

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.)

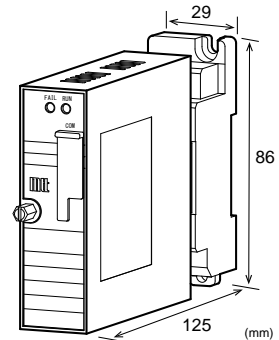
Note: Although the breakpoints can be specified within the range of -15 to 115%, the output range will be from -10 to 110%.

Options
No code: None

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

/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	100-240V AC	24V DC	100-240V DC
Single Output	5.0VA max	1.2W max	4.8W 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 Input range code: 2 (8V)

Settings 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.)
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● 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	Isolation between input, output 1, output 2, power, and ground.
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

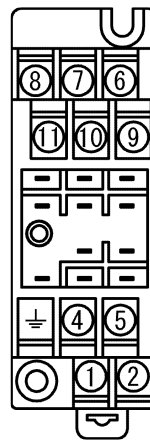
Installation	Wall/DIN rail mounting
Wiring	M3.5 screw terminal connection (with a power terminal block cover & drop-proof screws)
Screwing Torque	0.8 to 1.0 [Nm] * Recommended
External Dimensions	W29 × H86 × D125mm (including the mounting screw and socket)
Weight	Main unit: 120g max. Socket: 80g max.

● MATERIALS

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)
Conformal Coating	HumiSeal® 1A27NS (Polyurethane)

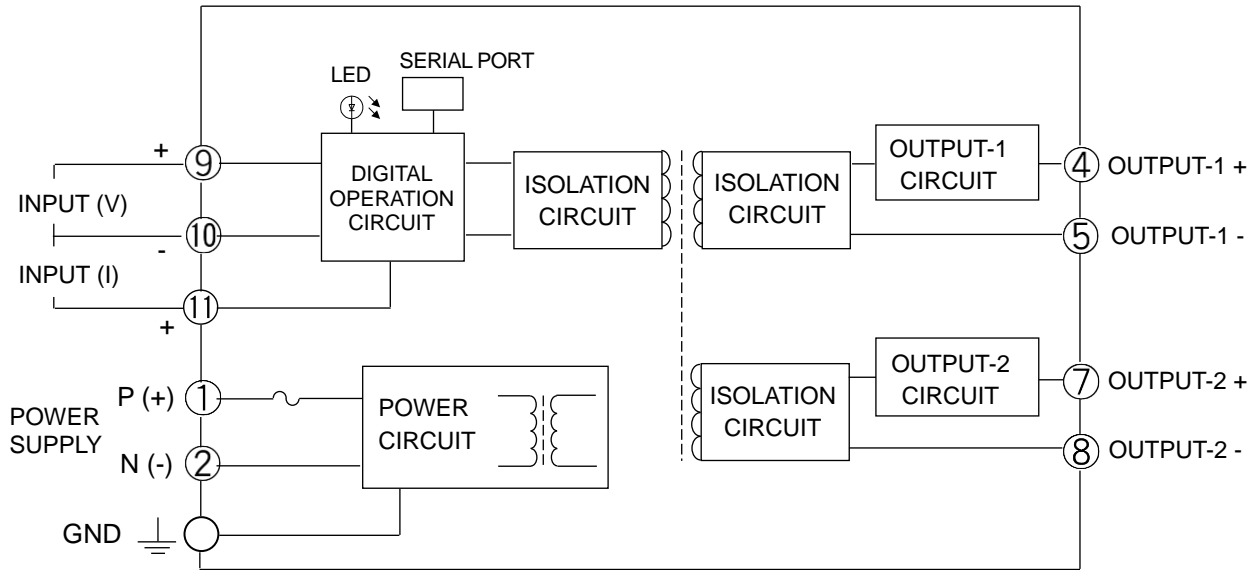
* HumiSeal® is a registered trademark of Chase Corporation.

TERMINAL ASSIGNMENT

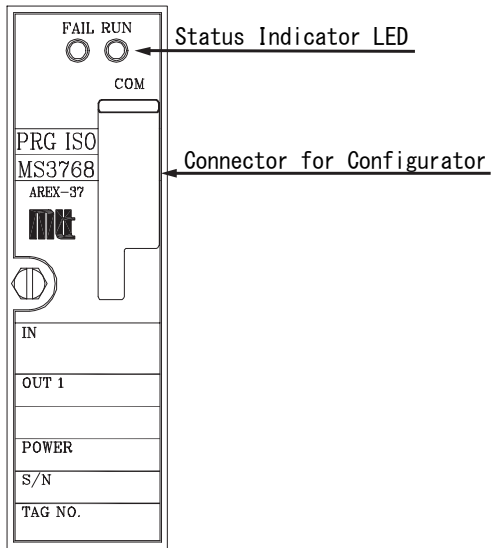


①	P (+)	POWER
②	N (-)	
⊥	GND	
④	+ OUTPUT 1	
⑤	- OUTPUT 1	
⑥	N.C.	
⑦	+ OUTPUT 2	
⑧	- OUTPUT 2	
⑨	+ INPUT (V)	
⑩	- INPUT	
⑪	+ INPUT (I)	

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 Assignment

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.

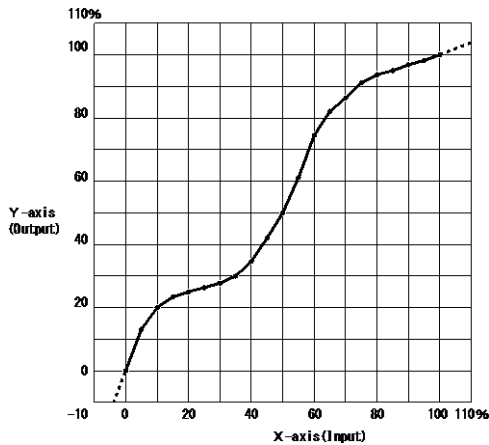
BREAKPOINT SPECIFICATIONS

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.

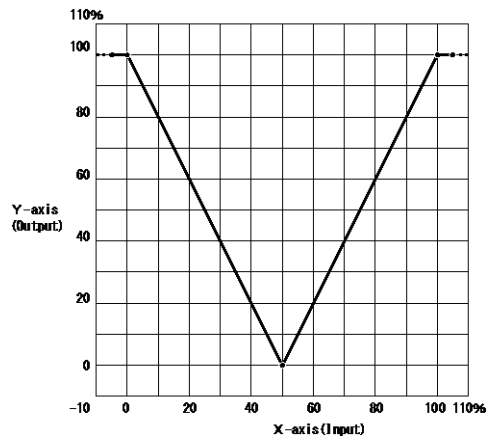
$(X_0.Y_0), (X_1.Y_1), (X_2.Y_2), \dots, (X_n.Y_n), (X_{n+1}.Y_{n+1}), (X_{n+2}.Y_{n+2}), \dots,$

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),



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