General Specifications

Model MXT
Universal Computing Unit
(3-input, Isolated 1-output Type)

JUXTA

GS 77J04X13-01E

■ 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.

- The optional Parameter Setting Tool (VJ77) or Handy Terminal (JHT200) can be used for the setting changes of various parameters such as computing functions or input/output ranges, the setting changes of programs, and the test outputs.
- The operation indicating lamp shows the operation status, abnormalities in a setting etc.
- Without a setting tool such as Handy Terminal etc., outputs can be adjusted using the switches on the front panel.

■ Model and Suffix Codes

MXT-□□□N-□ *B/□

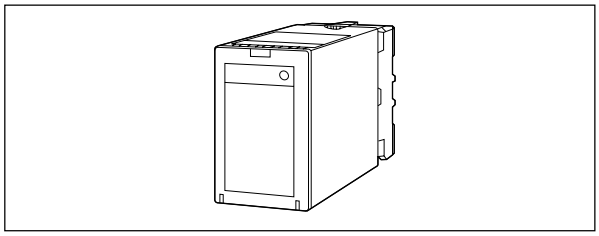
Model
Function
A: Free program
R: Temperature-pressure compensation
S: Addition/Subtraction
T: Multiplication/Division
U: Square root extraction
V: High selector
W: Low selector

Input signal
A: 0 to 50 mA DC Span is 1 mA or more
1: –10 to +10 V DC Span is 0.1 V or more

Output signal
A: 0 to 20 mA DC Span is 2 mA or more
B: 0 to 5 mA DC Span is 1 mA or more
1: 0 to 10 V DC Span is 0.1 V or more
2: 0 to 100 mV DC Span is 10 mV or more
3: –10 to +10 V DC Span is 0.2 V or more
4: –100 to +100 mV DC Span is 20 mV or more

Power supply
1: 15-40 V DC (Operating range: 12 to 48 V DC)
2: 100-240 V AC (Operating range: 85 to 264 V AC)

Optional specification
/R250: With 250 Ω receiving resistor



■ Ordering Information

Specify the following when ordering.
Model and suffix codes: e.g. MXT-AA1N-2*B
Input range: e.g. 4 to 20 mA DC
Output range: e.g. 1 to 5 V DC
If the constants for each computing function are specified with the order, the specified values will be assigned before shipment. (Refer to “Functions.”)

■ Input/Output Specifications

Input signal: 3 points of DC current or DC voltage signals
(However, 3 points of signals must have the same input range.)

Input setting range:

Input signal suffix code	Setting range
A	0 to 50 mA DC Span is 1 mA or more*
1	±10 V DC Span is 0.1 V or more

*: Setting range is 0 to 35 mA DC for the optional specification “/R250.”

Input resistance:
Current signal: 100 Ω (external receiving resistor)
250 Ω for the optional specification “/R250”
Voltage signal:
1 MΩ (800 kΩ during power off)

Permissible applicable input:
Current input:
70 mA DC or less for input resistance of 100 Ω
40 mA DC or less for input resistance of 250 Ω
Voltage input: ±15 V DC or less

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

Analog output setting range:

Output signal suffix code	Setting range
A	0 to 20 mA DC Span is 2 mA or more
B	0 to 5 mA DC Span is 1 mA or more
1	0 to 10 V DC Span is 0.1 V or more
2	0 to 100 mV DC Span is 10 mV or more
3	±10 V DC Span is 0.2 V or more
4	±100 mV DC Span is 20 mV or more

Analog output permissible load resistance:

Output range	Permissible load resistance
0 to 20 mA DC	750 Ω or less
0 to 5 mA DC	3000 Ω or less
0 to 5 V DC	2 kΩ or more
0 to 10 V DC	10 kΩ or more (when 100% output exceeds 5 V)
0 to 100 mV DC	250 kΩ or more
–10 to +10 V DC	10 kΩ or more
–100 to +100 mV DC	250 kΩ or more

Input adjustment range:
±1% of span or more (zero/span adjustments)

Output adjustment range:
±5% of span or more (zero/span adjustments)

■ 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. The accuracy is limited according to the input/output range settings.

- Accuracy Calculation

Accuracy = Input accuracy + Output accuracy (%)

Accuracy is obtained by totalizing the expression (1) for input accuracy and the expression (2) for output accuracy. However, ±0.05% is applied if a value obtained from the expression (1) or (2) is less than ±0.05%.

For current input, add the error of receiving resistor ±0.1% to the input accuracy.

Input accuracy = ±0.05% × a/b ··· expression (1)

Input signal suffix code	Input range (Range converted into voltage)	Accuracy calculation condition a	Accuracy calculation condition b
A, 1	Outside of ±2.5 V DC and within ±10 V DC	4 (V)	Input span (Span converted into voltage)
	±2.5 V DC	1 (V)	

Note: When input signal is current, the values converted into voltage by the receiving resistor are applied to the input range and input span.

Output accuracy = ±0.05% × a/b ··· expression (2)

Output signal suffix code	Output range	Accuracy calculation condition a	Accuracy calculation condition b
A	0 to 20 mA DC	10 (mA)	Output span
B	0 to 5 mA DC	2.5 (mA)	
1	0 to 2.5 V DC	1 (V)	
	Outside of 0 to 2.5 V DC and within 0 to 10 V DC	4 (V)	
2	0 to 25 mV DC	10 (mV)	
	Outside of 0 to 25 mV DC and within 0 to100 mV DC	40 (mV)	
3	±2.5 V DC	1 (V)	
	Outside of ±2.5 V DC and within ±10 V DC	4 (V)	
4	±25 mV DC	20(mV)	
	Outside of ±25 mV DC and within ±100 mV DC	40 (mV)	

[Example of accuracy calculation]

Input range: 0 to 20 mA DC

Receiving resistor: 250 Ω

(0 to 5 V DC when converted into voltage)

Output range: 20 to 40 mV DC

Input accuracy =

$$\pm 0.05\% \times \frac{4}{5} = \pm 0.04\% \longrightarrow \pm 0.05\%$$

(since it is less than ±0.05%)

Add ±0.1% (error of receiving resistor) to the above.

Then, Input accuracy = ±0.15%

Output accuracy = $\pm 0.05\% \times \frac{40}{20} = \pm 0.1\%$

Therefore, Accuracy = ±0.25%

Computation cycle: 100 ms (For the function suffix code “A”, selectable from 50 ms, 100 ms and 200 ms.)

Response speed: 500 ms, 63% response (10 to 90%)

Effect of power supply voltage fluctuations:
Equal to or less than whichever is greater, ±0.1% of span or accuracy 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 ~ 50/60 Hz
Power supply input voltage:
15-40 V DC ⎓ (±20%) or
100-240 V AC ~ (–15, +10%) 50/60 Hz
Power consumption:
24 V DC 1.9 W
100 V AC 3.6 VA, 200 V AC 5.2 VA
Insulation resistance:
100 MΩ or more at 500 V DC between input, output, power supply, and grounding terminals mutually. (Each input terminal is not isolated 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

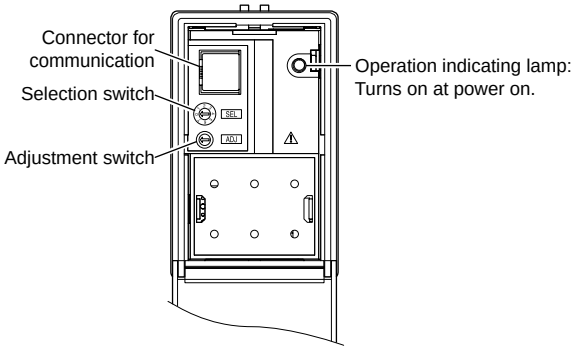
Material: Main unit : ABS resin (black), UL94 V-0
ABS resin + polycarbonate resin (black), UL94 V-0
PBT resin, including glass fiber (black), UL94 V-0
Socket: Modified polyphenylene oxide resin, including glass fiber (black), UL94 V-1
Mounting: Wall or DIN rail mounting (When mounting the units close together, leave a space of at least 5 mm between them.)
Connection: M3.5 screw terminals
External dimensions:
86.5 (H) × 51 (W) × 133 (D) mm (including a socket)
Weight: Main unit: approx. 200 g
Socket: approx. 80 g

■ Accessories

Spacer: One (for DIN rail mounting)
Range label: One
Receiving resistor: Three (for current input)
* When the optional specification "/R250" is specified, the 250 Ω receiving resistor is attached. When the optional specification "/R250" is not specified, the 100 Ω receiving resistor is attached.

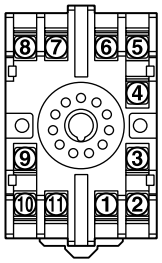
■ Front Panel

Output can be adjusted using the selection switch and adjustment switch.



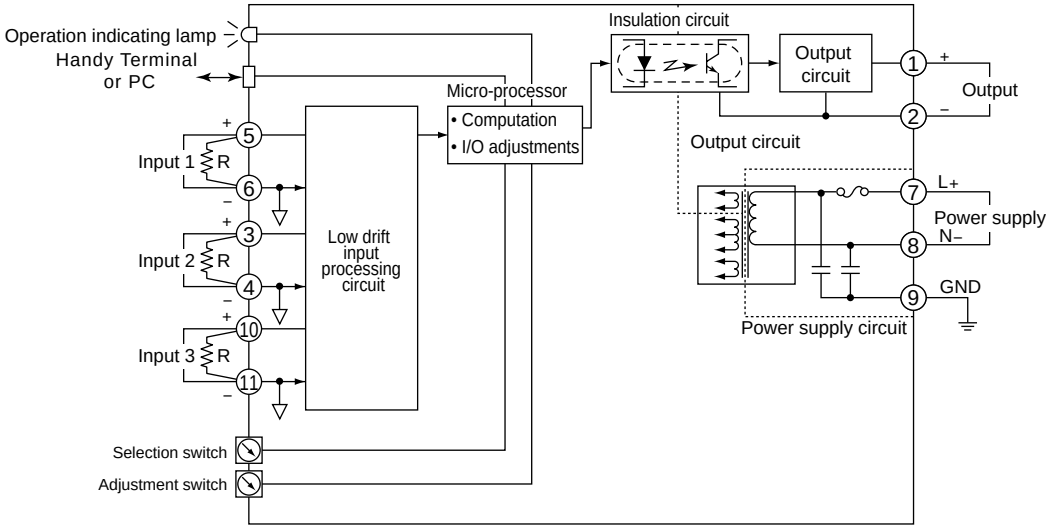
Position of selection switch	Item to be adjusted
0	No function
1	Output zero adjustment
2	Output span adjustment
3	No function
4	No function
5	No function
6	No function
7	No function

■ Terminal Assignments



1	OUTPUT	(+)
2	OUTPUT	(−)
3	INPUT 2	(+)
4	INPUT 2	(−)
5	INPUT 1	(+)
6	INPUT 1	(−)
7	SUPPLY	(L+)
8	SUPPLY	(N−)
9	GND	(GND)
10	INPUT 3	(+)
11	INPUT 3	(−)

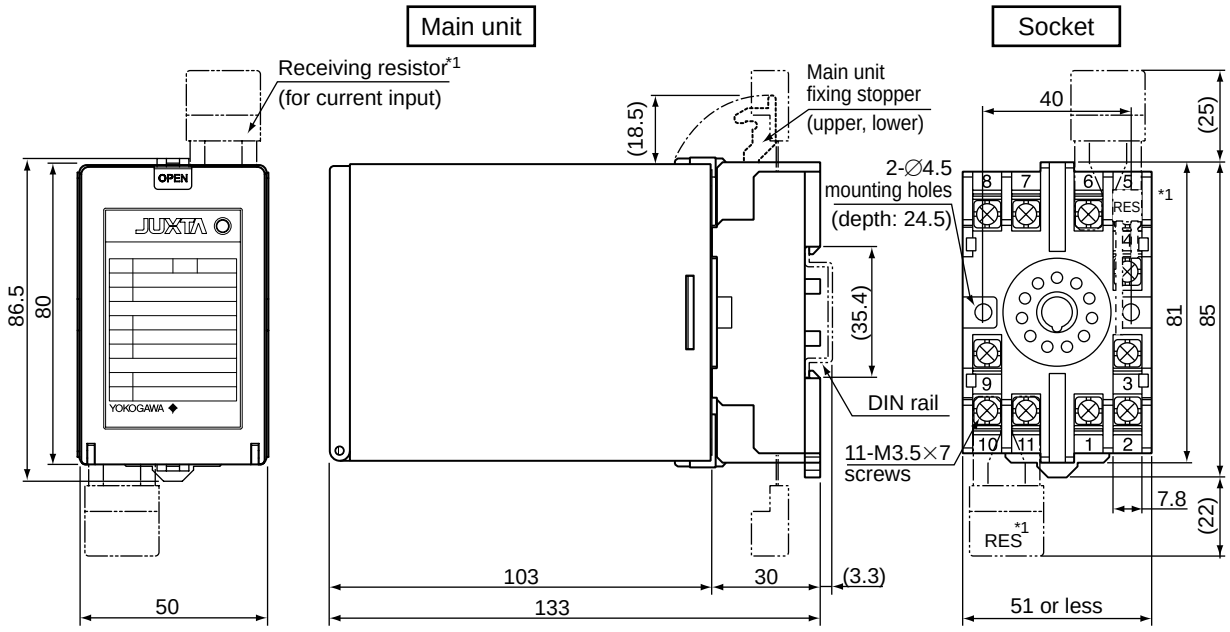
■ Block Diagram



R: External resister for current input

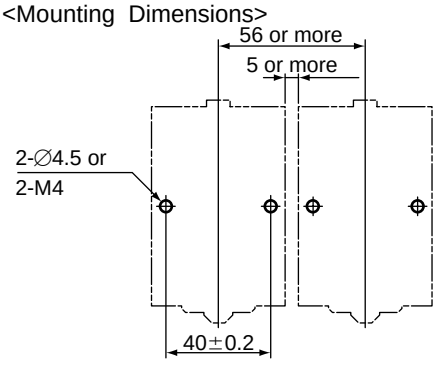
■ External Dimensions

Unit : mm



*1: The receiving resistor is supplied for the input signal suffix code "A"

<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.

■ Functions

● **MXT-A Free Program**

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

Initial Setting

• Program: Outputs the value that corresponds to the input.

● **MXT-R Temperature-Pressure Compensation**

This computing unit performs temperature-pressure compensation of gas flow measured by differential pressure flow meter (Orifice, Bentury, Flow nozzle, etc.) using the following expressions (select either one). For temperature-pressure compensation of gas flow measured by eddy current meter, use the MXT-T.

"With input limit function" or "without input limit function" can be set for input signal.

"With square root extraction" or "without square root extraction" can be set for uncompensated flow input signal.

If "with square root extraction" is selected for uncompensated flow input signal, it is shipped with the low-cut point of 1% and the hysteresis of 0.2%.

$$Y=\sqrt{\frac{K2\cdot X2+A2}{K3\cdot X3+A3}}\cdot K1\cdot\sqrt{X1}\quad\cdots(1)$$ [with extraction of flow input signal]

$$Y=\sqrt{\frac{K2\cdot X2+A2}{K3\cdot X3+A3}}\cdot K1\cdot X1\quad\cdots(2)$$ [without extraction of flow input signal]

where Y (Output): Compensated flow output signal (%)
X1 (Input-1): Uncompensated flow input signal (%)
X2 (Input-2): Pressure input signal (%)
X3 (Input-3): Temperature input signal (%)
K1 to K3: Gain (no unit)
A2 and A3: Bias (%)

Settings of gain and bias

<For temperature-pressure compensation>

How to obtain K1, K2, A2, K3, and A3:

$$\bullet\ K1=\frac{\text{Uncompensated flow input span}}{\text{Compensated flow input span}}\quad\cdots(a)$$

$$\bullet\ K2=\frac{\text{Maximum value – Minimum value (of pressure transmitter range)}}{\text{Reference pressure (kPa) + 101.32}}\quad\cdots(b)$$

$$\bullet\ A2=\frac{\text{Minimum value (of pressure transmitter range) + 101.32}}{\text{Reference pressure (kPa) + 101.32}}\quad\cdots(c)$$

Pressure compensation items

$$\bullet\ K3=\frac{\text{Maximum value – Minimum value (of temperature range)}}{\text{Reference temperature °C + 273.15}}\quad\cdots(d)$$

$$\bullet\ A3=\frac{\text{Minimum value (of temperature range) + 273.15}}{\text{Reference temperature °C + 273.15}}\quad\cdots(e)$$

Temperature compensation items

<For either temperature compensation or pressure compensation>

When only the temperature compensation is performed:

Make "1" for the pressure compensation items. That is, set K2 = 0, A2 = 100% and use the expressions (d) and (e) to obtain other gain and bias.

When only the pressure compensation is performed:

Make "1" for the temperature compensation items. That is, set K3 = 0, A3 = 100% and use the expressions (b) and (c) to obtain other gain and bias.

Setting range of gain: –320 to +320
Number of significant digits: 4
Minimum unit: 0.00001

Setting range of bias: –32000 to +32000%
Number of significant digits: 4
Minimum unit: 0.001%

Input limit function: The function which limits the input-1, input-2, and input-3 signals between 0%and 100%.

Setting range of low-cut point: 0 to 100%
Number of significant digits: 4
Minimum unit: 0.001%

Setting range of hysteresis: 0 to 100%
Number of significant digits: 4
Minimum unit: 0.001%

Computation accuracy: ±0.1% (However, input (X1) vs. output when K1 = K2 = K3 =1, A2 = A3 = 0%, and inputs (X2, X3) are fixed at 100%.)

Ordering Information and Initial Settings

• Gain: K1 = 1, K2 = 1, and K3 = 1
Number of significant digits: 4 (e.g. 1.23456 unacceptable; 12.34, 1.234, 0.01234 acceptable)
• Bias: A2 = 0% and A3 = 0%
Number of significant digits: 4 (e.g. 123.456% unacceptable; 12.34, 1.234, 0.012% acceptable)
• Without extraction of flow input signal. Shipped with the expression (2).
• With input limit function

● MXT-S Addition / Subtraction

This computing unit adds and subtracts three inputs using the following expression.

"With input limit function" or "without input limit function" can be set for input signal.

$$Y = K4 \{K1(X1+A1) + K2(X2+A2) + K3(X3+A3)\} + A4$$

where Y (Output): Output signal (%)
X1 to X3 (Input-1 to Input-3): Input signal (%)
K1 to K4: Gain (no unit)
A1 to A4: Bias (%)

Set " 0" for K1, K2, and K3 of the unused input circuit. Not necessary to specify A1, A2, and A3 of the circuit.

Setting range of gain: –320 to +320
Number of significant digits: 4
Minimum unit: 0.00001

Setting range of bias: –32000 to +32000%
Number of significant digits: 4
Minimum unit: 0.001%

Input limit function: The function which limits the input-1, input-2, and input-3 signals between 0%and 100%.

Computation accuracy: ±0.1% (However, when K1 = 0.5, K2 = 0.25, K3 = 0.25, K4 =1, and A1 = A2 = A3 = A4 = 0%.)

Ordering Information and Initial Settings

- Gain: K1 = 0.5, K2 = 0.25, K3 = 0.25, and K4 = 1
  Number of significant digits: 4 (e.g. 1.23456 unacceptable; 12.34, 1.234, 0.01234 acceptable)
- Bias: A1 = 0%, A2 = 0%, A3 = 0%, and A4 = 0%
  Number of significant digits: 4 (e.g. 1.23456% unacceptable; 12.34, 1.234, 0.012% acceptable)
- With input limit function

● MXT-T Multiplication / Division

This computing unit inputs three signals, multiplies and divides the three input signals using the following expressions.

The unit can perform temperature-pressure compensation by inputting gas flow signal measured by eddy current meter etc., temperature signal, and pressure signal as three input signals.

"With input limit function" or "without input limit function" can be set for input signal.

$$Y=K4\cdot\frac{(K1\cdot X1+A1)\cdot(K2\cdot X2+A2)}{(K3\cdot X3+A3)}+A4$$

where Y (Output): Output signal (%)
X1 to X3 (Input-1 to Input-3): Input signal (%)
K1 to K4: Gain (no unit)
A1 to A4: Bias (%)

Settings of gain and bias

For temperature-pressure compensation of gas flow measured by eddy current meter etc., use the following expressions to obtain each gain and bias.

<For temperature-pressure compensation>

How to obtain K1, A1, K2, A2, K3, A3, K4, and A4:

- K1= 1 since the output value of flow transmitter is used as it is.
- A1= 0% since the output value of flow transmitter is used as it is.
- Use the aforementioned expression (b) to obtain K2.
- Use the aforementioned expression (c) to obtain A2.

  Pressure compensation items

- Use the aforementioned expression (d) to obtain K3.
- Use the aforementioned expression (e) to obtain A3.

  Temperature compensation items

- $K4 = \frac{\text{Uncompensated flow input span}}{\text{Compensated flow input span}}$
- A4 = 0% since the compensated flow value is normally used as it is.

<For either temperature compensation or pressure compensation>

When only the temperature compensation is performed:

Make "1" for the pressure compensation item. That is, set K2 = 0, A2 = 100% and use the aforementioned expressions (d) and (e) to obtain other gain and bias.

When only the pressure compensation is performed:

Make "1" for the temperature compensation item. That is, set K3 = 0, A3 = 100% and use the aforementioned expressions (b) and (c) to obtain other gain and bias.

Note: Set K3 = 0 and A3 = 100% when using this unit as multiplier.

Setting range of gain: –320 to +320
Number of significant digits: 4
Minimum unit: 0.00001

Setting range of bias: –32000 to +32000%
Number of significant digits: 4
Minimum unit: 0.001%

Input limit function: The function which limits the input-1, input-2, and input-3 signals between 0%and 100%.

Computation accuracy: ±0.1% (However, input (X1) vs. output when K1 = K2 = K3 = K4 = 1, A1 = A2 = A3 = A4 = 0%, and inputs (X2, X3) are fixed at 100%.)

Ordering Information and Initial Settings

- Gain: K1 = 1, K2 = 1, K3 = 1, and K4 = 1
  Number of significant digits: 4 (e.g. 1.23456 unacceptable; 12.34, 1.234, 0.01234 acceptable)
- Bias: A1 = 0%, A2 = 0%, A3 = 0%, and A4 = 0%
  Number of significant digits: 4 (e.g. 123.456% unacceptable; 12.34, 1.234, 0.012% acceptable)
- With input limit function

● **MXT-U Square Root Extraction**

This computing unit extracts square root of three inputs using the following expression.

A low-cut point can be set for the computation result. It is shipped with the low-cut point of 1%.

"With input limit function" or "without input limit function" can be set for input signal.

$$Y = \sqrt{K4 \cdot \frac{(K1 \cdot X1 + A1) \cdot (K2 \cdot X2 + A2)}{(K3 \cdot X3 + A3)}} + A4$$

where Y (Output): Output signal (%)
X1 to X3 (Input-1 to Iinput-3): Input signal (%)
K1 to K4: Gain (no unit)
A1 to A4: Bias (%)

Set K3 = 0, A3 = 100% when no division is carried out.

Setting range of gain: –320 to +320
Number of significant digits: 4
Minimum unit: 0.00001

Setting range of bias: –32000 to +32000%
Number of significant digits: 4
Minimum unit: 0.001%

Input limit function: The function which limits the input-1, input-2, and input-3 signals between 0%and 100%.

Setting range of low-cut point: 0 to 100%
Number of significant digits: 4
Minimum unit: 0.001%

Computation accuracy: ±0.1% (However, input (X1) vs. output when K1 = K2 = K3 = K4 = 1, A1 = A2 = A3 = A4 = 0%, and inputs (X2, X3) are fixed at 100%.)

Ordering Information and Initial Settings

- Gain: K1 = 1, K2 = 1, K3 = 1, and K4 = 1
  Number of significant digits: 4 (e.g. 1.23456 unacceptable; 12.34, 1.234, 0.01234 acceptable)
- Bias: A1 = 0%, A2 = 0%, A3 = 0%, and A4 = 0%
  Number of significant digits: 4 (e.g. 123.456% unacceptable; 12.34, 1.234, 0.012% acceptable)
- With input limit function

● **MXT-V High Selector**

This computing unit selects the highest signal out of three input signals (X1, X2, and X3) or out of two input signals (X1 and X2) to output it (Y).

Ordering Information

- Number of inputs: e.g. 3-input high selector

● **MXT-W Low Selector**

This computing unit selects the lowest signal out of three input signals (X1, X2, and X3) or out of two input signals (X1 and X2) to output it (Y).

Ordering Information

- Number of inputs: e.g. 3-input low selector