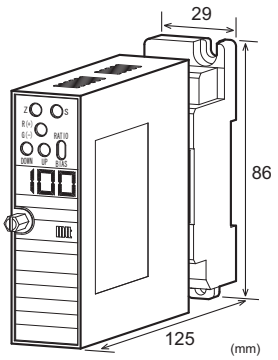
Slim Plug-In Ratio/Bias Converter with Isolated Single/Dual Output (Input Bias Model)

DESCRIPTION

The MS3739IB is a slim, plug-in ratio/bias converter (input bias model) that converts the ratio and bias of DC current or voltage signals and provides isolated single or dual output.



ORDERING CODE

MS3739IB - □ - □ □ □

Model

Power Supply

A: 100 to 240V AC (50 to 60Hz)
D: 24V DC **P**: 100 to 240V DC

Input

A: 4 to 20mA DC
B: 2 to 10mA DC
C: 1 to 5mA DC
D: 0 to 20mA DC
E: 4 to 20mA DC*1
H: 10 to 50mA DC
Z: Other DC current signals
3: 0 to 1V DC
4: 0 to 10V DC
5: 0 to 5V DC
6: 1 to 5V DC
4W: ±10V DC
5W: ±5V DC
0: Other DC voltage signals

* 1: Shunt resistor 50Ω

Output 1

A: 4 to 20mA DC
D: 0 to 20mA DC
Z: Other DC current signals
1: 0 to 10mV DC
2: 0 to 100mV DC
3: 0 to 1V DC
4: 0 to 10V DC
5: 0 to 5V DC
6: 1 to 5V DC
3W: ±1V DC
4W: ±10V DC
5W: ±5V DC
0: Other DC voltage signals

Output 2

No code: None
The codes are the same as for Output 1.

Note 1: When a voltage output is selected for Output 1, a current output cannot be selected for Output 2.
Note 2: When the code A (4 to 20mA) is selected for both of the two outputs, the output load will be 550Ω maximum for Output 1 and 350Ω maximum for Output 2.

Options

No code: None
/L: Dual current output with high output load (OUT-1: 750Ω / OUT-2: 550Ω)
/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.
(e.g.) MS3739IB-A-AA6
* The factory default settings are:
Positive gain; Ratio = 1; and Bias = 0%.

Other Ordering Examples:
For an input code of "0": MS3739IB-A-0A6 (Input: 2 to 10V)
For an output code of "Z": MS3739IB-A-AAZ (Output: 8 to 20mA)
For specific settings (gain/ratio/bias): MS3739IB-A-AA6 (Negative gain / Ratio = 2 / Bias = 0%)
Note: If you wish to include multiple options in your order, specify the option codes in series (e.g. /LX).

SPECIFICATIONS

●POWER SECTION

Power Requirements	100 to 240V AC: 85 to 264V AC (47 to 63Hz) 24V DC: 24V DC±10% 100 to 240V DC: 85 to 264V DC
Power Sensitivity	Better than ±0.1% of span for each power supply range.
Power Line Fuse	160mA fuse is installed (standard).

Power Consumption

Power	100-240V AC	24V DC	100-240V DC
Single Output	6.0VA max	1.7W max	6.0W max
Dual Output	6.5VA max	2.1W max	7.2W max

●INPUT SECTION

Input Resistance

Voltage Input (DC)	With or without power: 1MΩ min.	
Current Input (DC)	4 to 20mA (std.)	250Ω
	2 to 10mA	250Ω
	1 to 5 mA	100Ω
	0 to 20mA	250Ω
	10 to 50mA	10Ω

Allowable Input Voltage

Voltage Input Model	30V DC max., continuous. (Standard for a span up to 10V)
Current Input Model	40mA DC max., continuous. (Standard for 4 to 20mA)

Ranges Available		
	Current Signal	Voltage Signal
Input Range (DC)	-100 to 100mA	-300 to 300V
Input Span (DC)	100μA[*1] to 200mA	200mV[*2] to 600V
Input Bias	-100 to 100%	-100 to 100%

Note: For any input range including negative input signals, the input spans for current and voltage signals range from (*1)200μA to 200mA and (*2)400mV to 600V, respectively.

Input Spec. Ex.1: For 3 to 8V input, the input span is 5V and the bias +60%.

Input Spec. Ex. 2: For -5 to 0V input, the input span is 5V and the bias -100%.

●OUTPUT SECTION

Allowable Output Load		
Voltage Output (DC)	1V span and up	2mA max.
	10mV	10kΩ min.
	100mV	100kΩ min.
Current Output (DC)	4-20mA single output	750Ω max.
	4-20mA dual output	Output 1: 550Ω max. Output 2: 350Ω max.

Zero Adjustment	Approx. ±5% of span. (Adjustable by the front-accessible trimmer.)
Span Adjustment	Approx. ±5% of span. (Adjustable by the front-accessible trimmer.)
Ratio Setting Range	Positive gain: 0.1 to 4.00 (in steps of 0.01) Negative gain: -0.1 to -4.00 (in steps of 0.01)
Bias Setting Range	-100 to 100% (in steps of 1%)
Output Range	Approx. -10 to +120% (1 to 5V DC)

Ranges Available		
	Current Signal	Voltage Signal
Output Range (DC)	0 to 20mA	-10 to 10V
Output Span (DC)	4 to 20mA	10mV to 20V
Output Bias	0 to 100%	-100 to 100%

Note: For current output signals, the accuracy of any current output smaller than 0.1mA is not guaranteed.

Output Spec. Ex.1: For 4 to 20mA output, the output span is 16mA and the bias +25%.

Output Spec. Ex. 2: For -1 to 4V output, the output span is 5V and the bias -20%.

●PERFORMANCE

Accuracy Rating	Better than ±0.2% of span (at 25°C±5°C). Ratio = 1; Bias = 0% (Positive gain) Ratio = -1; Bias = 0% (Negative gain)
Equation	Y = K (X + B) (Positive gain) Y = K (X + B) + F (Negative gain) where Y: Output (%) K: Ratio X: Input (%) B: Bias F: 100%
Temperature Effect	Better than ±0.15% of span per 10°C change in ambient.
Response Time	85ms max. (0 to 90%) with a step input at 100%.
Ratio/Bias Indicator	Red LED, digit height 8.0mm, 3 digits.
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 / [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)
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

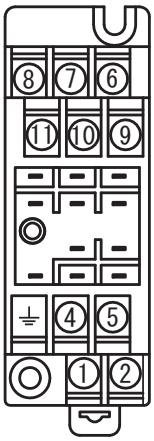
●PHYSICAL

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

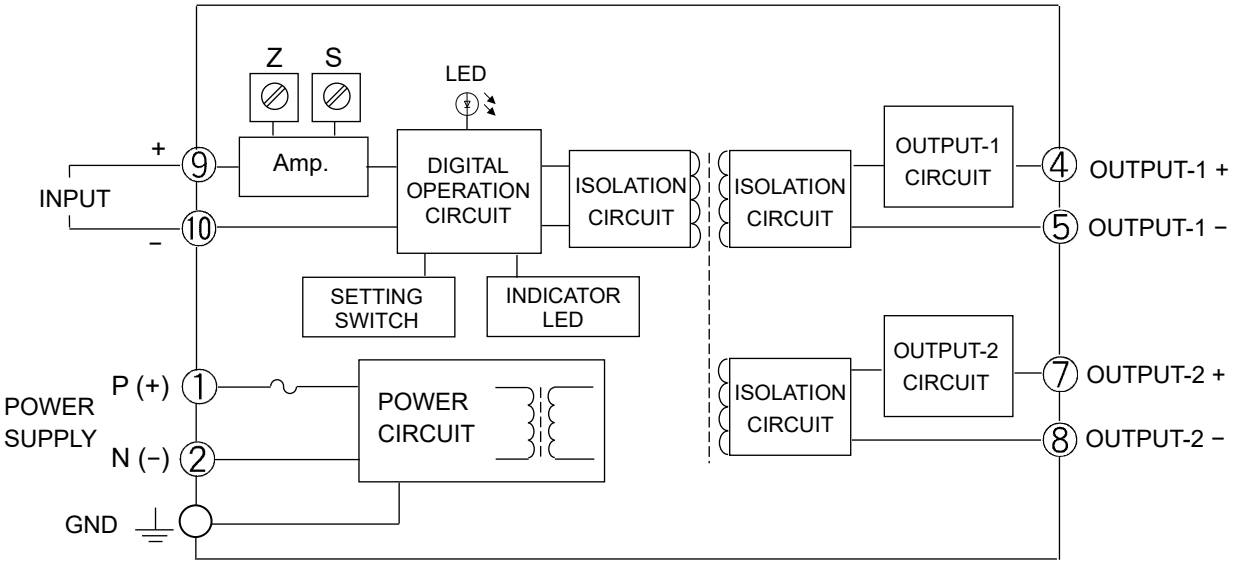
Housing	ABS resin (UL 94V-0)
Terminal Block	PBT resin (UL 94V-0)
Terminal Block Cover	PC resin (UL 94V-2)
DIN Rail Stopper	PP resin (UL 94HB)
Screw Terminal	Nickel-plated steel
Contacts Material and Finish	Brass with 0.2μm gold plating
Printed Circuit Board	Glass fabric, epoxy resin (FR-4: UL 94V-0)

TERMINAL ASSIGNMENTS

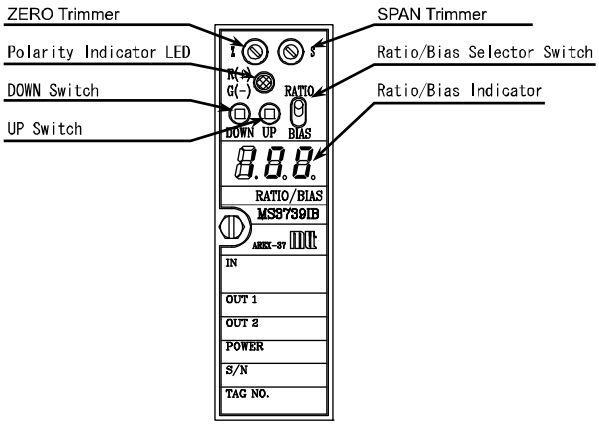


①	P (+)	POWER
②	N (−)	
⏚	GND	
④	+ OUTPUT 1	
⑤	− OUTPUT 1	
⑥	N.C.	
⑦	+ OUTPUT 2	
⑧	− OUTPUT 2	
⑨	+ INPUT	
⑩	− INPUT	
⑪	N.C.	

BLOCK DIAGRAM



FRONT VIEW



SETTINGS

●RATIO/BIAS SETTING

Ratio Setting

When the Ratio/Bias Selector Switch is set to the RATIO position, the Ratio/Bias Indicator shows the current ratio value. This value can be changed to a desired value by pressing the UP/DOWN Switch.

Bias Setting

When the Ratio/Bias Selector Switch is set to the BIAS position, the Ratio/Bias Indicator shows the current bias value. This value can be changed to a desired value by pressing the UP/DOWN Switch.

Indicators

The Polarity Indicator LED is red when the set value is positive and green when it is negative.
The Ratio/Bias Indicator goes OFF if no switch is operated for one minute, while the Polarity Indicator LED keeps illuminating green regardless of the polarity.

UP/DOWN Switch

The switch is of a push button type. Pressing and holding the switch changes the value faster.

Factory Default Settings

Unless otherwise requested, the ratio and bias will be set to the factory defaults as indicated below:

Positive gain; Ratio = 1; and Bias = 0%.

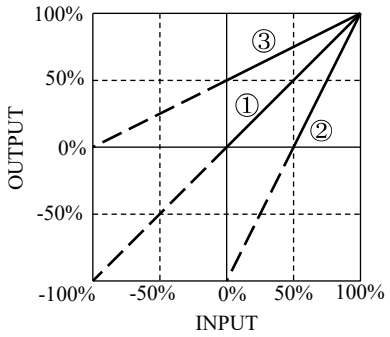
Examples of Positive Gain Setting

The following are typical examples of positive gain setting on a converter configured for 4-20mA DC input and 4-20mA DC output.

① To obtain 4-20mA DC output against 4-20mA DC input: Ratio = 1.00; Bias = 0%

② To obtain 4-20mA DC output against 12-20mA DC input: Ratio = 2.00; Bias = -50%

③ To obtain 12-20mA DC output against 4-20mA DC input: Ratio = 0.50; Bias = 100%



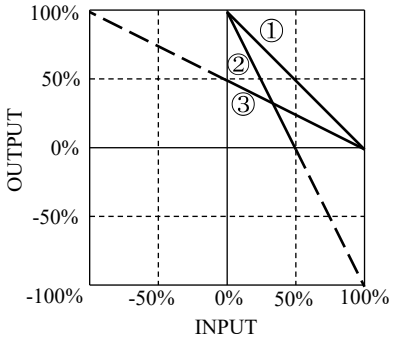
Examples of Negative Gain Setting

The following are typical examples of negative gain setting on a converter configured for 4-20mA DC input and 4-20mA DC output.

① To obtain 20-4mA DC output against 4-20mA DC input: Ratio = -1.00; Bias = 0%

② To obtain 20-4mA DC output against 4-12mA DC input: Ratio = -2.00; Bias = 0%

③ To obtain 12-4mA DC output against 4-20mA DC input: Ratio = -0.50; Bias = 100%



LED STATUS INDICATORS

●INDICATOR PATTERNS

No.	Event	Ratio/Bias Indicator (7-segment LED)	Polarity Indicator LED	Output	Recovery Operation
1	Power ON or switch operation	Blinks 3 times (1 s ON - 0.5 s OFF cycle).	Green LED turns ON for 1 second, and then red LED turns ON for 0.5 second. This cycle is repeated 3 times.	Normal	–
2	Normal operation	OFF	Green LED is ON.	Normal	–
3	Value setting	Set value	Red LED is ON when the set value is positive; Green LED is ON when it is negative.	Normal	–
4	DAC error	Error code: 1	Red LED blinks at 0.25 second intervals.	Typically 0%, but may vary.	None
5	CRC error of a set value	Error code: 2	Red LED blinks at 1 second intervals.	0%	Reconfig-uration
6	CRC error of a compensated value	Error code: 4	Red LED blinks at 1 second intervals.	0%	None
7	System error	Not defined.	Red LED is ON; Green LED is not defined.	Typically 0%, but may vary.	None

Notes:

No. 1: When the Ratio/Bias Indicator is turned ON, a 3-digit number “888” with dots is displayed.

No. 4 - 7: Only the last digit is displayed in the event of an error.

No. 7: The red LED may fail to light up.