



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 |
| Indicating alarm | A1, A2, A3 | red |
- (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 : $23^{\circ}C \pm 5^{\circ}C$
- (4) Display resolution : Depending on measuring range and scaling (Refer to Measuring range code table)
- (5) Measured value display range : $-10\% \sim 110\%$ of measuring range
($-240 \sim 680^{\circ}C$ in case of the measuring range of Pt $-240 \sim 680^{\circ}C$)
- (6) Input scaling : Scaling is practicable in voltage/current inputting $-1999 \sim 9999$
(span 10 $\sim$ 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 : $^{\circ}C$ $^{\circ}F$

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 Ω min.
- External resistance range : 100 Ω max.
- Burnout : Standard feature (upscale)
- Cold junction temperature : $\pm 1^{\circ}C$ (ambient temperature of 18 $\sim$ 28 $^{\circ}C$ range)
- Compensation accuracy : $\pm 2^{\circ}C$ (ambient temperature of 0 $\sim$ 50 $^{\circ}C$ range)
 $\pm 0.5\%FS$ (the index value of K, T, U, thermocouple is between -100 and $0^{\circ}C$)
 $\pm 1.0\%FS$ (the index value of K, T, U, thermocouple is below $-100^{\circ}C$)
- Cold junction temperature : Cold junction temperature compensation accuracy $\pm 1^{\circ}C$
- Follow-up : (the change of ambient temperature is below 0.5 $^{\circ}C$ / min)
- (3) R. T. D. : Pt100 3-wire type
- Standard current : approx. 0.25 mA
- Lead wire tolerable resistance : 5 Ω max. (The 3 lead wires should have the same resistance.)
- Influence of lead wire resistance : 5 Ω max. / wire 0.3 $^{\circ}C$
- (4) Voltage : 0 $\sim$ 10mVDC, 0 $\sim$ 100mVDC
1 $\sim$ 5VDC, 0 $\sim$ 5VDC
- Input impedance : 500k Ω min.
- (5) Current : 4 $\sim$ 20mA, 0 $\sim$ 20mA DC
- Receiving impedance : 250 Ω (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 $\sim$ 100 sec.
- (9) PV bias : ± 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 $\sim$ 999.9% of measuring range (OFF setting : ON-OFF action)
- (3) Integral time (I) : OFF, 1 $\sim$ 5000 sec. (OFF setting : P or PD action)
- (4) Derivative time (D) : OFF, 1 $\sim$ 3600 sec. (OFF setting : P or PI action)
- (5) ON-OFF differential gap : 1 $\sim$ 999 unit
- (6) Proportional cycle : 1 $\sim$ 120 sec. (setting resolution 1)
- (7) Manual output : 0 $\sim$ 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 $\sim$ 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 $\sim$ 1.5V maximum load current 20mA
Current 4-20mA DC Maximum load resistance 500 Ω

Alarm output 1

(A controller has this function as an option.)

An indicating alarm has this function as a standard future.)

- (1) Alarm output rating : 1a 240V AC 2A (resistive load)
- (2) Alarm action : ON-OFF action
- (3) Alarm differential gap : 1 $\sim$ 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) $-1999 \sim 2000$ unit
Higher and lower limit deviation (within and beyond) 0 $\sim$ 2000 unit
Control loop / disconnection 1 $\sim$ 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) $\sim$ (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) $\sim$ (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 $\sim$ 20mA DC maximum load resistance 300 Ω
- (3) Scaling : Depending to input range
- (4) Limit : 0 $\sim$ 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 $\sim$ 32 patterns can be setted
- (6) Operating time : 1 $\sim$ 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 $\sim$ 50 $^{\circ}C$ |
| Humidity | : Below 90%RH (no condensation) |
| Altitude | : 2000m above sea level max. |
| Category | : II |
| Pollution degree | : 2 |
| Storage temperature | : $-20 \sim 65^{\circ}C$ |
| Supply voltage | : 90 $\sim$ 264V AC 50 / 60Hz or 21.6 $\sim$ 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 Ω 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 $\sim$ 3.2mm (By using metal fittings, 1 $\sim$ 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 | } Refer to the panel-cut drawings |
| Horizontal mounting | |
| Vertical-horizontal mounting | |
- (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	0N-	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
	1T-	Alarm output 1 point+ Analog output : 4~20mA DC			1T-	Alarm output 1 point+ Analog output : 4~20mA DC
	0T-	Analog output : 4~20mA DC			2T-	Alarm output 2 points+ Analog output : 4~20mA DC
	1T-	Alarm output 1 point+ Analog output : 4~20mA DC			1R-	Alarm output 1point+Communication function
	0R-	Communication Function RS 485			2R-	Alarm output 2points+Communication function
	1R-	Alarm output 1point+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	0	Without
	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	K 1	-199.9~400.0 °C	-300~700 °F
	K 2	0~1200 °C	0~2200 °F
	J 1	0~600 °C	0~1100 °F
	T 1	-199.9~200.0 °C	-300~400 °F
	E 1	0~700 °C	0~1300 °F
	R 1	0~1700 °C	0~3100 °F
	S 1	0~1700 °C	0~3100 °F
	U 1	-199.9~200.0 °C	-300~400 °F
	N 1	0~1300 °C	0~2300 °F
	B 1	0~1800 °C	0~3300 °F
R. T. D Pt100Ω	P 1	-200~600 °C	-300~1100 °F
	P 2	-100.0~200.0 °C	-150.0~400.0 °F
	P 3	0.0~100.0 °C	0.0~200.0 °F
	P 4	0~230°C	0~450 °F
0~10mV	M 1	Scaling range: -1999~9999 count Span: 10~10000 count decimal point changeable	
0~100mV	M 2		
1~5V	V 1	※At the time of current input Attached external resistance 250Ω at the V code	
0~5V	V 2		
4~20mA	V 1		
0~20mA	V 2		

Insulation block chart

Controller

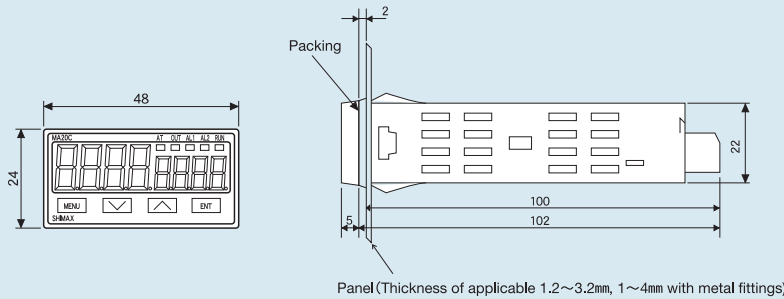
———— basic insulation ————— Functional insulation
..... No insulation

Key input / Display		
Measuring input (PV)	System	Control output (Voltage pulse/Current)
		Control output (Contact)
		Alarm output (AL1)
		Alarm output (AL2)
		Analogue output
		External control input (DI)
Power supply		

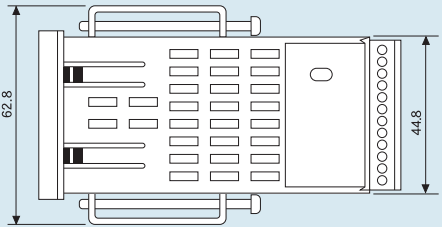
Indication Alarmmeter

Key input / Display		
Measuring input (PV)	System	Alarm output (AL1)
		Alarm output (AL2)
		Alarm output (AL3)
		Analogue output
		External control input (DI)
Power supply		

External dimension

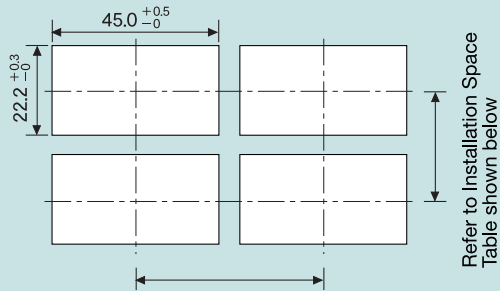


External View of Installation with Metal fittings



Panel Cutout (unit:mm)

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

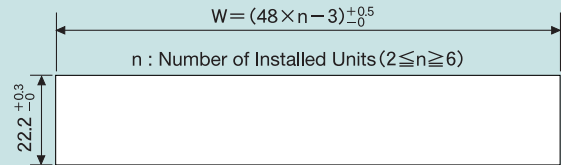


Refer to Installation Space Table shown below

Min. Installation Space According to Thickness of the Panel

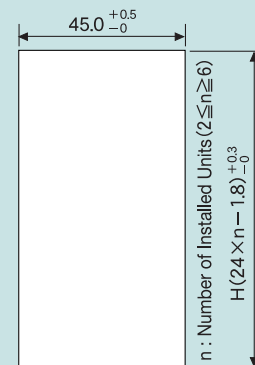
Thickness of Panel	Installation Space (Vertical)	Thickness of Panel	Installation Space (Vertical)	Installation Space (Horizontal)
1.0	25.0	2.3	24.0	More than 48.0 as for horizontal direction More than 66.0 with metal fittings
1.2	25.0	2.8	24.0	
1.6	24.4	3.2	24.0	
2.0	24.0			

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

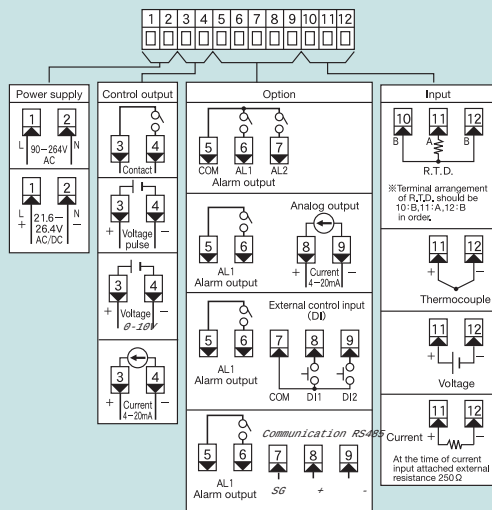


n	2	3	4	5	6
H	46.2	70.2	94.2	118.2	142.2

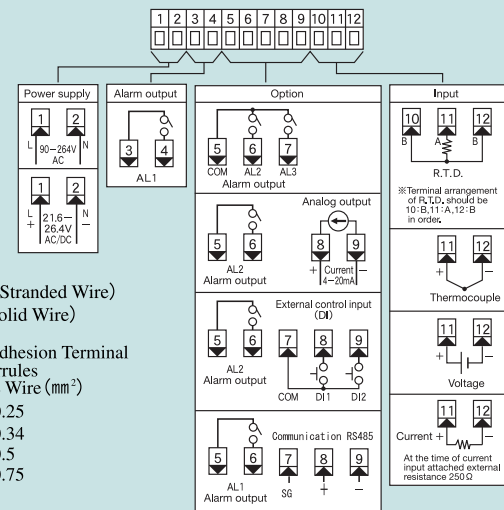
Metal fittings are needed for each unit in case of vertically consecutive installation in one hole.

Terminal Arrangement Plan

MA20C Controller



MA20I Indication Alarmmoter



Appropriate Wire
0.12~1.25mm² (Stranded Wire)
φ 0.4~1.2mm (Solid Wire)

Recommended Adhesion Terminal
WAGO Color Ferrules
Type Appropriate Wire (mm²)

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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