

DESCRIPTION

The MS3768 is a slim, plug-in programmable linearizer that accepts non-linear DC current or voltage input and provides linearized isolated single or dual output. Up to 21 breakpoints can be configured for segment approximation and those points as well as input and output ranges can be changed using configuration software running on a personal computer.

ORDERING CODE
MS3768 - - -
Model
Power Supply
A: 100 to 240V AC (50 to 60Hz)

D: 24V DC

P: 100 to 240V DC

Input Range (Max. Measuring Range)
A: 2mA DC (± 2 mA DC)

B: 4mA DC (± 4 mA DC)

C: 8mA DC (± 8 mA DC)

D: 16mA DC (± 16 mA DC)

E: 32mA DC (± 32 mA DC)

F: 50mA DC (-32 to +50mA DC)

1: 4V DC (± 4 V DC) **2:** 8V DC (± 8 V DC)

3: 16V DC (± 16 V DC) **4:** 32V DC (± 32 V DC)

5: 60V DC (± 60 V DC)

Output
Single Output Model
A: 4 to 20mA DC (Output load 750 Ω) *1

4: 0 to 10V DC *2

5: 0 to 5V DC *2

6: 1 to 5V DC *2

Dual Output Model
A1: 4 to 20mA DC / 1 to 5V DC *1

A2: 4 to 20mA DC / 4 to 20mA DC *1

4W: 0 to 10V DC / 0 to 10V DC *2

5W: 0 to 5V DC / 0 to 5V DC *2

6W: 1 to 5V DC / 1 to 5V DC *2

*1: Fixed output(s). The output range cannot be changed.

*2: The output range can be changed.

Breakpoint
XY: Breakpoints specified. *

N: No breakpoints specified.

* Up to 21 breakpoints can be specified within the range of -15 to 115% for both the X axis (input) and Y axis (output). Specify breakpoints to two decimal places. (Use a Specification Order Form.)

Note: Although the breakpoints can be specified within the range of -15 to 115%, the output range will be from -10 to 110%.

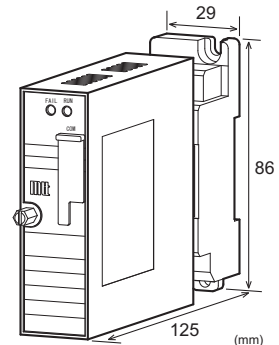
Options
No code: None

/L: Dual current output with high output load
(OUT-1: 750 Ω / OUT-2: 550 Ω)

/H: Polyurethane conformal coating

/X: Others (Special order)

* For non-standard options, ask MTT for availability.


ORDERING INFORMATION

To place an order, please use the ordering code format as shown on the left. Also specify an input range* and breakpoints.

(e.g.) MS3768-A-36W-XY (Input range: 2 to 10V)

Attached Order Form (Breakpoints)

* Note that the input range should be specified within the maximum measuring range and span requirements indicated below.

| Input Range Code | Code shown on Configuration Window | Maximum Measuring Range | Specifiable Span | |
|------------------|------------------------------------|-------------------------|------------------|------|
| | | | Min. | Max. |
| A | Input Range 2mA | ± 2 mA | 1mA | 4mA |
| B | Input Range 4mA | ± 4 mA | 2mA | 8mA |
| C | Input Range 8mA | ± 8 mA | 4mA | 16mA |
| D | Input Range 16mA | ± 16 mA | 8mA | 32mA |
| E | Input Range 32mA | ± 32 mA | 16mA | 50mA |
| F | Input Range 50mA | -32 to +50mA | 32mA | 50mA |
| 1 | Input Range 4V | ± 4 V | 2V | 8V |
| 2 | Input Range 8V | ± 8 V | 4V | 16V |
| 3 | Input Range 16V | ± 16 V | 8V | 32V |
| 4 | Input Range 32V | ± 32 V | 16V | 60V |
| 5 | Input Range 60V | ± 60 V | 32V | 60V |

SPECIFICATIONS
POWER SECTION
Power Requirements 100 to 240V AC: 85 to 264V AC (47 to 63Hz)

24V DC: 24V DC $\pm 10\%$

100 to 240V DC: 85 to 264V DC

Power Sensitivity Better than $\pm 0.1\%$ of span for each power supply range.

Power Line Fuse 160mA fuse is installed (standard).

Power Consumption

| | 100-240V AC | 24V DC | 100-240V DC |
|---------------|-------------|----------|-------------|
| Power | 5.0VA max | 1.2W max | 4.8W max |
| Single Output | 5.0VA max | 1.6W max | 6.0W max |
| Dual Output | 5.0VA max | 1.6W max | 6.0W max |

INPUT SECTION
Input Resistance

Voltage Input (DC) 1M Ω min. with or without power.

Current Input (DC) 10 Ω
Allowable Input Voltage

Voltage Input Model 120V DC, continuous.

Current Input Model 100mA DC, continuous.

Factory Default Settings Input range code: 2 (8V)

Measuring input range: 0 to 5V

● **OUTPUT SECTION**

| | | |
|---|--|------------------------|
| Allowable Output Load | | |
| Voltage Output (DC) | 2mA max. | |
| Current Output (DC) | 4-20mA single output | 750Ω max. |
| | 4-20mA dual output | Output 1: 550Ω max. |
| | | Output 2: 350Ω max. |
| Zero Adjustment | Approx. ±4% of span. (Adjustable by PC via RS-232C.) | |
| Span Adjustment | Approx. ±4% of span. (Adjustable by PC via RS-232C.) | |
| Output Range | -10 to 110% | |
| Factory Default Settings (Voltage Output Model) | Single output model: Output code: 6 (1 to 5V DC) Dual output model: Output code: 6W (1 to 5V DC / 1 to 5V DC) | |

● **SOFTWARE CONFIGURATION PARAMETERS**

| | | |
|--------------------------------|---|--|
| Configurable Parameters | - Linearizer ON/OFF | |
| | - ADC range (Input range) | |
| | - Measuring input range | |
| | - Output range | |
| | - Limitation function | |
| | - Zero/Span adjustment (Approx. ±4% of span) | |
| | - PAUSE status | |
| | - Coefficient setting (up to 21 breakpoints) | |
| | (All of the above are configurable by PC via RS-232-C.) | |

● **PERFORMANCE**

| | |
|--|--|
| Accuracy Rating | |
| Segment gain < 1: | Better than ± (Input accuracy + Output accuracy) % |
| Segment gain ≥ 1: | Better than ± (Input accuracy + Output accuracy) × Maximum segment gain % |
| Input Accuracy | $(2 \times \text{Range} / \text{Span}) \times 0.02\%$ |
| Output Accuracy | 0.04% |
| Maximum Segment Gain | $ (Y_{n+1} - Y_n) / (X_{n+1} - X_n) $ |
| Temperature Effect | 100ppm/°C max. |
| Response Time | 260ms max. (0 to 90%) with a step input at 100%. |
| Calculation Method | Segment approximation* |
| * The missing values between breakpoints are calculated by linear interpolation. | |
| Note: If a breakpoint of -10% or 110% is not specified on the X axis, the output will be proportional to the adjacent segment. | |
| CMRR | 100dB min. (500V AC, 50/60Hz) |
| Isolation | 4-way isolation between input, output 1, output 2, and power. |
| Insulation Resistance | 100MΩ min. (@ 500V DC) between input, output 1, output 2, power, and ground. |

| | |
|----------------------------|--|
| Dielectric Strength | [Input, RS-232C Port] / [Output 1, Output 2] / [Power, Ground]: 2000V AC for 1 minute (Cutoff current: 0.5mA) Power / Ground: 2000V AC for 1 minute (Cutoff current: 5mA) Output 1 / Output 2: 500V AC for 1 minute (Cutoff current: 0.5mA) Input / RS-232C Port: 50V DC for 1 minute (Cutoff current: 1.0mA) |
| Surge Withstand Capability | Tested as per ANSI/IEEE C37.90.1-1989. |
| Operating Environment | Ambient temperature: -5 to 55°C Humidity: 5 to 90% RH (non-condensing) |
| Storage Temperature | -10 to 60°C |

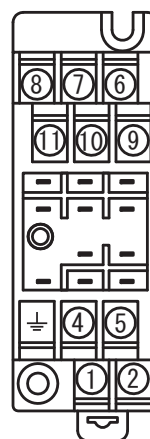
● **PHYSICAL**

| | |
|---------------------|--|
| Installation | Wall/DIN rail mounting |
| Wiring | M3.5 screw terminal connection (with a power terminal block cover & drop-proof screws) |
| Screwing Torque | 0.8 to 1.0 [Nm] * Recommended |
| External Dimensions | W29 × H86 × D125 mm (including the mounting screw and socket) |
| Weight | Main unit: 120g max. Socket: 80g max. |

● **MATERIAL**

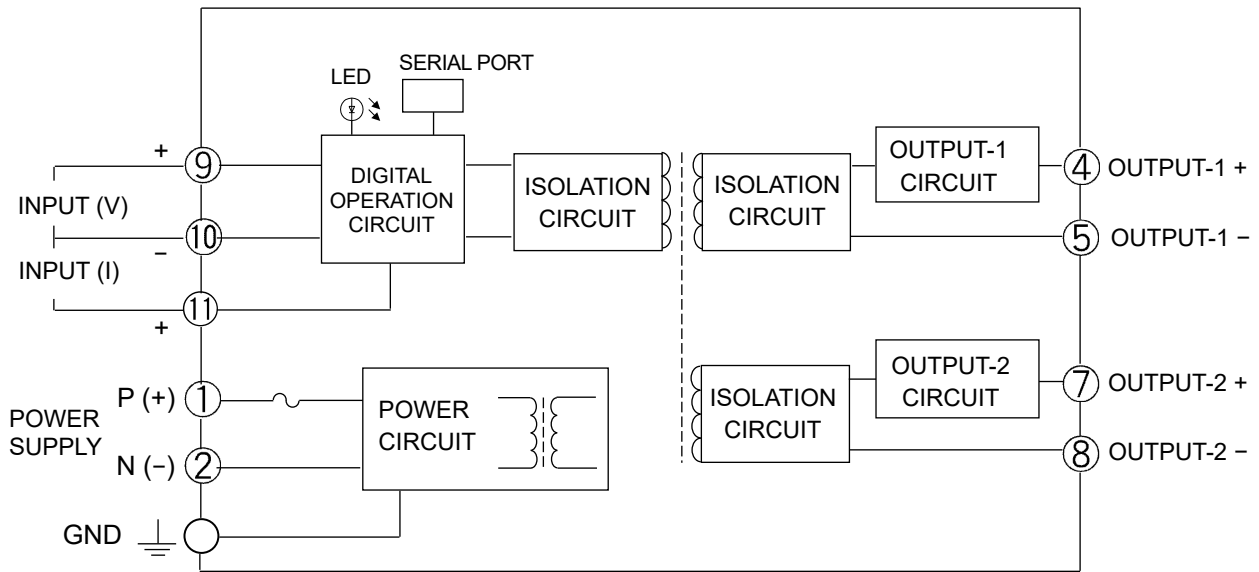
| | |
|------------------------------|--|
| Housing | ABS resin (UL 94V-0) |
| Terminal Block | PBT resin (UL 94V-0) |
| Terminal Block Cover | PC resin (UL 94V-2) |
| DIN Rail Stopper | PP resin (UL 94HB) |
| Screw Terminal | Nickel-plated steel |
| Contacts Material and Finish | Brass with 0.2μm gold plating |
| Printed Circuit Board | Glass fabric, epoxy resin (FR-4: UL 94V-0) |

TERMINAL ASSIGNMENTS

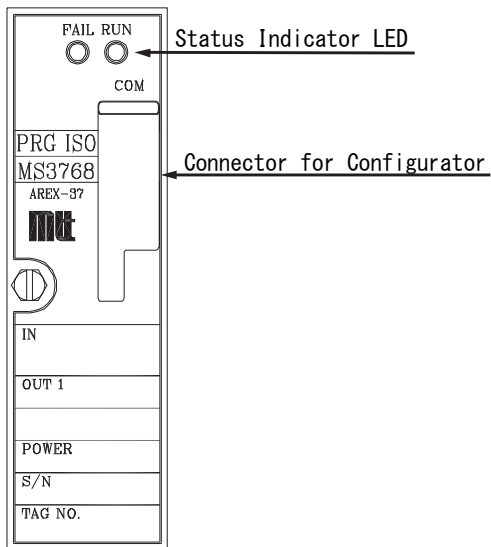


| | | |
|---|-------------|-------|
| ① | P (+) | POWER |
| ② | N (-) | |
| ⊥ | GND | |
| ④ | + OUTPUT 1 | |
| ⑤ | - OUTPUT 1 | |
| ⑥ | N.C. | |
| ⑦ | + OUTPUT 2 | |
| ⑧ | - OUTPUT 2 | |
| ⑨ | + INPUT (V) | |
| ⑩ | - INPUT | |
| ⑪ | + INPUT (I) | |

BLOCK DIAGRAM



FRONT VIEW



CONNECTOR

COM (CONNECTOR FOR CONFIGURATOR)

The COM port is used to connect the transmitter to a personal computer through serial communication (RS-232C). An optional communication cable, MTT's MS-CBL01 (with a 9-pin D-subminiature female connector for PC connection) is required for the connection. If the USB port is used, it is recommended that a USB conversion adapter REX-USB60F (made by RATO Systems) be used with the MS-CBL01.

Connector Pin Assignments

| Pin No. | Signal Name |
|---------|-------------|
| 1 | DVdd |
| 2 | SHDN |
| 3 | N.C. |
| 4 | N.C. |
| 5 | TX |
| 6 | RX |
| 7 | ISOCOM |
| 8 | ISOCOM |

STATUS INDICATOR LED

INDICATOR PATTERNS

| Module Status | Description | LED | | Remarks |
|---------------|------------------------|------------|------------|---------------------------|
| | | Blue (RUN) | Red (FAIL) | |
| INIT | | ● | ● | |
| RUN | Normal operation | ● | - | |
| | Under scale | ◎ | | Blink pattern: ●●○○●●○○ |
| | Over scale | ◎ | | Blink pattern: ●○○●●○○ |
| PAUSE | Common to all commands | ◎ | - | Blink pattern: ●●●○○○○ |
| ERROR | ADC error | - | ◎ | Blink pattern: ●●●○○○○● |
| | DA output error | - | ◎ | Blink pattern: ●●●○○○○●●● |
| | Power error | - | ◎ | Blink pattern: ●●●○○○○ |
| HALT | WDT | - | ● | May fail to turn ON. |
| | Memory | - | ● | May fail to turn ON. |
| | Power error | - | ● | May fail to turn ON. |

Notes:

1. OFF: - or ○, ON: ●, Blink: ◎
2. Each of the circle symbols (○, ●) shown in the Remarks column indicates a duration of 0.25 s.

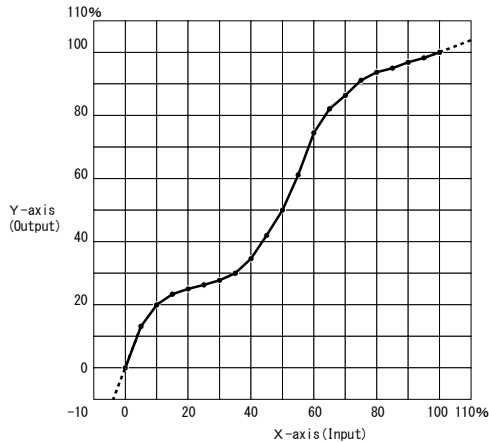
BREAKPOINT SPECIFICATIONS

Up to 21 breakpoints can be specified within the range of -15 to 115% for both the X axis (input) and Y axis (output). Specify breakpoints to two decimal places.

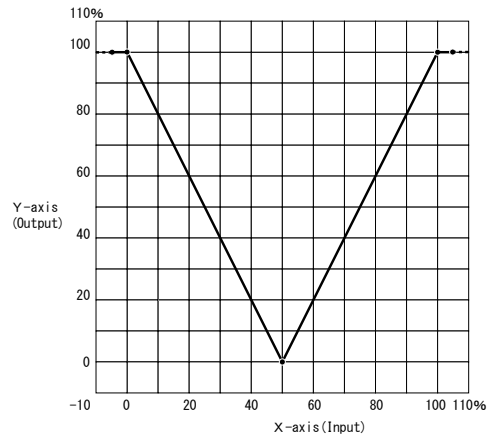
$(X_0.Y_0), (X_1.Y_1), (X_2.Y_2), \dots, (X_n.Y_n), (X_{n+1}.Y_{n+1}), (X_{n+2}.Y_{n+2}), \dots,$

where $X_n < X_{n+1}$

Note: Although the breakpoints can be specified within the range of -15 to 115%, the output range will be from -10 to 110%.



(Example 1)
 21 breakpoints specified:
 (0.0), (5.13), (10.20),
 (15.24), (20.25), (25.26),
 (30.28), (35.31), (40.35),
 (45.42), (50.50), (55.61),
 (60.75), (65.82), (70.87),
 (75.91), (80.93), (85.95),
 (90.98), (95.99), (100.100)



(Example 2)
 V-shaped conversion with an upper limitation value
 (-5.100), (0.100), (50.0),
 (100.100), (105.100)