# General Specifications

Model MA5
Distributor
(Free Range Type)

JUXTA

GS 77J04A05-01E

## ■ General

*The MA5 is a plug-in type distributor that is used in combination with a two-wire type transmitter to convert the transmitter's 4 to 20 mA DC signals into isolated DC current or DC voltage signals.*

- Output range setting, selection of square root extractor and breakpoint linearization (breakpoint setting), I/O adjustment, I/O monitoring, and loop back test can be made using the optional Parameter Setting Tool (VJ77) or Handy Terminal (JHT200).
- The operation indicating lamp shows the operation status, abnormalities in a setting etc.
- I/O adjustment can be made using the switches on the front panel of the MA5 without a setting tool such as Handy Terminal.
- Supports BARD-800 and -810.

## ■ Model and Suffix Codes

MA5 -01□ -A□ 0□ /□

Model

Output
1: 1 output

Power supply
1: 15-40 V DC (Operating range: 12 to 48 V)
6: 100-240 V AC/DC (Operating range: 85 to 264 V)

Input signal
A: 4 to 20 mA DC

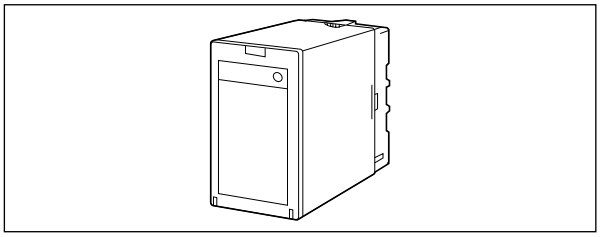
Output signal

| | |
|---|---|
| A: 0 to 20 mA DC | Span is 5 mA or more |
| B: 0 to 5 mA DC | Span is 1 mA or more |
| 1: –10 to +10 V DC | Span is 0.1 V or more |
| 2: –100 to +100 mV DC | Span is 10 mV or more |

Z: (Custom order)
Customized current signals or voltage signals

Breakpoint linearization
0: Not available
1: Available

Optional specification
/SN: Without socket



## ■ Ordering Information

Specify the following when ordering.
- Model and suffix codes: e.g. MA5-016-AA00
- Output range: e.g. 4 to 20 mA DC

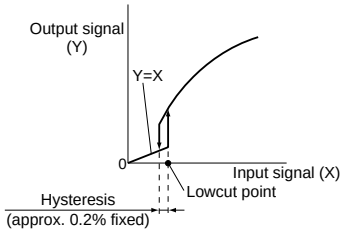
Specify a lowcut point when "with square root extractor" is required: e.g. Lowcut point 0.4%
The distributor will be shipped with a lowcut point of 0.6% if no specification of lowcut point.
Specify breakpoints in Work Sheet when linearization is required.

## ■ Input/Output Specifications

Input signal: 4 to 20 mA DC signal from transmitter
Input resistance: 250 Ω
Transmitter power supply: 25.25 ±0.25 V DC (provided with a current limiter to keep the current between 25 and 35 mA)
Allowable conductor resistance (RL): Up to [(20 – transmitter's minimum operating voltage) V/0.02 A] Ω
Maximum allowable input: 40 mA DC
Square root extractor: Outputted against the result of extracting square root of input.

$$Y=\left(\sqrt{\frac{X-(\text{input 0 \% value})}{\text{input span}}}\right)\times(\text{output span})+(\text{output 0 \% value})$$

Lowcut point setting range: 0.3 to 100% of input, setting available by 0.1% notch
Output characteristic: Output for lowcut point or less is cramped with straight line proportional to input.



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1st Edition Jul. 2005

Output signal: 1 point of DC current or DC voltage signal

Output signal setting range:

| Output signal suffix code | Setting range |
|---|---|
| A | 0 to 20 mA DC Span is 5 mA or more |
| B | 0 to 5 mA DC Span is 1 mA or more |
| 1 | ±10 V DC Span is 0.1 V or more |
| 2 | ±100 mV DC Span is 10 mV or more |

Allowable load resistance:

Voltage output: 2 kΩ or more for ±5 V DC
10 kΩ or more for ±10 V DC
250 kΩ or more for ±100 mV DC

Current output: 15 (V)/max. output (A) (Ω) or less

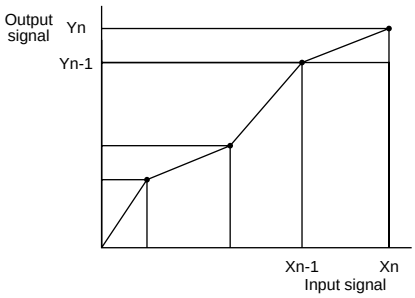
Linearization:

Breakpoint: Up to 32 points (Set a relationship between input and output with % value over the span.)

Allowable setting range of breakpoint:
–6 to +106% (both input and output)

• With 4 significant digits; can be set to the second place of a decimal point.

• Set breakpoints according to the following.
For input: $-6.0\% \leqq X_0 < X_1 < X_2 \cdots X_{n-1} < X_n \leqq 106.0\%$
For output: $-6.0\% \leqq Y_0$ to $Y_n < 106.0\%$




Adjustment range:

Input adjustment: ±1% of span or more (Zero/Span)

Output adjustment: ±5% of span or more (Zero/Span)

## ■ Standard Performance

Accuracy rating: ±0.1% of span
However, the accuracy is not guaranteed for output levels less than 0.5% of the span of a 0 to X mA output range type.
For square root extractor input, ±1% of span when the input is 2% or less.

The accuracy is limited according to the output range setting.

• Accuracy Calculation

**Accuracy = Input accuracy + Output accuracy (%)**

Input accuracy: ±0.05%

Compare the specified output range with the output range in the table below (narrower range) and choose accuracy calculation conditions.

Output accuracy = ±0.05% × a/b

| Output signal suffix code | | Accuracy calculation condition | |
|---|---|---|---|
| | Output range | a | b |
| A | 0 to 20 mA DC | 10 (mA) | Output span |
| B | 0 to 5 mA DC | 2.5 (mA) | |
| 1 | ±2.5 V DC | 1 (V) | |
| | Outside of ±2.5 V DC and within ±10 V DC | 4 (V) | |
| 2 | ±25 mV DC | 10 (mV) | |
| | Outside of ±25 mV DC and within ±100 mV DC | 40 (mV) | |

However, ±0.05% is applied if an output accuracy obtained from the expression is less than ±0.05%.

If 1 or more is set for the line segment gain of linearization, multiply the input/output accuracy by the value of line segment gain.

Line segment gain (slope) is the maximum value calculated from the following expression.

$$\text{Line segment gain} = \frac{Yn - Yn\text{-}1}{Xn - Xn\text{-}1}$$

Response speed: 150 ms, 63% response (10 to 90%)

Effect of power supply voltage fluctuations:
±0.1% of span or less for the fluctuation within the operating range of each power supply voltage specification.

Effect of ambient temperature change:
±0.15% of span or less for a temperature change of 10°C.

## ■ Power Supply and Isolation

Power supply rated voltage:
15-40 V DC ⎓ or
100-240 V AC/DC ≂ 50/60 Hz
Power supply input voltage:
15-40 V DC ⎓ (±20%) or
100-240 V AC/DC ≂ (–15, +20%) 50/60 Hz
Power consumption:
24 V DC 2.8 W, 110 V DC 2.7 W
100 V AC 5.5 VA, 200 V AC 7.5 VA
Insulation resistance:
100 MΩ at 500 V DC between input, output, power supply, and grounding terminals mutually.
Withstand voltage:
2000 V AC for 1 minute between input, output, power supply and grounding terminals mutually.

## ■ Environmental Conditions

Operating temperature range: 0 to 50°C
Operating humidity range: 5 to 90% RH (no condensation)
Operating conditions: Avoid installation in such environments as corrosive gas like sulfide hydrogen, dust, sea breeze and direct sunlight.
Installation altitude: 2000 m or less above sea level.

## ■ Mounting and Dimensions

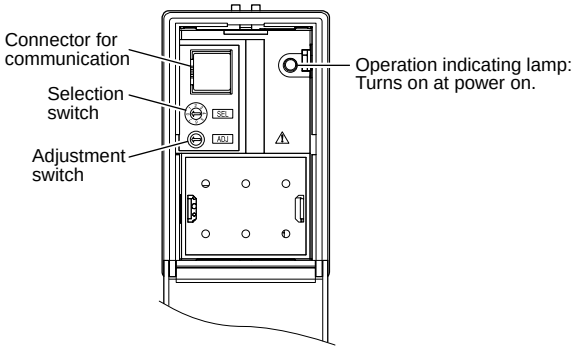
Construction: Plug-in type
Material: Main unit : ABS resin (black), UL94 V-0
ABS resin + polycarbonate resin (black), UL94 V-0
PBT resin, including glass fiber (black), UL94 V-0
Socket: Modified polyphenylene oxide resin, including glass fiber (black), UL94 V-1
Mounting: Wall or DIN rail mounting
Connection: M3.5 screw terminals
External dimensions: 86.5 (H)×51 (W)×123 (D) mm (including a socket)
Weight: Main unit: approx. 200 g
Socket: approx. 60 g

## ■ Accessories

Spacer: One (for DIN rail mounting)
Range label: One

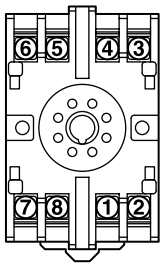
## ■ Front Panel

Input/output can be adjusted using the selection switch and adjustment switch.




| Position of selection switch | Item to be adjusted |
|---|---|
| 0 | No function |
| 1 | Output zero adjustment |
| 2 | Output span adjustment |
| 5 | Input zero adjustment |
| 6 | Input span adjustment |

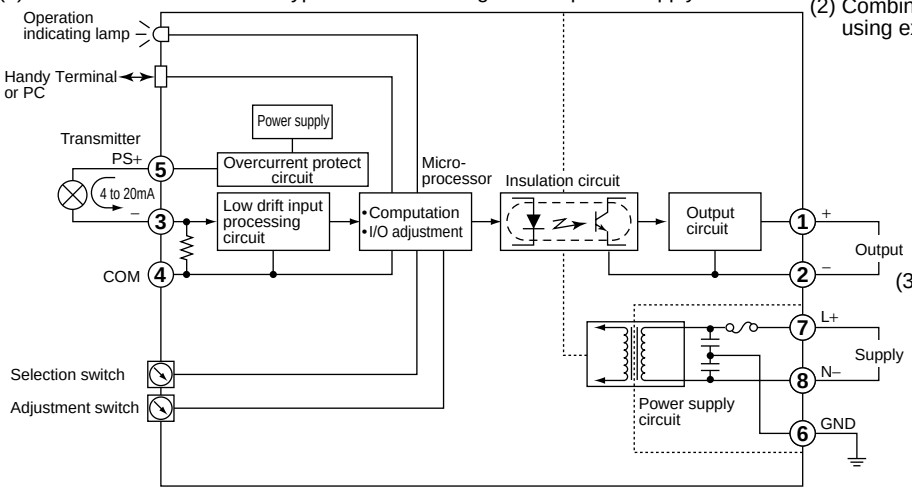
## ■ Terminal Assignments



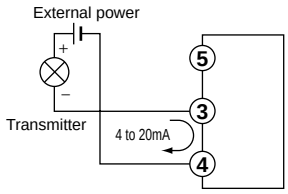

| | | |
|---|---|---|
| 1 | OUTPUT | (+) |
| 2 | OUTPUT | (–) |
| 3 | INPUT | (–) |
| 4 | INPUT | (COM) |
| 5 | INPUT | (PS+) |
| 6 | GND | (GND) |
| 7 | SUPPLY | (L+) |
| 8 | SUPPLY | (N–) |

## ■ Block Diagram

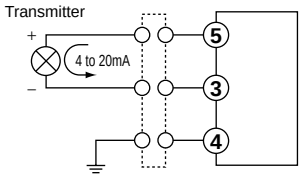
(1) Combination with two-wire type transmitter using internal power supply




(2) Combination with two-wire type transmitter using external power supply

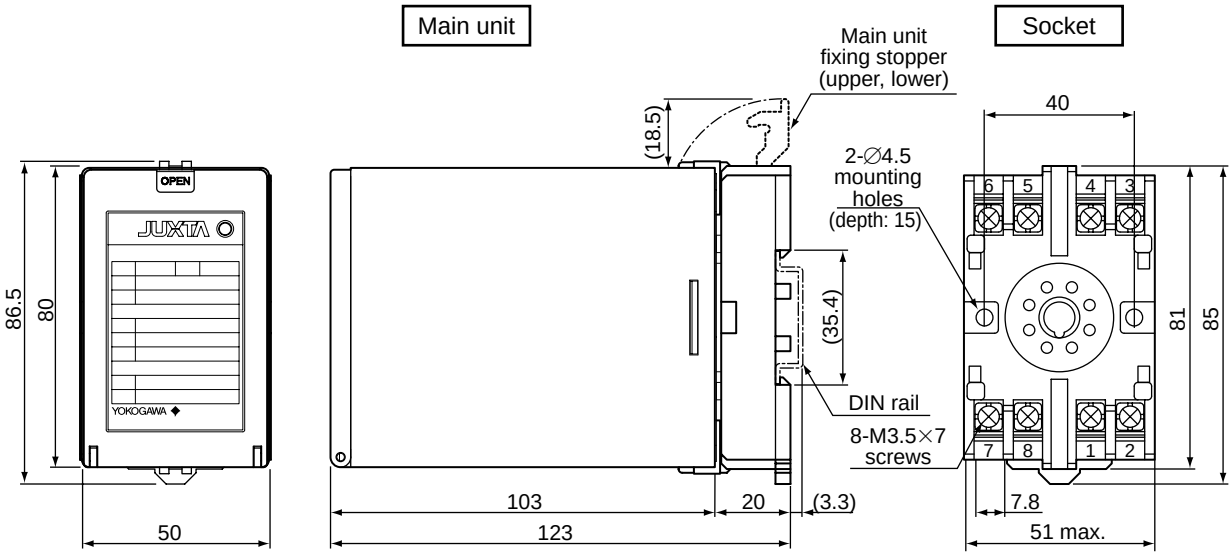



(3) Example to construct Intrinsically Safe System using Zener Barrier

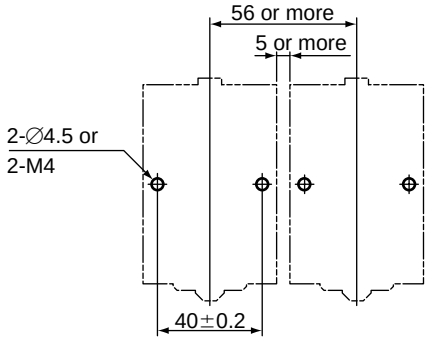



## ■ External Dimensions

Unit: mm




<Mounting Dimensions>




Note:
- When mounting the units close together, leave a space of at least 5 mm between them.
- Use the supplied spacer to keep a space of 5 mm for DIN rail mounting.

## ■ Work Sheet

Model and Suffix Codes

Number of breakpoints _____

Write at least 2 points for input and output breakpoints data.

| Input (%) | | Output (%) | | Input (%) | | Output (%) | |
|---|---|---|---|---|---|---|---|
| $X_0$ | | $Y_0$ | | $X_{16}$ | | $Y_{16}$ | |
| $X_1$ | | $Y_1$ | | $X_{17}$ | | $Y_{17}$ | |
| $X_2$ | | $Y_2$ | | $X_{18}$ | | $Y_{18}$ | |
| $X_3$ | | $Y_3$ | | $X_{19}$ | | $Y_{19}$ | |
| $X_4$ | | $Y_4$ | | $X_{20}$ | | $Y_{20}$ | |
| $X_5$ | | $Y_5$ | | $X_{21}$ | | $Y_{21}$ | |
| $X_6$ | | $Y_6$ | | $X_{22}$ | | $Y_{22}$ | |
| $X_7$ | | $Y_7$ | | $X_{23}$ | | $Y_{23}$ | |
| $X_8$ | | $Y_8$ | | $X_{24}$ | | $Y_{24}$ | |
| $X_9$ | | $Y_9$ | | $X_{25}$ | | $Y_{25}$ | |
| $X_{10}$ | | $Y_{10}$ | | $X_{26}$ | | $Y_{26}$ | |
| $X_{11}$ | | $Y_{11}$ | | $X_{27}$ | | $Y_{27}$ | |
| $X_{12}$ | | $Y_{12}$ | | $X_{28}$ | | $Y_{28}$ | |
| $X_{13}$ | | $Y_{13}$ | | $X_{29}$ | | $Y_{29}$ | |
| $X_{14}$ | | $Y_{14}$ | | $X_{30}$ | | $Y_{30}$ | |
| $X_{15}$ | | $Y_{15}$ | | $X_{31}$ | | $Y_{31}$ | |

(Specification conditions)

Input conditions: $-6.0\% \leqq X_0 < X_1 < X_2 < \cdots\cdots X_{n-1} < X_n \leqq 106.0\%$

Output conditions: $-6.0\% \leqq$ ($Y_0$ to $Y_n$) $\leqq 106.0\%$