

General Specifications

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

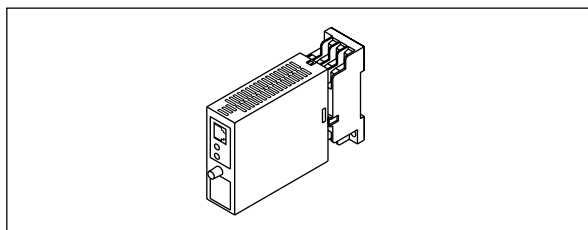


GS 77J01X07-01E

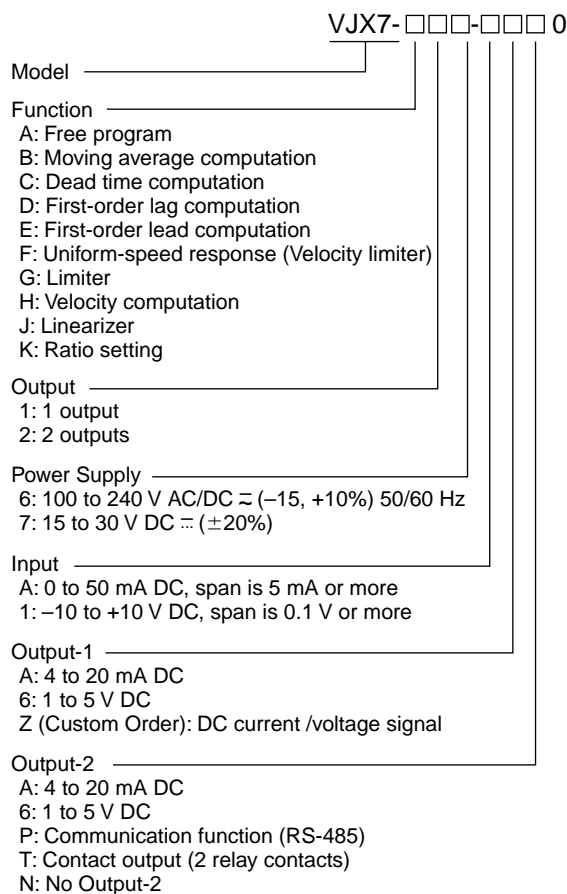
General

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.

- 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 or the like).



Model and Suffix Codes



Input

Input Signal: 1 DC current or 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 M Ω (100 k Ω when power off)

Output

1. Output-1

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

2. Output -2

● Analog Output

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

● 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 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

■ Items Available to Be Set

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

Input range, function code, computation program, address number, baud rate, parity, data length, stop bit and protocol

■ Standard Performance

Accuracy rating: $\pm 0.1\%$ of span

However accuracy is limited in the following case according to the input ranges:

Input range is -10 to +10 V (H range), span is under 5 V;
 accuracy (%) = $\pm 0.1\% \times 5 \text{ V} / \text{input span [V]}$

Input range is -5 to +5 V (M range), span is under 2.5 V;
 accuracy (%) = $\pm 0.1\% \times 2.5 \text{ V} / \text{input span [V]}$

Input range is -1 to +1 V (L range), span is under 0.5 V;
 accuracy (%) = $\pm 0.1\% \times 0.5 \text{ V} / \text{input span [V]}$

When current input, apply [input range \times 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: $\pm 0.1\%$ or less of span for power supply voltage fluctuation of 85 to 264 V AC (47 to 63 Hz)/DC and 12 to 36 V DC.

Effect of Ambient Temperature Change: $\pm 0.2\%$ or less of span for change of 10 °C

■ Safety and EMC Standards

The followings will be acquired.

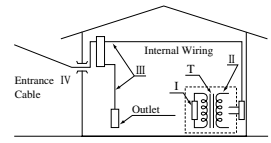
Safety: approved by CSA1010, approved by UL3121-1.

Installation category: CAT. II (CSA1010)

Pollution degree: 2 (CSA1010)

As for the apparatus authorized, power supply voltage is limited to 15V-30VDC, and the circuit to connect is limited to a class 2. (UL3121-1)

Category	Description	Remarks
CAT. I	For measurements performed on circuits not directly connected to MAINS.	
CAT. II	For measurements performed on circuits directly connected to the low voltage installation.	Appliances, portable equipments, etc.
CAT. III	For measurements performed in the building installation.	Distribution board, circuit breaker, etc.
CAT. IV	For measurements performed at the source of the low-voltage installation.	Overhead wire, cable systems, etc.



EMC standards: Complies with EN61326.

The above conformed instrument is only for voltage of 15 to 30 V DC $\pm (\pm 20\%)$.

■ Power Supply and Isolation

Power Supply Rated Voltage:

100 to 240 V AC/DC $\approx 50/60$ Hz

15 to 30 V DC \approx

Power Supply Input Voltage: 100 to 240 V AC/DC \approx

(-15, +10%) 50/60 Hz

15 to 30 V DC $\approx (\pm 20\%)$

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 M Ω /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 input and output-2 when contact output

1000 V AC / minute between output-1 and output-2

■ Environmental Conditions

Temperature: 0 to 50 °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.

■ 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 \times 76 \times 124.5mm (W \times H \times D)

Weight: Approx. 170 g

■ Standard Accessories

Tag number label: 1

Range label: 1

Shunt resistor: 1 (when current input is specified)

■ Items to Specify When Ordering

- Model and suffix codes

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

■ Factory Setting

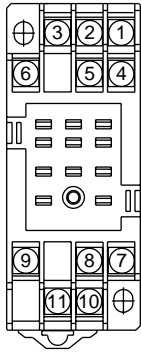
Factory settings are as follows:

- Input range: 4 to 20 mA DC
- Fixed constants: See the functional specification.

● 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

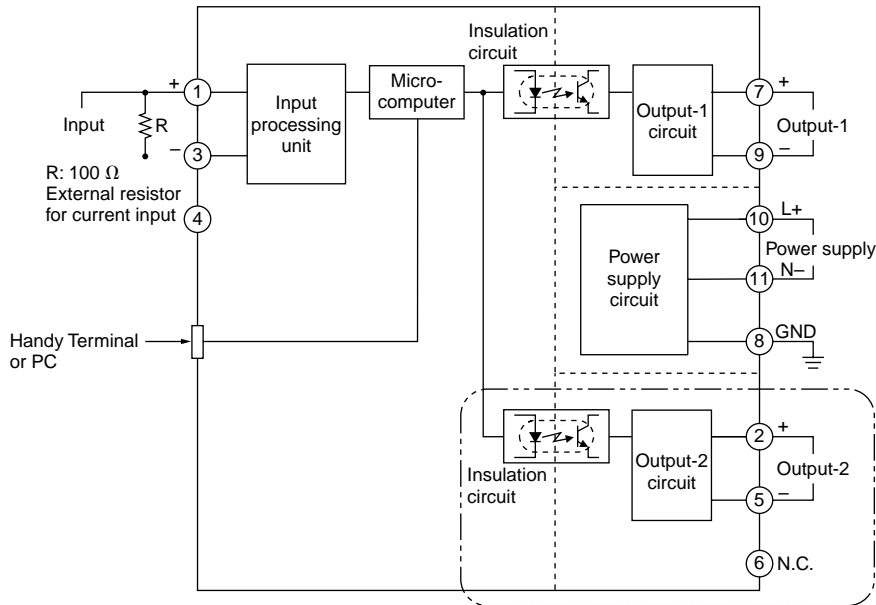
■ Terminal Arrangement



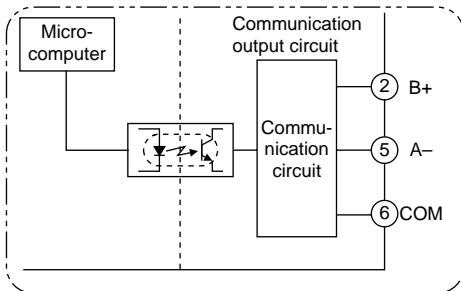
Terminal No.	Signal	Output-2 analog output	Output-2 communication output	Output-2 contact output
1	Input	(+) (+)		
2	Output-2	(+)	B (+)	RLY1
3	Input	(-) (-)		
4	Not connected			
5	Output-2	(-)	A (-)	COM
6	Output-2	Not connected	COM	RLY2
7	Output-1	(+) (+)		
8	GND	GND		
9	Output-1	(-) (-)		
10	Power supply	(L+) (L+)		
11	Power supply	(N-) (N-)		

Note 1: With the one-output type, terminals for Output-2 are not connected.

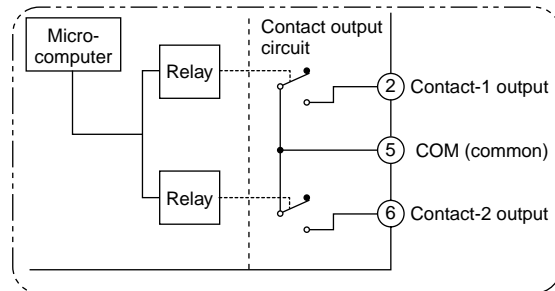
■ Block Diagram



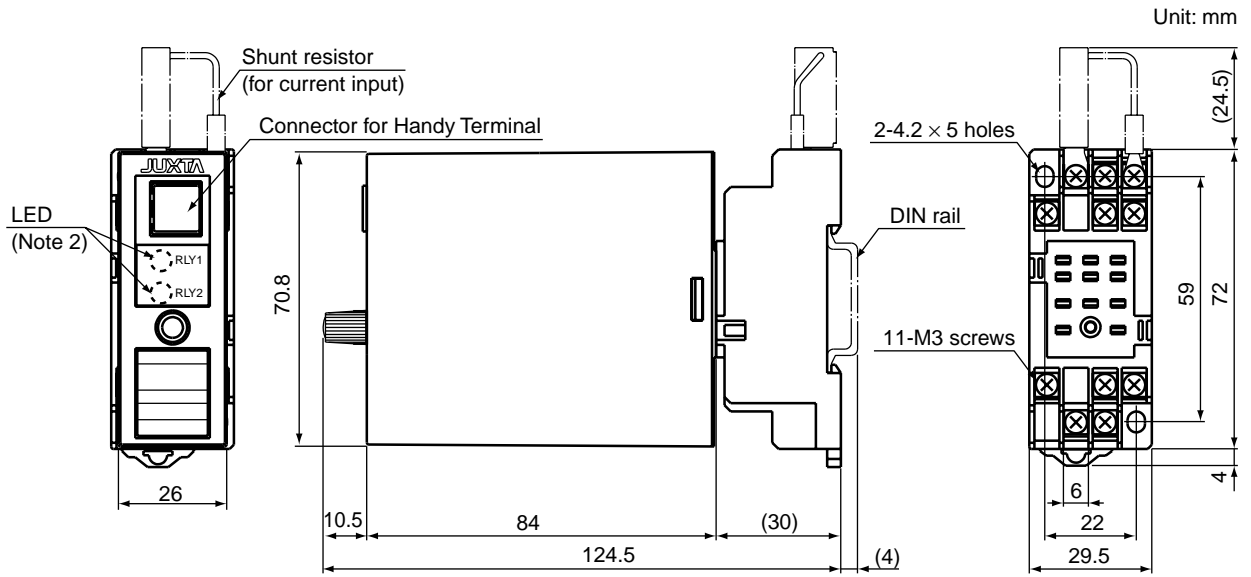
• When output-2 is communication function



• When output-2 is contact output



External Dimensions



Note 2: Only when output-2 is contact 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.

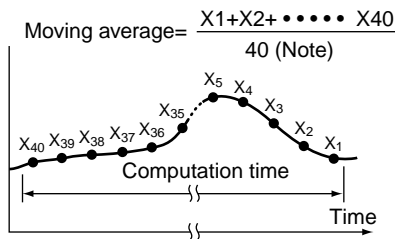
Initial setting

- 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

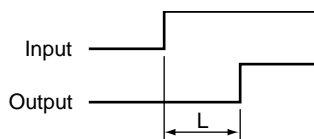
- Moving-average time: 10 sec
- First-order lag time constant: 0 sec

● 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

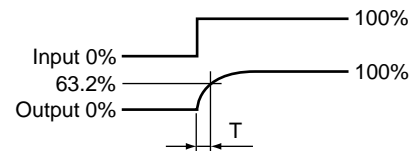
- Dead time: 10 sec
- First-order lag time constant: 0 sec

● 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

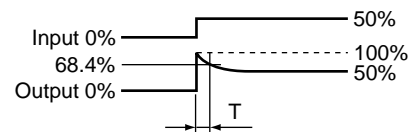
- First-order lag time constant: 10 sec

● 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).

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

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

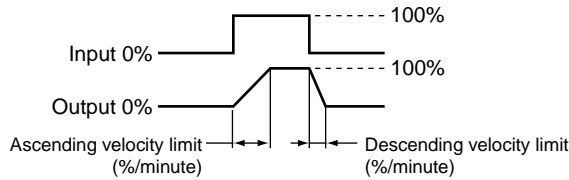
Ordering information and initial setting

- 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) from 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 (%).

Breakpoint (21 points) setting conditions:

For input: -6.0% X0 to X20% 106.0%; minimum unit is 0.01%.

$$X0 < X1 < X2 < \dots < X20$$

For output: -6.0% Y0 to Y20% 106.0%; minimum unit is 0.01%.

When input% X0, Y0 is output.

When input ≥ X20, Y20 is output.

Computation accuracy: ±0.1% (when line-segment gain is 1 or less)

Ordering information and initial setting

- Breakpoint data (21 points at maximum): Write down all the data of X0 to X20, Y0 to Y20. If not specified, the unit will be shipped with the breakpoint data set so that the input equals the output.

● **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%