

# User's Manual

## Model VJS7 Potentiometer Converter (Multi-function) (Isolated Single-output and Isolated Dual-output Types)

JUXTA

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You can download the latest manuals from the following website:

<http://www.yokogawa.com/ns/juxta/im/>

Thank you for purchasing the JUXTA Signal Conditioner.  
Please read through this manual before use for correct handling.

**YOKOGAWA**  
Yokogawa Electric Corporation

IM 77J01S07-01E  
7th Edition Feb. 2017

### CAUTIONARY NOTES FOR SAFE USE OF THE PRODUCT

This User's Manual should be carefully read before installing and operating the product. Please keep this User's Manual for future reference.

For more information of the safety precautions, please refer to the "Precautions on the Use of the JUXTA Series (IM 77J01A00-91Z1)". The related manuals and general specifications are shown in the table below.

Doc. Name	Doc. Number
Precautions on the Use of the JUXTA Series (User's Manual)	IM 77J01A00-91Z1
Model VJS7 Potentiometer Converter (User's Manual)	IM 77J01S07-01E (This manual)
Model VJS7 Potentiometer Converter (General Specifications)	GS 77J01S07-01E

User's manuals in the above table are essential parts of the product; keep it in a safe place for future reference.

This manual is intended for the following personnel;

- Engineers responsible for installation, wiring, and maintenance of the equipment.
- Personnel responsible for normal daily operation of the equipment.

The following symbol is used on the product and in this manual to ensure safe usage.



#### WARNING

**Calls attention to actions or conditions that could cause serious or fatal injury to the user, and indicates precautions that should be taken to prevent such occurrences.**



#### CAUTION

**Calls attention to actions or conditions that could cause injury to the user or damage to the instrument or property and indicates precautions that should be taken to prevent such occurrences.**

### CHECKING THE PRODUCT SPECIFICATIONS AND THE CONTENTS OF PACKING

#### (1) Checking the Model and Product Specifications

Check that the model and specifications indicated on the nameplate attached to the main unit are as ordered.

#### (2) Contents of the Packing

Check that the package contains the following items:

- VJS7: 1 unit
- Standard Accessories:
  - Tag number label: 1 sheet
  - Range label: 1 sheet
  - User's manual (IM 77J01S07-01E, this manual): 1 copy
  - User's manual (IM 77J01A00-91Z1): 1 copy

### GENERAL

This plug-in type converter is used in combination with transmitters which send displacement information of regulator valves by resistance change signals from a potentiometer, and converts the resistance change 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 alarm output (2 relay contacts). (Isolated Dual-output Type)
- Various parameters such as input range can be set and modified using a PC (VJ77(sold separately)) or Handy Terminal (JHT200(sold separately) and the like).

### MODEL AND SUFFIX CODES

Model	Suffix codes	Description
VJS7	-0 x x -1 x x 0 /x	Potentiometer Converter (Multi-function)
Fixed code	-0	Always -0
Output configuration	1	1 output
	2	2 outputs
Power supply	6	100-240 V AC/DC (*1)
	7	15-30V DC (*2)
Input signal	-1	Potentiometer resistance (Total resistance: 100Ω to 10kΩ)
	-Z	Optional signals of resistance other than the code-1 resistance above
Output-1	A	4 to 20mA DC
	B	2 to 10mA DC
	C	1 to 5mA DC
	D	0 to 20mA DC
	E	0 to 16mA DC
	F	0 to 10mA DC
	G	0 to 1mA DC
	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 5 V DC
	7	-10 to +10V DC
	Z	(Custom Order)(*3)
Output-2	A	4 to 20mA DC
	6	1 to 5V DC
	P	Communication function (RS-485)
	T	Alarm output (2 relay contacts)
	N	No output-2
Fixed code	0	Always 0
Option	/SN	No socket (with socket if not specified)
	/C0	HumiSeal coating(*4)
	/FB	Fuse bypass(*4)

\*1 Operating range: 85-264 V AC/DC

\*2 Operating range: 12-36 V DC

\*3 DC voltage signal or DC current signal

\*4 When option code /C0 or /FB is specified, the conformity to the safety and EMC standards is excluded. CE marking is not applicable.

## 1. MOUNTING METHODS

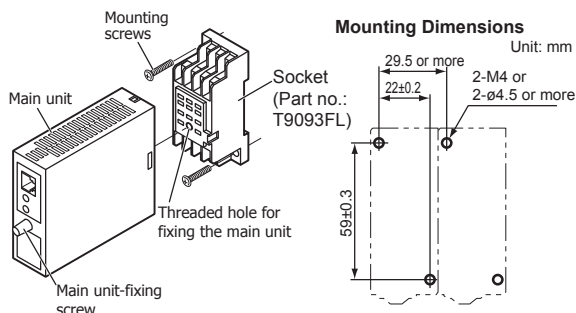


### CAUTION

- Plug/disconnect the main unit into/from the socket vertically to the socket face. Otherwise the terminals may bend and it may cause bad contact.
- The converter shall not tilt 5 degrees or more in either direction when installed.
- When the converter is not connected to the socket, it is necessary to protect the socket against ingress of dust to the connector part.
- Keep this product in a conductive bag when plugged out, during transport or storage.

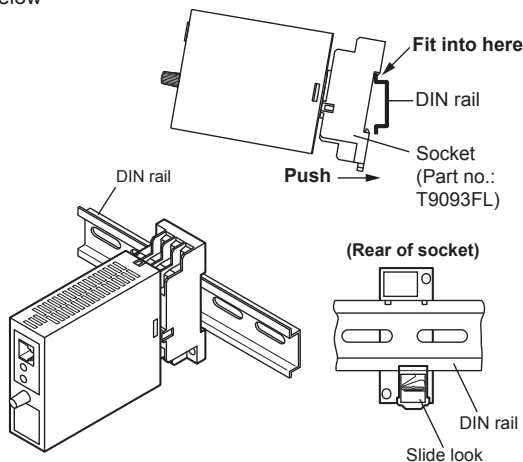
### 1.1 Wall Mounting

Loosen the main unit-fixing screw of the product and pull out the main unit from the socket. Fix the socket on the wall with screws. Next, insert the main unit into the socket and fasten the main unit with the main unit-fixing screw.



### 1.2 DIN Rail Mounting

Insert a DIN rail into the upper part of the DIN rail groove on the rear of the socket, and then slide the slide lock at the lower part of the socket upwards until the socket is fixed into position as shown below



### 1.3 Mounting Using

When using a multi-mounting base, see the User's Manual for VJCE (VJCE Mounting Base).

### 1.4 Using a Duct

When using a wiring duct, install the duct at least 30 mm away from the top and bottom faces of the main unit.

## 2. INSTALLATION LOCATION

- Avoid the following environments for installation locations: Areas with vibrations, corrosive gases, dust, water, oil, solvents, direct sunlight, radiation, a strong electric field, and/or a strong magnetic field, direct radiant heat, wind, temperature fluctuation, 2,000 m or more above sea level.
- If there is any risk of a surge being induced into the power line and/or signal lines due to lightning or other factors, a dedicated lightning arrester should be used as protection for both the product and a field-installed device.
- Operating temperature/humidity range: -10 to 55°C (-10 to 45°C for side-by-side mounting\*)/5 to 90%RH (no condensation)
  - \* If the previous model (style S3.xx earlier) is installed together, the ambient temperature is 0 to 40°C.

- Continuous vibration: (at 5 to 9 Hz) Half amplitude of 3 mm or less (at 9 to 150 Hz) 9.8m/s<sup>2</sup> or less, 1 oct/min for 90 minutes each in the three axis directions
- Impact: 98 m/s<sup>2</sup> or less, 11 ms, 3 axes, 6 directions, 3 times each

## 3. EXTERNAL WIRING

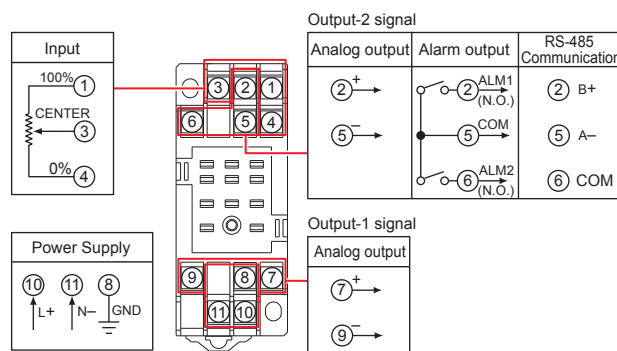


### WARNING

- To avoid the risk of an electric shock, turn off the power supply and use a tester or similar device to ensure that no power is supplied to a cable to be connected, before carrying out wiring work.
- Do not operate the product in the presence of flammable or explosive gases or vapors. To do so is highly dangerous.
- Use of the product ignoring the specifications may cause overheating or damage. Before turning on the power, ensure the following:
  - Power supply voltage and input signal value applied to the product should meet the required specifications.
  - The external wiring to the terminals and wiring to ground are as specifications.

Wiring should be connected to the terminals on the socket of the product. The terminals for external connections are of M3 screws. Use crimp-on terminal lugs for connections to the terminals.

- Recommended cables: A nominal cross-sectional area of 0.5 mm<sup>2</sup> or thicker for signal cables, and that of 1.25 mm<sup>2</sup> or thicker for power cables.



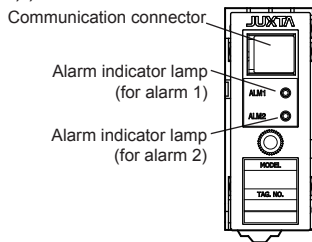
### CAUTION

- Do not use output-2 for the isolated single-output type.
- The power line and input/output signal lines should be installed away from noise-generating sources. Otherwise accuracy cannot be guaranteed.
- Make sure to earth ground the ground terminal through minimum resistance. The length and thickness of the grounding cable should be as short and thick as possible. Directly connect the lead from the ground terminal (terminal no. 8) of the product to the ground. Do not carry out daisy-chained inter-ground terminal wiring
- The product is sensitive to static electricity; exercise care in operating it. Before you operate the product, touch a nearby metal part to discharge static electricity.
- If an inductance (L) load such as auxiliary relays or solenoid valves is used, always insert a spark killer for diminishing sparks, such as a CR filter or a diode in parallel with the inductance load. Otherwise a malfunction or relay failure may occur. Refer to the following guidelines for a capacitor and resistor:
  - C: 0.5 to 1 μF with respect to a contact current of 1 A
  - R: 0.5 to 1 Ω with respect to a contact voltage of 1 V
- If the ambient temperature is 50 °C or more, please use the cable that the rated temperature is 70 °C or more.

## 4. DESCRIPTION OF FRONT PANEL

### 4.1 Front Panel

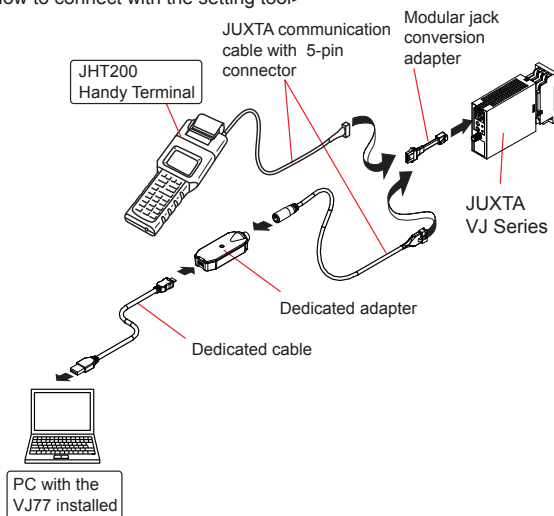
The communications connector in the front panel is used for setting up parameters through a PC (VJ77 PC-based Parameters Setting Tool) or the Handy Terminal. The alarm-1 and alarm-2 LEDs light up if an alarm occurs (those LEDs are provided only when the output-2 is specified for alarm output (the output-2 suffix code is T).)



### 4.2 Connector for Communication

Use the connector for communication when setting the parameters using a PC (VJ77 Parameters Setting Tool) or the Handy Terminal

<How to connect with the setting tool>



- Use the VJ77 of version R2.02.01 or later.
- The modular jack conversion adapter does not come with the JHT200 Handy Terminal. It is sold separately.

## 5. SETTING PARAMETERS

Set the parameters using a PC (VJ77 Parameter Setting Tool) or the Handy Terminal. Refer to “7. LIST OF PARAMETERS” in this manual and the User's Manual for VJ77 PC-based Parameters Setting Tool (IM 77J01J77-01E) or the User's Manual for JHT200 Handy Terminal (IM 77J50H01-01EN). Parameters are indicated inside the [ ].



### CAUTION

- Set the parameters in order starting with (1).
  - (1) Burnout
  - (2) Total resistance
  - (3) Input range
- Set the burnout action before setting the input range. Changing the burnout action setting resets the input range.

### 5.1 Settings Related to Inputs and Outputs

#### 5.1.1 Burnout

Set the burnout operation in [D39: BURN OUT].  
Set “OFF”, “UP”, or “DOWN.”

#### 5.1.2 Total resistance

Set the total resistance in [D14: RESIST].  
Setting range: 100 to 10000 Ω

#### 5.1.3 Input Range

Set the input low range in [P22: IN1 LOW\_RNG], and input high range in [P23: IN1 HIGH\_RNG].

##### (1) Resetting the input range

Select and set “RESET” in [P22: IN1 LOW\_RNG] or [P25: IN1 HIGH\_RNG]. Then the input low range [D24: INPUT1L\_RNG] or input high range [D25: INPUT1H\_RNG] are reset.

##### (2) Setting the input low range

Apply the stable signal equivalent to 0% input from the connected potentiometer. Select and set “EXECUTE” in [P22: IN1 LOW\_RNG]. Then the input low range [D24: INPUT1L\_RNG] is set automatically.

##### (3) Setting the input high range

Apply the stable signal equivalent to 100% input from the connected potentiometer. Select and set “EXECUTE” in [P23: IN1 HIGH\_RNG]. Then the input high range [D25: INPUT1H\_RNG] is set automatically.

#### 5.1.4 Software Filter

Set the software filter in [D57: S/W FILTER].

OFF, LOW, MIDDLE, HIGH (default value: OFF)

When LOW, MIDDLE, or HIGH is selected, a first-order filter equivalent to 100 ms, 300 ms, or 1 s is inserted in the input.

#### 5.1.5 Direction of Output Action

Analog output signals can be reversed. To reverse the signal from output-1, set [D50: OUT1 DR] to REVERSE. For output-2, set [D51 OUT2 DR] to REVERSE. To return the output-1 signal to normal, set [D50: OUT1 DR] to DIRECT. For output-2, set [D51: OUT2 DR] to DIRECT.

## 5.2 Settings Related to Communication Function

Set the following parameters when output-2 is specified for communication function. For more information on the communication function, see the Instruction Manual for VJ Series Communication Function (IM 77J1J11-01E).

#### 5.2.1 Communication Protocol

Set the communication protocol by selecting from among PCLINK, PC-LINK WITH SUM, MODBUS ASCII, MODBUS RTU, and LADDER in [F01: PROTOCOL].

#### 5.2.2 Communication Address

Set the address number of the isolator numerically in a range of 1 to 99 in [F02: ADDRESS].

#### 5.2.3 Baud Rate

Set the baud rate by selecting from among 1200, 2400, 4800, 9600, 19200 and 38400 bps in [F03: BAUD RATE].

#### 5.2.4 Parity

Select and set NONE, EVEN, or ODD in [F04: PARITY].

#### 5.2.5 Data Length

Select and set 7 bits or 8 bits in [F05: DATA LEN].

#### 5.2.6 Stop Bit

Select and set 1 bit or 2 bits in [F06: STOP BIT].

#### 5.2.7 Input Decimal Point Position

Number of digits of decimal places (setting of D register [D0003]) can be set.

Select and set among 0 to 5 digits in [F07: INPUT DEC PT].

## 5.3 Settings Related to Alarm Output

Set the following parameters when output-2 is specified for alarm output.

#### 5.3.1 Alarm Setpoints

Set the alarm setpoints of alarm-1 and alarm-2 in [E03: SET POINT1] and [E04: SET POINT2] numerically.

- Setting range: A range of 0 to 100% of input range
- Setting resolution: 0.1%

#### 5.3.2 Direction of Alarm Action

Select the direction of alarm-1 action and that of alarm-2 action from among HIGH ALM (high-limit alarm) and LOW ALM (low-limit alarm) and set each in [E05: ALM1 ACTION] (direction of alarm-1 action) or [E06: ALM2 ACTION] (direction of alarm-2 action).

- To activate alarm status when input signal  $\geq$  alarm setpoint, select HIGH ALM.
- To activate alarm status when input signal  $\leq$  alarm setpoint, select LOW ALM.

### 5.3.3 Hysteresis

Set alarm-1 and alarm-2 hysteresis, in [E09: HYSTERESIS1] and [E10: HYSTERESIS2]. Hysteresis is a value added to the alarm setpoint in order for an alarm status to be released (to normal) after the alarm status has been activated. The alarm status will be released in the following conditions, depending on the direction of alarm action.

- \* When HIGH ALM (high-limit alarm) is set: Alarm is released when input signal < (alarm setpoint - hysteresis).
- \* When LOW ALM (low-limit alarm) is set: Alarm is released when input signal > (alarm setpoint + hysteresis).
- Setting range: A range of 0 to 100% of input range
- Setting resolution: 0.1%

### 5.3.4 Alarm ON Delay and Alarm OFF Delay

Set alarm-1 and alarm-2 ON delays in [E11: ON DELAY1] and [E12: ON DELAY2] and then alarm-1 and alarm-2 OFF delays in [E13: OFF DELAY1] and [E14: OFF DELAY2]. An alarm ON delay is a delay time from the establishment of alarm condition to alarm output; an alarm OFF delay is a delay time from the establishment of return-to-normal condition to output.

- Setting range: 0 to 999 seconds
- Setting resolution: 1 second (Note that about 0.2 second will be added to set time to prevent erroneous operation.)

For example, when an alarm ON delay is set to 1 second, alarm output is generated if alarm status continues for more than 1 second after the input value exceeds the alarm setpoint. Further, when an alarm OFF delay is set to 2 seconds, alarm output is released if normal condition continues for more than 2 seconds after the input value has returned to normal from the alarm status.

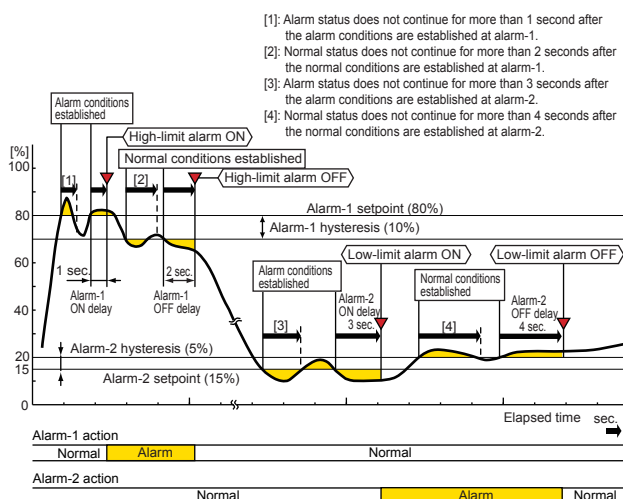
### 5.3.5 Direction of Relay Action

Set the direction of relay energizing in alarm-1 normal condition and alarm-2 normal condition by selecting from among NRM DEENERGIZED (de-energized under normal condition) and NRM ENERGIZED (energized under normal condition) in [E15: RL1 ACTION] and [E16: RL2 ACTION] and set them.

## 6. DESCRIPTION OF ALARM ACTIONS

This chapter describes examples of alarm actions under the following conditions.

Item	Alarm-1 Parameter	Setpoint	Alarm-2 Parameter	Setpoint
Direction of alarm action	E05: ALM1 ACTION	High-limit alarm	E06: ALM2 ACTION	Low-limit alarm
Alarm setting	E03: SET POINT1	80%	E04: SET POINT2	15%
Hysteresis	E09: HYSTERESIS1	10%	E10: HYSTERESIS2	5%
Alarm ON delay	E11: ON DELAY1	1 sec.	E12: ON DELAY2	3 sec.
Alarm OFF delay	E13: OFF DELAY1	2 sec.	E14: OFF DELAY2	4 sec.
Description of alarm actions	The alarm sounds if the condition where the input value is 80% or more of high-limit alarm continues for more than 1 second. After the alarm sounds, when the condition where input value is less than 70% of the high-limit alarm continues for more than 2 seconds, the status returns to normal		The alarm sounds if the condition where the input value is 15% or less of low-limit alarm continues for more than 3 seconds. After the alarm sounds, when the condition where input value is more than 20% of the low-limit alarm continues for more than 4 seconds, the status returns to normal.	



## 7. LIST OF PARAMETERS

Parameter Display	Item
MODEL	Model
TAG NO	Tag no.
SELF CHK	Self-check result
<b>A DISPLAY1</b>	<b>Display1</b> *2
A01 INPUT1	Input value 1
A09 OUTPUT1	Output value 1
A10 OUTPUT2	Output value 2
A15 ALM1 STATUS	Alarm-1 status
A16 ALM2 STATUS	Alarm-2 status
A54 STATUS	Status *1
A56 REV NO	Rev. no.
A58 MENU REV	MENU REV
A60 SELF CHK	Self-check result
<b>B DISPLAY2</b>	<b>Display2</b> *2
B01 INPUT1	Input value 1
B09 OUTPUT1	Output value 1
B10 OUTPUT2	Output value 2
B15 ALM1 STATUS	Alarm-1 status
B16 ALM2 STATUS	Alarm-2 status
B60 SELF CHK	Self-check result
<b>D SET (I/O)</b>	<b>Setting (I/O)</b> *2
D01 TAG NO.1	Tag no. 1
D02 TAG NO.2	Tag no. 2
D03 COMMENT1	Comment 1
D04 COMMENT2	Comment 2
D14 RESIST	Total resistance
D24 INPUT1 L_RNG	Input low range
D25 INPUT1 H_RNG	Input high range
D32 OUT1 L_RNG	Output-1 low range *3
D33 OUT1 H_RNG	Output-1 high range *3
D34 OUT2 L_RNG	Output-2 low range *3
D35 OUT2 H_RNG	Output-2 high range *3
D39 BURN OUT	Burnout
D50 OUT1 DR	Direction of output-1 action
D51 OUT2 DR	Direction of output-1 action
D57 S/W FILTER	Software filter
D59 NMRR	Frequency setting *3
D60 SELF CHK	Self-check result
<b>E SET(ALM)</b>	<b>Setting (alarm output)</b> *2
E03 SET POINT1	Alarm-1 setting (%)
E04 SET POINT2	Alarm-2 setting (%)
E05 ALM1 ACTION	Direction of alarm-1 action
E06 ALM2 ACTION	Direction of alarm-2 action
E09 HYSTERESIS1	Alarm-1 hysteresis (%)
E10 HYSTERESIS2	Alarm-2 hysteresis (%)
E11 ON DELAY1	Alarm-1 ON delay setting
E12 ON DELAY2	Alarm-2 ON delay setting
E13 OFF DELAY1	Alarm-1 OFF delay setting
E14 OFF DELAY2	Alarm-2 OFF delay setting
E15 RL1 ACTION	Direction of alarm-1 relay action
E16 RL2 ACTION	Direction of alarm-1 relay action
E60 SELF CHK	Self-check result
<b>F SET(COM)</b>	<b>Setting (communication)</b> *2
F01 PROTOCOL	Communication protocol
F02 ADDRESS	Address
F03 BAUD RATE	Baud rate
F04 PARITY	Parity
F05 DATA LEN	Data Length
F06 STOP BIT	Stop bit
F07 INPUT DEC PT	Decimal point position of input
F60 SELF CHK	Self-check result
<b>P ADJUST</b>	<b>Adjustment</b> *2
P22 IN1 LOW RNG	Input-1 low range setting
P23 IN1 HIGH RNG	Input-1 high range setting
P30 OUT1ZERO ADJ	Zero adjustment of output-1
P31 OUT1SPAN ADJ	Span adjustment of output-1
P32 OUT2ZERO ADJ	Zero adjustment of output-2
P33 OUT2SPAN ADJ	Span adjustment of output-2
P60 SELF CHK	Self-check result
<b>Q TEST</b>	<b>Test</b> *2
Q04 OUT1 TEST	Forced output (output 1)
Q05 OUT2 TEST	Forced output (output 2)
Q10 ALM1 TEST	Forced output (alarm 1)
Q11 ALM2 TEST	Forced output (alarm 2)
Q60 SELF CHK	Self-check result

\*1 The Status is displayed for service personnel to see history records.

\*2 There are items not displayed depending on what output-2 is specified.

\*3 The parameters are the items to be set at the factory.



## 8. MAINTENANCE

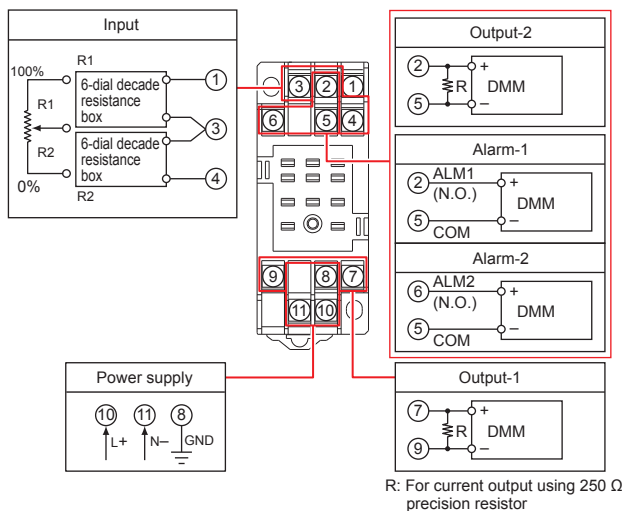
The product starts running immediately when the power is turned on; however, it needs 10 to 15 minutes of warm-up before it meets the specified performance.

### 8.1 Calibration Apparatus

- 6-dial decade resistance boxes × 2 units (YOKOGAWA 279301 or equivalent)
- A digital multimeter (DMM) (YOKOGAWA 7561 or equivalent)
- A precision resistor of  $250\ \Omega \pm 0.01\%$ , 1W
- Setting tool for adjustment (Refer to "4.2 Connector for Communication" in this manual.)

### 8.2 Calibration Procedure

1. Connect the instruments as shown below. First adjust the output-1 signal and then the output-2 signal.



2. Operate the variable resistor according to the specifications (total resistance, 0%, 100% resistance) of the potentiometer to be connected. Keeping total resistance constant, change each value of R1 and R2 to apply the resistance equivalent to 0, 25, 50, 75, and 100% of the input range to the converter.
3. Check to see the corresponding output voltages are 0, 25, 50, 75, and 100% respectively and within the specified accuracy rating. ("R" is used for current output.)

For alarm output, check the relay action by the alarm indicator lamp or resistance of output terminals.

- Use the setting tool (VJ77 Parameter Setting Tool or JHT200 Handy Terminal) to adjust the input/output signals.

User's Manual for VJ77 [Document No.: IM 77J01J77-01E]  
User's Manual for JHT200 [Document No.: IM 77J50H01-01EN]

## 9. SAFETY AND EMC STANDARDS

The following will be acquired.

Safety:

IEC/EN 61010-1 compliance (CE), IEC/EN 61010-2-030 compliance (CE)  
CAN/CSA C22.2 No.61010-1 compliance (CSA)  
UL61010-1 (CSA NRTL/C)

Installation category II

Pollution degree 2

Measurement category O (other)

Rated measurement input voltage:  $\pm 0.5\ \text{V DC max.}$

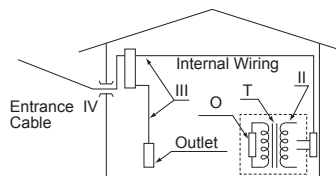
Rated transient overvoltage:  $1500\ \text{V}^{(*)}$

\* This is a reference safety standard value for Measurement Category I of CSA/UL61010-1 and Measurement Category O of EN 61010-2-030. This value is not necessarily a guarantee of instrument performance.



### CAUTION

**This instrument is for Measurement Category O (other). Do not use it for measurements in locations falling under Measurement Categories II, III, and IV.**



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

### EMC standards:

- CE marking:  
EN 61326-1 Class A, Table 2  
EN 61326-2-3
- \* The instrument continues to operate at a measurement accuracy of within  $\pm 20\%$  of the range during testing.  
EN 55011 Class A Group 1  
EN 61000-3-2 Class A  
EN 61000-3-3
- 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



### CAUTION

**Caution to comply with EMC standards: When operating this instrument by external power supply, use an independent power unit conforming to CE-marking. Be sure to use the lightning arrester to comply EMC standards.**

Note: When option code /C0 or /FB is specified, the conformity to the safety and EMC standards is excluded.

## 10. 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.)

## 11. TRANSPORT AND STORAGE CONDITIONS

- Temperature:  $-25$  to  $70^\circ\text{C}$
- Temperature change rate:  $20^\circ\text{C}$  per hour or less
- Humidity: 5 to 95%RH (no condensation)



### CAUTION

**Keep this product in a conductive bag when plugged out, during transport or storage.**