

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 Ω min.
External resistance range : 100 Ω 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 Ω max. (The 3 lead wires should have the same resistance.)
Influence of lead wire resistance : 5 Ω max. / wire 0.3°C
- (4) Voltage : 0~10mVDC, 0~100mVDC
1~5VDC, 0~5VDC
Input impedance : 500k Ω min.
- (5) Current : 4~20mA, 0~20mA 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 : 0~100 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, 0.1~999.9% 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 Ω

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 Ω
(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 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 : 1.2~3.2mm (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 |

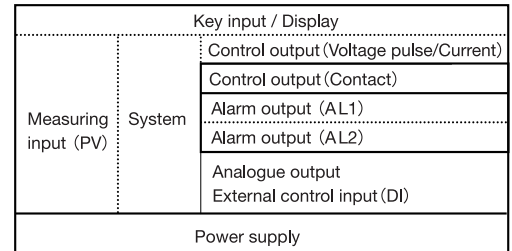
Measuring range code table

| 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 | |

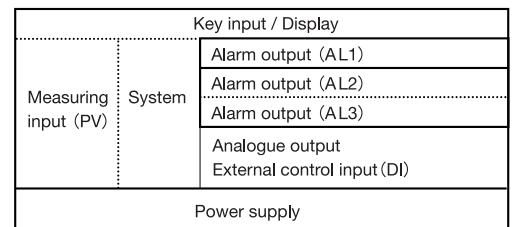
Insulation block chart

Controller

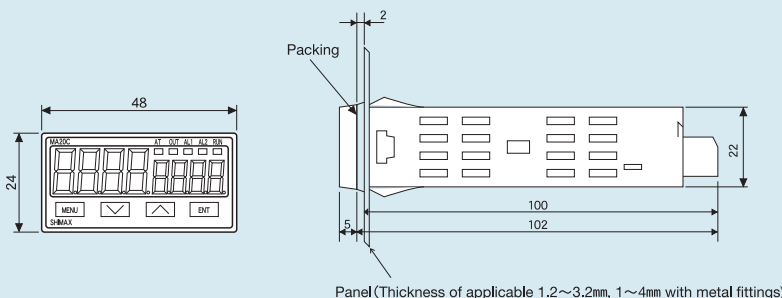
—— basic insulation —— Functional insulation
 No insulation



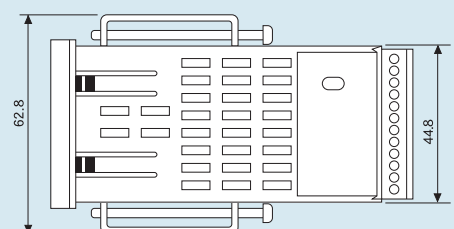
Indication Alarmmeter



External dimension

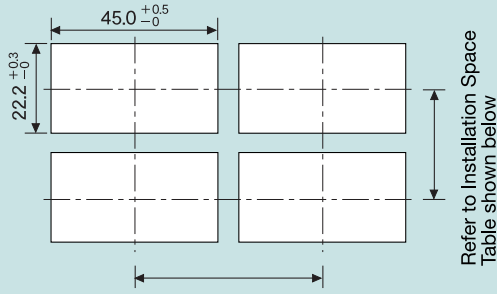


External View of Installation with Metal fittings



Panel Cutout (unit:mm)

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

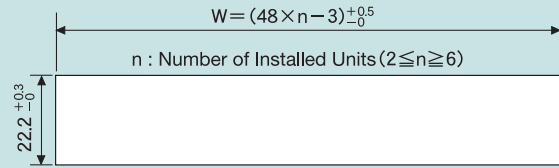


Refer to Installation Space Table shown below

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

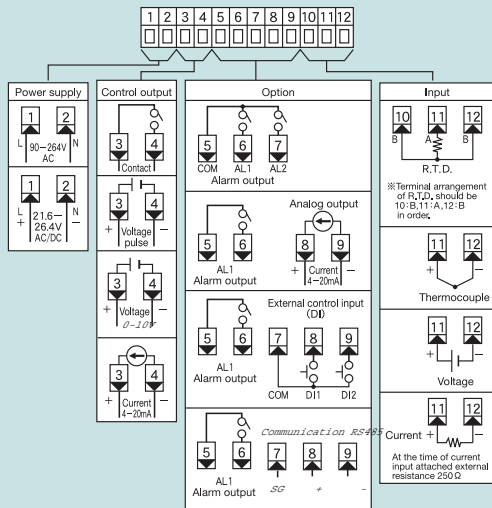


| n | 2 | 3 | 4 | 5 | 6 |
|---|------|------|------|-------|-------|
| H | 46.2 | 70.2 | 94.2 | 118.2 | 142.2 |

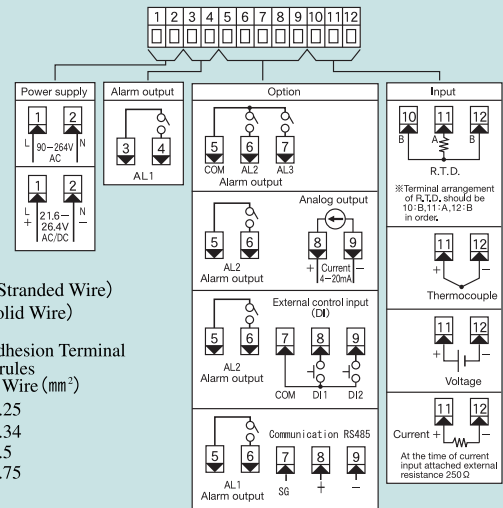
Metal fittings are needed for each unit in case of vertically consecutive installation in one hole.

Terminal Arrangement Plan

MA20C Controller



MA20I Indication Alarmmeter



Appropriate Wire
0.12~1.25mm² (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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