General Specifications

GS 77J01X07-01E

Model VJX7
Universal Computing Unit (Multi-function)
(Isolated Single-output and Isolated Dual-output Types)

JUXTA

■ General

This plug-in type universal computing unit receives DC current or DC voltage signals, applies various computing functions to them, and then converts them into isolated DC current or DC voltage signals.

- *Output-2 can be selected from DC voltage signal, DC current signal, communication function (RS-485), or contact output (2 relay contacts).*
- *Various parameters such as input range and computation programs can be set and modified using a PC (VJ77) or Handy Terminal (JHT200).*

■ Model and Suffix Codes

VJX7-□□□-□□□0/□

Model

Function
A: Free program
B: Moving average computation
C: Dead time computation
D: First-order lag computation
E: First-order lead computation
F: Uniform-speed response (Velocity limiter)
G: Limiter
H: Velocity computation
J: Linearizer
K: Ratio setting

Output
1: 1 output
2: 2 outputs

Power Supply
6: 100-240 V AC/DC (Operating range: 85 to 264 V)
7: 15-30 V DC (Operating range: 12 to 36 V)

Input
A: 0 to 50 mA DC, span is 5 mA or more
1: –10 to +10 V DC, span is 0.1 V or more

Output-1
A: 4 to 20 mA DC
6: 1 to 5 V DC
Z (Custom Order): DC current /voltage signal

Output-2
A: 4 to 20 mA DC
6: 1 to 5 V DC
P: Communication function (RS-485)
T: Contact output (2 relay contacts)
N: No output-2

Options
/SN: No socket (with socket if not specified)
/C0: HumiSeal coating*
/FB: Fuse bypass*

* When option code /C0 or /FB is specified, the conformity to the safety and EMC standards is excluded. CE marking is not applicable.

Note 1: "/C0" option: Polyurethane coating. The "/C0" (Humiseal coating) option does not guaranteed the coating effect though it is expected that the corrosion resistance for electric circuit is reinforced. And it is not able to submit coating test data.
Note 2: "/FB" option: The primary power supply fuse is deleted, short circuit and ship it.

■ Ordering Information

• Model and suffix codes
The input range and fixed constants for each computation function are set as specified before shipment.

- Model and suffix code: e.g. VJX7-B26-AAA0
- Input range (required item): 4 to 20 mA DC
- Moving average time: 20 s

■ Factory Default Settings

Factory settings are as follows:

To change the set value, a PC-based Parameter Setting Tool (VJ77) or Handy Terminal (JHT200) is required.

- **When output-2 is specified as communication output**

• Address No.: 01
• Baud rate: 9600 bps
• Parity: Even
• Data length: 8 bits
• Stop bit: 1 bit
• Protocol: PCLINK

■ Input Specifications

Input Signal: 1 DC current of voltage signal
Input Range:
Code A: 0 to +50 mA DC, span is 5 mA or more
Code 1: −10 to +10 V DC, span is 0.1 V or more
Input Resistance:
DC current signal: 100 Ω (with external shunt resistor)
DC voltage signal: 1 MΩ (100 kΩ when power off)
Maximum allowable input:
Voltage input: ± 30V DC or less
Current input: Any level that satisfies the following condition.
(input current)^2 × input resistance ≤ 0.5W
Input adjustment range: ±1% of span or more (Zero/Span)

GS 77J01X07-01E

7th Edition Apr. 2019 (YK)

■ Output Specifications

1. Output-1

Output Signal	Output Resistance	Permissible Load Resistance
1 to 5 V DC	1 Ω or less	2 kΩ or more
4 to 20 mA DC	500 kΩ or more	750 Ω or less

- **Custom Order Output Signal**
  2 to 10 mA DC, 1 to 5 mA DC, 0 to 20 mA DC, 0 to 16 mA DC, 0 to 10 mA DC, 0 to 1 mA DC, 0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC, 0 to 10 V DC, 0 to 5 V DC, –10 to +10 V DC

  Note: Customized specifications for the output-1 signal within 0 to 20 mA DC or within -10 to +10 V DC comply with safety standards, EMC standards, and environmental standards.
  - The above note is limited to the standard specification of output-2.
  - Other customized specifications do not conform to these standards.

2. Output -2

- **Analog Output**

Output Signal	Output Resistance	Permissible Load Resistance
1 to 5 V DC	1 Ω or less	2 kΩ or more
4 to 20 mA DC	500 kΩ or more	350 Ω or less

Output variable range: -6 to 106 % (Both output 1 and output 2)
Output adjustment: ±10 % (Zero/Span) (Output 1 and output 2)

- **Communication Function**

This unit can be connected to a PC, graphic panel, YOKOGAWA programmable controller FA-M3, or programmable controllers of other manufacturers.

Standards: EIA RS-485
Maximum number of connectable controllers: 31 controllers
Maximum communication distance: 1200 m
Communication method: 2-wire half duplex, start-stop synchronization, non-procedural
Communication rate: 1200, 2400, 4800, 9600, 19200, or 38400 bps
Data length: 8, 7 bits
Stop bit: 1, 2 bits
Parity: Even parity, odd parity, or none
Communication protocol: PC-link, PC-link with SUM, MODBUS ASCII, MODBUS RTU, or LADDER
PC-link communication: Communication protocol with a PC, graphic panel, UT link module of FA-M3
MODBUS communication: Communication protocol with a PC (SCADA).
Ladder communication: Communication protocol with ladder communication module of FA-M3 and programmable controller of other manufacturers

- **Contact Output**

Output signal: 2 relay contacts
Contact capacity: 30 V DC, 1A
Output signal: NO contact output, 2 points
Contact turns on when energized.
COM terminal is common.
Contact rating: 30 V DC, 1A

■ Items Available to Be Set

The following items can be set through a PC (VJ77 PC-based parameters setting tool) or Handy Terminal (JHT200):

Input range, computation program, fixed constant, computation cycle, address number, baud rate, parity, data length, stop bit and protocol, I/O adjustment

■ Standard Performance

Accuracy rating: ±0.1% of span
However, accuracy is not guaranteed for output level less than 0.5% of the span of a 0 to X mA (e.g. 0 to 20 mA) output range type. However, accuracy is limited in the following case.
Input range is -10 to +10 V, span is under 4 V; accuracy (%) = ± 0.1 % x 4 V / input span [V]
Input range is -2.5 to +2.5 V, span is under 1 V; accuracy (%) = ± 0.1 % x 1 V / input span [V]
When current input, apply [input range x input resistance] to the above, and add 0.1 % of resistance error.
Computation cycle: 0.1 second
Response speed: 500 ms, 63% response (10 to 90% change of range)
Effect of Power Supply Voltage Fluctuation: Accuracy range or less of span for power supply voltage fluctuation.
Effect of Ambient Temperature Change: ±0.15% or less of span for change of 10 °C

■ Safety and EMC Standards

CSA: CSA 22.2 No. 61010-1, installation category II [*1], pollution degree 2 [*2], and CSA C22.2 No. 61010-2-030
UL: UL61010-1, UL 61010-2-030 (CSA NRTL/C)
CE:
EMC directive
EN 61326-1 compliance, Class A Table 2 [*3]
EN 61326-2-3 compliance
EN 61000-3-2 compliance
EN 61000-3-3 compliance
EN 55011 Class A Group 1
Low voltage directive:
EN 61010-1, EN 61010-2-030
Installation category II [*1]
Pollution degree 2 [*2]
Measurement category O (other)
EMC Regulatory Arrangement in Australia and New Zealand (RCM): EN 55011 Class A, Group 1
KC marking: Electromagnetic wave interference prevention standard, electromagnetic wave protection standard compliance

*1 Installation category (overvoltage category) II: Describes a number which defines a transient overvoltage condition. Implies the regulation for impulse withstand voltage.
"II" applies to electrical equipment which is supplied from the fixed installation like a distribution board.

*2 Pollution degree 2: Describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering.
"2" applies to normal indoor atmosphere. Normally, only non-conductive pollution occurs.

*3 The instrument continues to operate at a measurement accuracy of within ±20% of the range during testing.

However, if optional code /C0 or /FB is specified, the conformity to the safety and EMC standards is excluded.

■ Environment Standard

RoHS Directive: EN 50581
(However, when option code /C0 or /FB is specified, CE marking is not applicable because the product does not comply with the Safety and EMC standards.)

■ Power Supply and Isolation

Power Supply Rated Voltage:
100 to 240 V AC/DC ⎓ 50/60 Hz
15 to 30 V DC ⎓
Power Supply Input Voltage: 100 to 240 V AC/DC (-15, +10%) 50/60 Hz
15 to 30 V DC (±20%)
Power Dissipation: 24 V DC 2.5 W, 110 V DC 2.6 W
100 V AC 5 VA, 200 V AC 6.7 VA
Insulation Resistance: 100 MΩ/500 V DC between input, output-1, output-2, power supply and ground mutually
Withstand Voltage: 2000 V AC / minute between input, (output-1, output-2), power supply, and ground mutually
1000 V AC / minute between output-1 and output-2

■ Environmental Conditions

Temperature: -10 to 55 °C (40 °C or less for side-by-side close installation*)
* If the previous model (style S3.xx earlier) is installed together, the ambient temperature is 0 to 40°C.
Humidity: 5 to 90% RH (no condensation)
Ambient Condition: Avoid installation in such environments as corrosive gas like hydrogen sulfide, dust, sea breeze and direct sunlight
Installation altitude 2000 m or less above sea level.
Magnetic field: 400 A/m or less.
Continuous vibration (at 5 to 9 Hz) Half amplitude of 3 mm or less (at 9 to 150 Hz) 4.9 m/s2 or less, 1 oct/min for 90 minutes each in the 3-axis directions.
Impact: 98 m/s2 or less, 11 msec, 3-axis 3 times each in 6 directions.
Altitude: 2000 m or less.
Warm-up time: At least 30 minutes after power on.

■ Transport and Storage Conditions

Ambient temperature: –25 to 70 °C
Temperature change rate: 20 °C per hour or less
Ambient humidity: 5 to 95 %RH (no condensation)

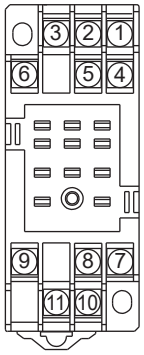
■ Mounting and Appearance

Construction: Compact plug-in type
Material: Modified Polyphenylene Oxide (Case body)
Mounting Method: Wall, DIN rail, or dedicated VJ mounting base mountings (only when Output-2 is analog output.)
Connection Method: M3 screw terminal
External Dimension: 29.5 x 76 x 124.5mm (WxHxD)
Weight: Main unit: 100 g or less,
Socket: 50 g or less

■ Standard Accessories

Tag number label: 1
Range label: 1
Shunt resistor: 1 (when current input is specified)

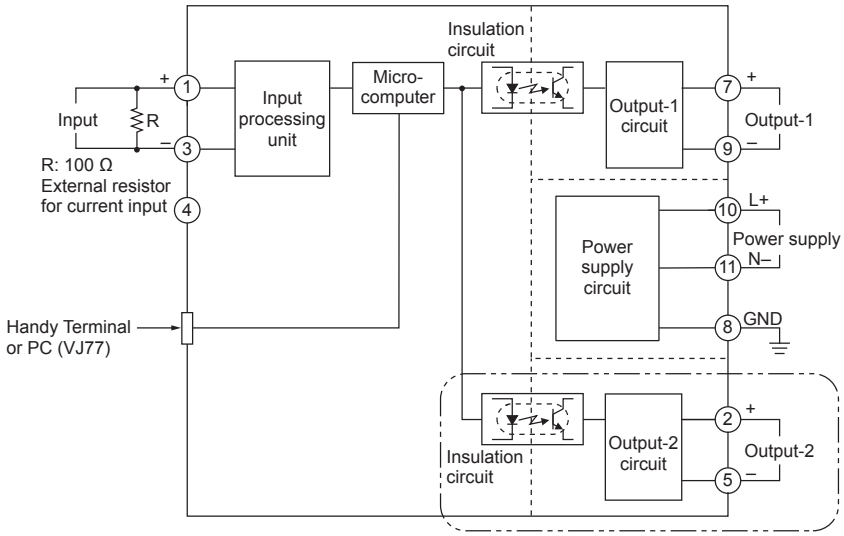
■ Terminal Arrangement



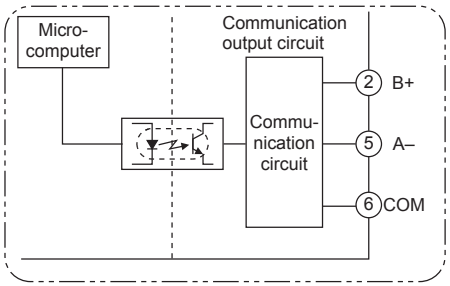
Terminal No.	Signal	Output-2		
		Analog output	Communication output	Alarm output
1	Input	+		
2	Output-2	+	B (+)	RLY1
3	Input	−		
4	Do not use			
5	Output-2	−	A (−)	COM
6	Output-2	Do not use	COM	RLY2
7	Output-1	+		
8	GND	GND		
9	Output-1	−		
10	Supply	L+		
11	Supply	N−		

Note: Do not use output-2 for the single-output type.

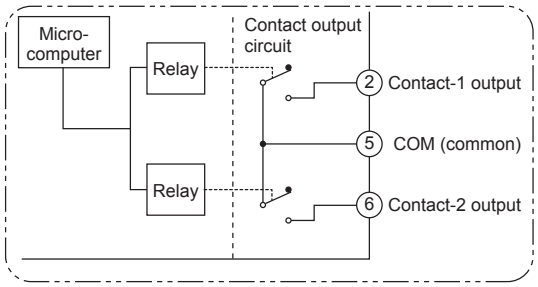
■ Block Diagram



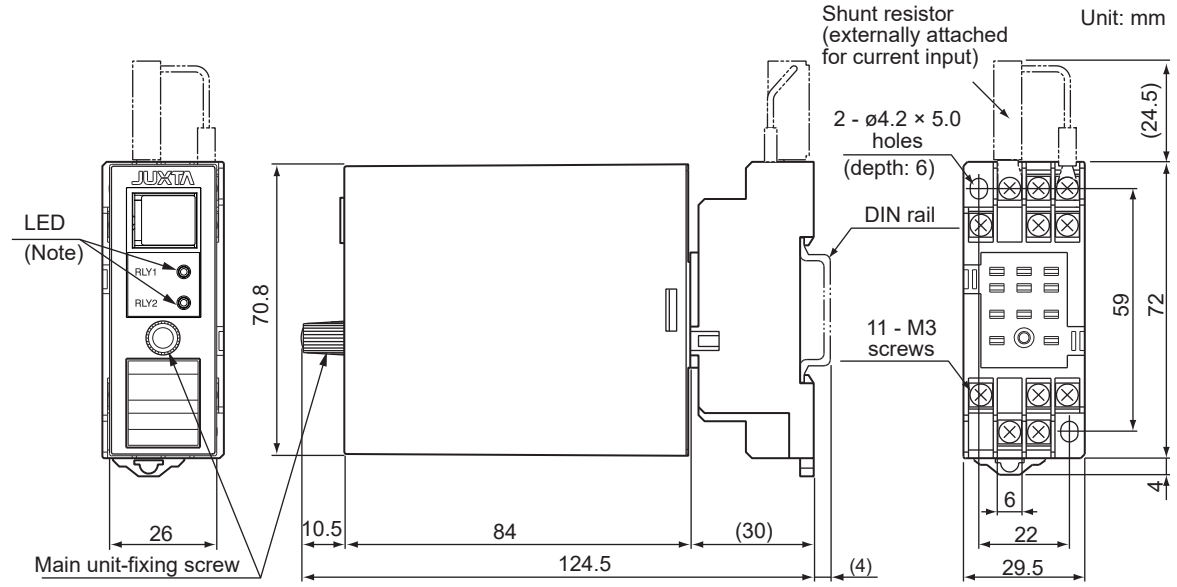
• When output-2 is communication function



• When output-2 is contact output



■ External Dimensions



Note: Only when output-2 is alarm output

■ Function Specifications

● **VJX7-A Free Program**

This computing unit is used to meet individual applications by programming the available commands using the Handy Terminal.

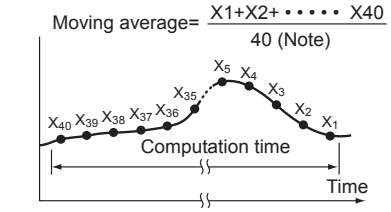
Initial setting

• Program: Outputs the value equivalent to the input.

● **VJX7-B Moving Average Computation**

This computing unit outputs the average of 40 input data (X) sampled at intervals of one-fortieth of the moving-average time (L). At the next sampling, the unit discards the oldest data and outputs the average of the 40 data, repeating the same operation. The output between samplings is smoothed out by interpolation.

e.g.



Note: For the moving average times at 1, 2 and 3 second, the number of samplings is 10, 20 and 30, respectively.

Setting range of moving-average time:
0 to 320,000 seconds with 4 significant digits.
Minimum unit is 1 second (however, 0.1 second is possible for 4 seconds or shorter).

To use a first-order lag filter for input (X), set the first-order lag time constant (T).

Setting range of time constant: 0 to 799.0 seconds; minimum unit is 0.1 second.
Accuracy of moving average and time constant setting: (±5.0% of set value) ±1 second

Ordering information and initial settings

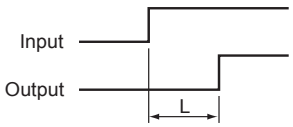
• Moving-average time: 10 sec
• First-order lag time constant: 0 sec

● **VJX7-C Dead Time Computation**

This computing unit stores the input values (X) sampled at intervals of one-fortieth of the dead time (L) into 40 buffers and outputs data (output-1 = Y1, output-2 = Y2) by orderly shifting them after the dead time has elapsed. However, for the dead times of 3, 2, and 1 second, the numbers of samplings is 30, 20, and 10, respectively. The output between samplings is smoothed by interpolation.

$$Y1=Y2=\frac{e^{-LS}}{1+TS}X$$

e.g. 0% → 100% step input



Setting range of dead time: 0 to 320,000 seconds with 4 significant digits. Minimum unit is 1 second (however, 0.1 second is possible for 4 seconds or shorter.)

To use a first-order lag filter for input (X), set the first-order lag time constant (T).

Setting range of time constant: 0 to 799.0 seconds
Accuracy of dead time and time constant setting: (±5.0% of set value) ±1 second

Ordering information and initial settings

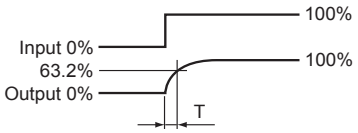
• Dead time: 10 sec
• First-order lag time constant: 0 sec

● **VJX7-D First-order Lag Computation**

This computing unit provides a first-order lag computation on input (X) with a time constant (T) and outputs the result (output-1 = Y1, output-2 = Y2).

$$Y1=Y2=\frac{e^{-LS}}{1+TS}X$$

e.g. 0% → 100% step input



Setting range of time constant: 0 to 799.0 seconds; minimum unit is 0.1 second.
Accuracy of time constant setting: (±5.0% of set value) ±1 second

Ordering information and initial setting

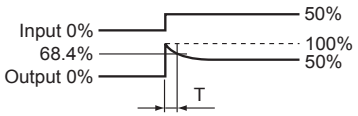
• First-order lag time constant: 10 sec

● **VJX7-E First-order Lead Computation**

This computing unit provides a first-order lead computation on input (X) with a time constant (T) and outputs the result (output-1 = Y1, output-2 = Y2).

$$Y1=Y2=\left(1+\frac{TS}{1+TS}\right)X$$

e.g. 0% → 50% step input



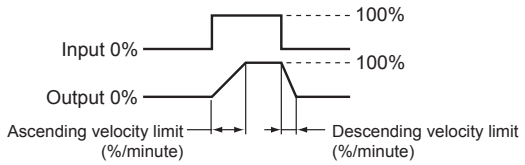
Setting range of time constant: 0 to 799.0 seconds; minimum unit is 0.1 second.
Accuracy of time constant setting: (±5.0% of set value) ±1 second

Ordering information and initial setting

• First-order lead time constant: 10 sec

● **VJX7-F Uniform-speed Response (Velocity Limiter)**
This computing unit limits the input (X) velocity at the ascending velocity limit for a positive change and at the descending velocity limit for a negative change, and outputs the limited value (output-1 = Y1, output-2 = Y2). When the input velocity (slope) is no more than the limit value, the unit outputs the input as is.

e.g. 0% → 100% → 0% step input



Setting range of velocity limit value: 0.1% to 699.9%/minute; minimum unit is 0.1%/minute. Setting the limit at 700.0%/minute or above does not limit the input, so the unit simply outputs the input as is (i.e., works as an open limit function).
Accuracy of velocity limit setting: (±5.0% of set value) ±1%/minute

Ordering information and initial settings
- Ascending velocity limit: 100%/minute
- Descending velocity limit: 100%/minute

● **VJX7-G Limiter**
This computing unit serves as an ordinary converter as long as the input (X) is within the upper and lower limits. When the input exceeds the limit, the unit outputs the signal that corresponds to the limit value (output-1 = Y1, output-2 = Y2).

Setting range of upper and lower limit values: –6.0% to 106.0%; minimum unit is 0.01%.
However, if the setting is made so that the upper limit < lower limit, the unit outputs the upper limit value.

Ordering information and initial settings
- Upper limit value: 100%
- Lower limit value: 0%

● **VJX7-H Velocity Computation**
This computing unit calculates the input velocity by subtracting the input of the last velocity computation (X_L) form the present input (X). The unit then adds a 50% bias to one-half of the obtained velocity and outputs the result (output-1 = Y1, output-2 = Y2).

The output obtained will be as follows:
When there is no change in input: 50%
When the input has increased: 50% or more (100% when $X - X_L = 100\%$)
When the input has decreased: 50% or less
(0% when $X - X_L = -100\%$)

$$Y1=Y2=\frac{X-X_L}{2}+50\%$$

Setting range of velocity computation time: 0 to 320,000 seconds with 4 significant digits. Minimum unit is 1 second (however, 0.1 second is possible for 4 seconds or shorter.)
To use a first-order lag filter for input (X), set the first-order lag time constant (T).

Setting range of time constant: 0 to 799.0 seconds; minimum unit is 0.1 second.
Accuracy of velocity computation time and time constant settings: (±5.0% of set value) ±1 second

Ordering information and initial settings
- Velocity computation time (L): 20 sec
- First-order lag time constant (T): 0 sec

● **VJX7-J Linearizer**
This computing unit gives an optional relationship between the input (X) and output (output-1 = Y1, output-2 = Y2) signals using an optional line-segment function. The line-segment function has 21 breakpoints, which each gives an input-output relationship as a percentage (%).

Set the number of line segments by 1 to 20.

Breakpoint setting conditions:
Number of breakpoints: 21
For input: $-6.0 \le X_0$ to $X_{20} \le 106.0\%$
Number of significant digits: 4
Minimum unit: 0.01%
$X_0 < X_1 < X_2 < \cdots < X_{20}$
For output: $-6.0 \le Y_0$ to $Y_{20} \le 106.0\%$
Number of significant digits: 4
Minimum unit; 0.01%
When input% X_0, Y_0 is output.
When input ≥ final set value, the final set value of output is output.
Computation accuracy: ±0.1% (when line-segment gain is 1 or less)

Ordering information and initial setting

- Breakpoint data:
  Input: 0, 5, 10, 15, 20, 25, 30, 35, 40,····100%
  Output: 0, 5, 10, 15, 20, 25, 30, 35, 40,····100%
  Number of significant digits: 4 (e.g. 1.23456% unacceptable; 12.34, 1.23, 101.1% acceptable)
- Number of line segments: 20

<Work Sheet>

Model and suffix code: VJX7- J ☐☐ - ☐☐☐ 0

Input (%)		Output (%)	
X_0		Y_0	
X_1		Y_1	
X_2		Y_2	
X_3		Y_3	
X_4		Y_4	
X_5		Y_5	
X_6		Y_6	
X_7		Y_7	
X_8		Y_8	
X_9		Y_9	
X_{10}		Y_{10}	
X_{11}		Y_{11}	
X_{12}		Y_{12}	
X_{13}		Y_{13}	
X_{14}		Y_{14}	
X_{15}		Y_{15}	
X_{16}		Y_{16}	
X_{17}		Y_{17}	
X_{18}		Y_{18}	
X_{19}		Y_{19}	
X_{20}		Y_{20}	

Number of line segments	

- **VJX7-K Ratio Setting**

This computing unit sets the ratio by the following expression.

$Y1 = Y2 = K1 \times (X + A1) + A2$

where Y1: Output-1 signal (%)
Y2: Output-2 signal (%)
X: Input signal (%)
K1: Ratio (no unit)
A1, A2: Bias (%)

Setting range of ratio: –320 to 320 with 4 significant digits; minimum unit is 0.00001.
Setting range of bias: –32,000% to 32,000% with 4 significant digits; minimum unit is 0.001%.
Computation accuracy: ±0.1% (when K1 = 1, A1 = A2 = 0%)

Ordering information and initial settings

- Ratio (K1): 1
- Bias (A1): 0%
- Bias (A2): 0%