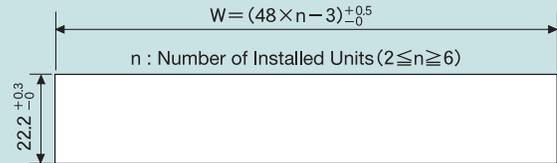


Refer to Installation Space Table shown below

### Min. Installation Space According to Thickness of the Panel

Thickness of Panel	Installation Space (Vertical)	Thickness of Panel	Installation Space (Vertical)	Installation Space (Horizontal)
1.0	25.0	2.3	24.0	More than 48.0 as for horizontal direction More than 66.0 with metal fittings
1.2	25.0	2.8	24.0	
1.6	24.4	3.2	24.0	
2.0	24.0			

Horizontally Consecutive Installation in One Hole (Max.6 units) Non-application of IP66



n	2	3	4	5	6
W	93	141	189	237	285

Vertically Consecutive Installation in One Hole (Max.6 units)  
Non-application of IP66

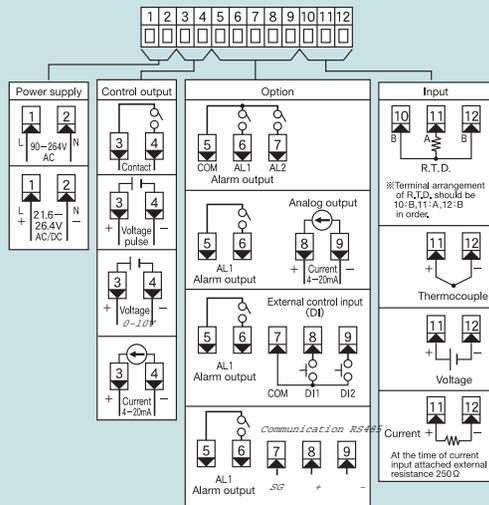


n	2	3	4	5	6
H	46.2	70.2	94.2	118.2	142.2

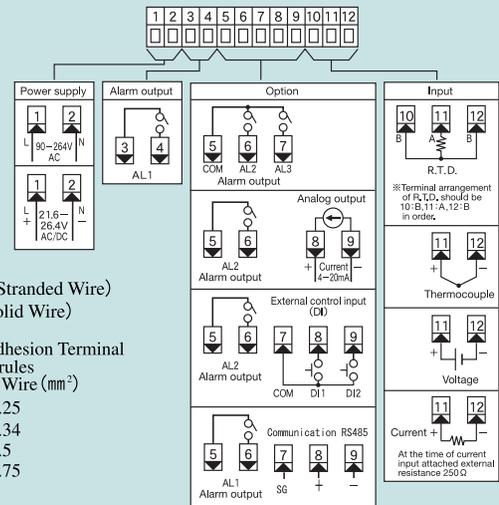
Metal fittings are needed for each unit in case of vertically consecutive installation in one hole.

## Terminal Arrangement Plan

### MA20C Controller



### MA20I Indication Alarmmeter



Appropriate Wire  
0.12~1.25mm<sup>2</sup> (Stranded Wire)  
φ 0.4~1.2mm (Solid Wire)

Recommended Adhesion Terminal  
WAGO Color Ferrules  
Type Appropriate Wire (mm<sup>2</sup>)

216-301	0.25
216-302	0.34
216-201	0.5
216-202	0.75

### ⚠ WARNING

MA20 series is designed for measuring 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 the product, 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 counter measures.

The contents of this instruction are subject to change without notice.

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