

**Plug-in Signal Conditioners M-UNIT**

**ENCODER POSITION TRANSMITTER**  
(field-programmable; built-in excitation)

MODEL **JRQ2**

**MODEL & SUFFIX CODE SELECTION**

JRQ2-□□□□

MODEL \_\_\_\_\_

**INPUT SELECTION**

- Open collector
- Voltage pulse
- RS-422 line driver

Two inputs (phase A and B) are required for adequate operation of the JRQ2.

**EXCITATION** \_\_\_\_\_

- 1 : 5V DC @120mA
- 4 : 12V DC @60mA
- 7 : 24V DC @25mA

**OUTPUT** \_\_\_\_\_

**Current**

- A : 4 – 20mA DC
- B : 2 – 10mA DC
- C : 1 – 5mA DC
- D : 0 – 20mA DC
- E : 0 – 16mA DC
- F : 0 – 10mA DC
- G : 0 – 1mA DC
- Z : Specify current

**Voltage**

- 1 : 0 – 10mV DC
- 2 : 0 – 100mV DC
- 3 : 0 – 1V DC
- 4 : 0 – 10V DC
- 5 : 0 – 5V DC
- 6 : 1 – 5V DC
- 4W : -10 – +10V DC
- 5W : -5 – +5V DC
- 0 : Specify voltage

**POWER INPUT** \_\_\_\_\_

**AC Power**

- K : 85 – 132V AC

**DC Power**

- S : 12V DC
- R : 24V DC
- V : 48V DC
- P : 110V DC

**ORDERING INFORMATION**

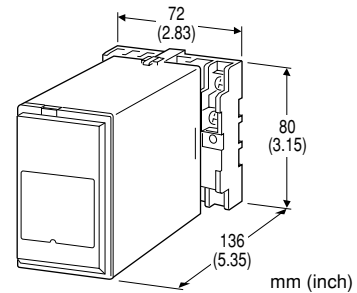
Specify code number and variables. Use Ordering Information Sheet (No. ESU-1576). Factory setting (table below) will be used if not otherwise specified.

- **Code number** (e.g. JRQ2-76-K)
- **Special output range** (For codes Z & 0)

**Factory Setting**

Input type	Open collector
Pulse amplitude	----
Noise filter	None
Detecting level	1V *1(5V excitation) 2V *1(12/24V excitation)
Count mode	1 count / 1 pulse (Phase B by one pulse edge)
Input zero count	0
Input span count	1000
Alarm setpoint	100%
Alarm deadband	1.00%
Alarm mode	High alarm
Linearization	Without
Input count at power off	Not held (Cold Start)

\*1. Detecting voltage in the internal circuit



**Functions & Features**

- Converts a two-phase forward and reverse rotation pulse signal with 90 degree phase difference into a forward and reverse position signal
  - Built-in excitation
  - Field-selectable input type and range
  - Isolation up to 2000V AC
  - High-density mounting
- Typical Applications**
- Measuring moving distance of a machine with a rotary encoder

**RELATED PRODUCTS**

- **Programming unit** (model: PU-2x)

**GENERAL SPECIFICATIONS**

- Construction:** Plug-in
- Connection:** M3.5 screw terminals
- Housing material:** Flame-resistant resin (black)
- Isolation:** Input to output to alarm output to power
- Pulse sensing:** DC coupled
- Overrange output:** Approx. -15 – +115% at 1 – 5V
- Alarm mode:** High or Low
- Alarm setpoint:** -15 – +115%
- Alarm deadband:** 0 – 20%
- Reset input:** Resets the internal counter value (The transmitter output equivalent to 0 count when the reset input terminals are closed for 500 msec. or longer.)
- Output at input/zero/span count overflow**
  - Positive side:** Held at the max. of 115%
  - Negative side:** Held at the min. of -15%
- Input monitor LED (PL1):** Red LED flashes according to the input phase A.
- Input monitor LED (PL2):** Red LED flashes according to the input phase B.
- Excitation adjustment:** 5 – 24V DC
- DIP/rotary switches:** For selecting input specifications
- Detecting level adjustments:** Used to adjust the threshold to determine the pulse state.
- Zero and span adjustments:** ±5% (front)
- Linearization:** Max. 16 points
- Modular jack:** Connecting the PU-2x

**Software programming:** Programming unit (model: PU-2x) used to set the input count range, zero and span, alarm, fine output adj., linearization, etc.

## INPUT & OUTPUT

### ■INPUT

**Maximum frequency:** 200 kHz

**Maximum count range:** -99999999 to +99999999

**Excitation:** Shortcircuit protection; 440mA max. at shortcircuit

**Minimum pulse width time requirement:** 2.5  $\mu$ sec. for both ON and OFF

### •Open Collector

#### Input requirements

EXCITATION	SENSING	OFF	ON
5V	Approx. 4V / 1.5mA	$\geq 200k\Omega$	$\leq 200\Omega$
12V	Approx. 9V / 2.3mA	$\geq 200k\Omega$	$\leq 200\Omega$
24V	Approx. 16V / 4.7mA	$\geq 200k\Omega$	$\leq 200\Omega$

**Detecting level:** 1V (5V excitation) \*

2V (12/24V excitation) \*

**Detecting pulse edge:** OFF to ON

### •Voltage Pulse

**Waveform:** Square or sine

**Input impedance:** 10k $\Omega$  minimum

**Pulse amplitude:** 0.1 – 100V p-p

**Max. voltage between input terminals:** 50V

**Detecting level:** 0 – 5V\* (factory setting: 2V)

**Detecting pulse state:** A pulse rise detected when the input voltage goes above the detecting level; a pulse sink detected when it goes below the level.

\*Detecting voltage in the internal circuit.

### •RS-422 Line Driver

**Receiver:** Conforms to RS-422

### ■OUTPUT

**•DC Current:** 0 – 20mA DC

**Minimum span:** 1mA

**Zero suppression/elevation:** Max. 1.5 times span

**Load resistance:** Output drive 15V maximum

Output	Load Resistance
4 – 20mA	: 750 ( $\Omega$ maximum)
2 – 10mA	: 1500
1 – 5mA	: 3000
0 – 20mA	: 750
0 – 16mA	: 900
0 – 10mA	: 1500
0 – 1mA	: 15k

**•DC Voltage:** -10 – +12V DC

**Minimum span:** 5mV

**Zero suppression/elevation:** Max. 1.5 times span

**Load resistance:** Output drive 10mA maximum; 5mA for negative voltage output; at  $\geq 0.5V$

Output	Load Resistance
0 – 10mV	: 10k ( $\Omega$ minimum)
0 – 100mV	: 100k
0 – 1V	: 100
0 – 10V	: 1000
0 – 5V	: 500
1 – 5V	: 500
-10 – +10V	: 2000
-5 – +5V	: 1000

### ■ALARM OUTPUT: Relay contact

**Rated load:** 125V AC @0.5A ( $\cos\phi=1$ )

30V DC @0.5A (resistive load)

Electrical life  $10^5$  cycles (resistive load)

**Maximum switching voltage:** 250V AC or 125V DC

**Maximum switching power:** 62.5VA or 60W

**Minimum load:** 10mV DC @1mA

**Mechanical life:**  $5 \times 10^7$  cycles (300 cycles/minute)

For maximum relay life with inductive loads, external protection is recommended.

## INSTALLATION

### Power input

**AC:** Operational voltage range 85 – 132V, 47 – 66 Hz, approx. 7VA

**DC:** Operational voltage range: Rating  $\pm 10\%$ , or 85 – 150V for 110V rating; ripple 10% p-p max.; approx. 4W (140mA at 24V)

**Operating temperature:** -5 to +60°C (23 to 140°F)

**Operating humidity:** 30 to 90% RH (non-condensing)

**Mounting:** Surface or DIN rail

**Dimensions:** W72×H80×D136 mm (2.83"×3.15"×5.35")

**Weight:** 350 g (0.77 lbs)

## PERFORMANCE in percentage of span

**Accuracy:**  $\pm 0.1\%$

**Alarm setpoint accuracy:**  $\pm 0.1\%$

**Temp. coefficient:**  $\pm 0.015\%/^{\circ}\text{C}$  ( $\pm 0.008\%/^{\circ}\text{F}$ )

**Response time:**  $\leq 0.5$  seconds (0 – 90%)

**Line voltage effect:**  $\pm 0.1\%$  over voltage range

**Insulation resistance:**  $\geq 100M\Omega$  with 500V DC

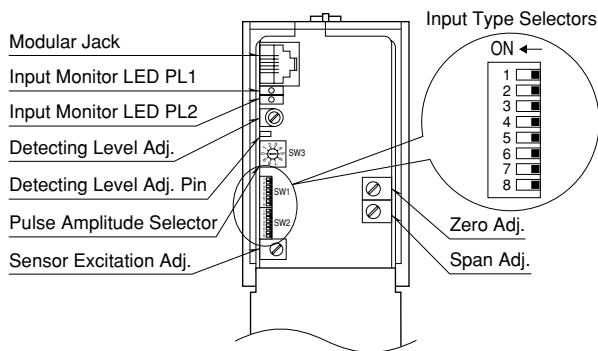
**Dielectric strength:** 2000V AC @1 minute

(input to output to power)

1500V AC @1 minute (input or output or power to alarm output)

2000V AC @1 minute (circuit to ground)

## FRONT PANEL CONFIGURATION & SWITCH SETTING



### ■ PULSE AMPLITUDE (rotary switch) (\*) Factory setting

This setting is invalid for RS-422 line driver input.

For voltage pulse input, select the pulse amplitude (V p-p) among the switch positions 0 through 6. For open collector, set the switch to 7. DO NOT SET to 8 or 9. The power supply to the unit must be turned off when changing the setting.

SW	PULSE AMPLITUDE	MAX. INPUT VOLTAGE
0	50 – 100V p-p	50V
1	25 – 50V p-p	50V
2	10 – 25V p-p	25V
3	5 – 10V p-p	10V
4	1 – 5V p-p	5V
5	0.5 – 1V p-p	1V
6*1	0.1 – 0.5V p-p	0.5V
7(*)	Open collector	

\*1. Maximum frequency limited to  $\pm 50$  kHz.

### ■ DETECTING LEVEL

A specific sensitivity scale is applied according to the pulse amplitude setting. The scaled input voltage is then compared to the preset detecting level.

The scaled H level voltage must be higher than the detecting level so that the pulse state is accurately detected. (Refer to the instruction manual for detailed information about adjusting the detecting level.)

SW	PULSE AMPLITUDE	SENSITIVITY SCALE
0	50 – 100V p-p	1/20
1	25 – 50V p-p	1/10
2	10 – 25V p-p	1/5
3	5 – 10V p-p	1/2
4	1 – 5V p-p	1
5	0.5 – 1V p-p	5
6	0.1 – 0.5V p-p	10
7	Open collector	1

### ■ DIP SWITCH SETTING (\*) Factory setting

Pulse sensing, noise filter and frequency range setting are invalid for RS-422 line driver input. The power supply to the unit must be turned off when changing the setting.

#### •Input Type

INPUT TYPE	SW1 & SW2					
	1	2	3	4	5	6
Open collector (*)	ON	OFF	ON	OFF	OFF	ON
Voltage pulse	OFF	OFF	ON	OFF	OFF	ON
RS-422 line driver*2	OFF	OFF	OFF	ON	ON	OFF

\*2. Pulse amplitude, detecting level and noise filter settings are invalid, however, in order to prevent wrong setting, we recommend to set the amplitude to 50 – 100V p-p (SW = 0), the detecting level to 0V, and no noise filter.

#### •Noise Filter

NOISE FILTER	SW1-7 & SW2-7	SW1-8 & SW2-8
High	ON	OFF
Low (*)	OFF	ON
None	OFF	OFF

'High' setting is for the input frequency  $\pm 10$  Hz or lower, while 'Low' setting is for  $\pm 500$  Hz or lower.

## RANGE CONFIGURATION

### ■ EXAMPLE 1: VOLTAGE PULSE with Amplitude 5V p-p, DC Offset 2.5V, Count Range 0 – 1000

Input type: Voltage

Input count: Zero count set to 0, Span count set to 1000

(Set 0% and 100% range values with the Programming Unit.)

Input amplitude: 1 – 5V p-p

Detecting level: 2.5V (Set to the offset value after it is scaled by the sensitivity scale.)

Noise filter: None (Choose according to the frequency.)

The rotary switch and DIP switch are configured as shown to the right.



### ■ EXAMPLE 2: VOLTAGE PULSE with Amplitude 24V p-p, DC Offset 12V, Count Range -100 – 100

Input type: Voltage

Input count: Zero count set to -100, Span count set to 100

(Set 0% and 100% range values with the Programming Unit.)

Input amplitude: 10 – 25V p-p

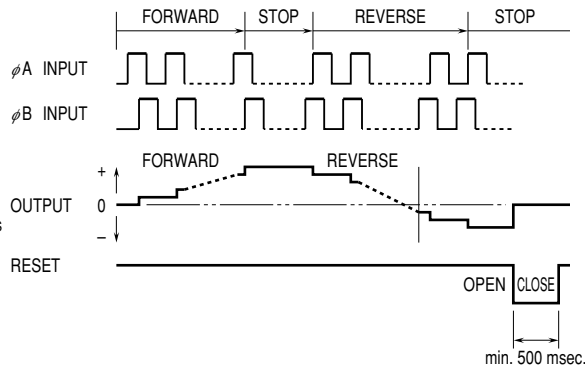
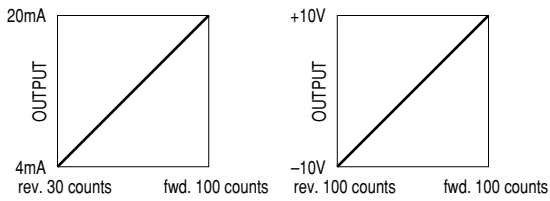
Detecting level: 1.2V (Set to the offset value after it is scaled by the sensitivity scale.)

Noise filter: None (Choose according to the frequency.)

The rotary switch and DIP switch are configured as shown to the right.



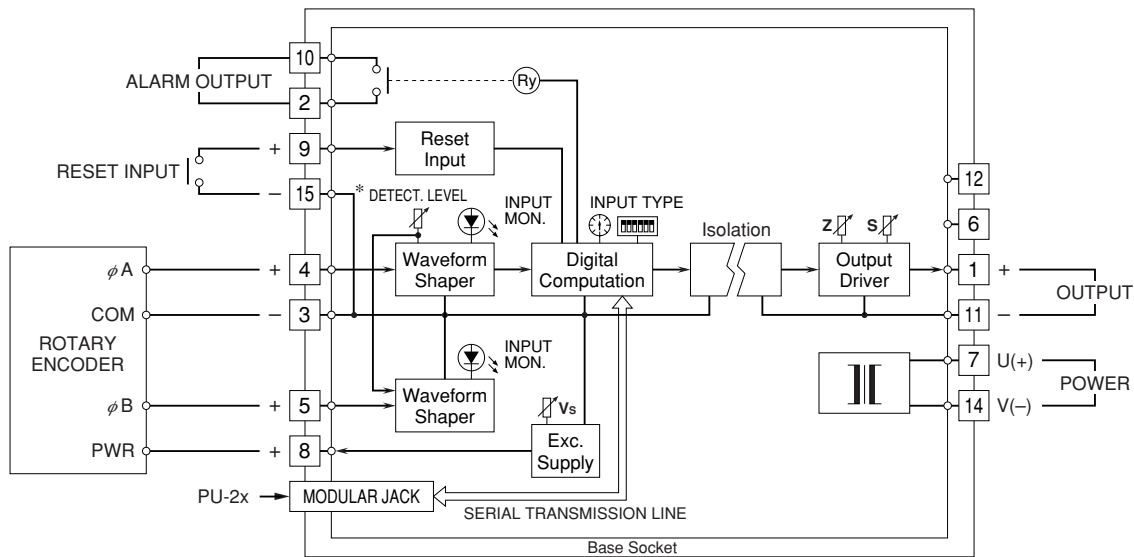
**OPERATIONS**



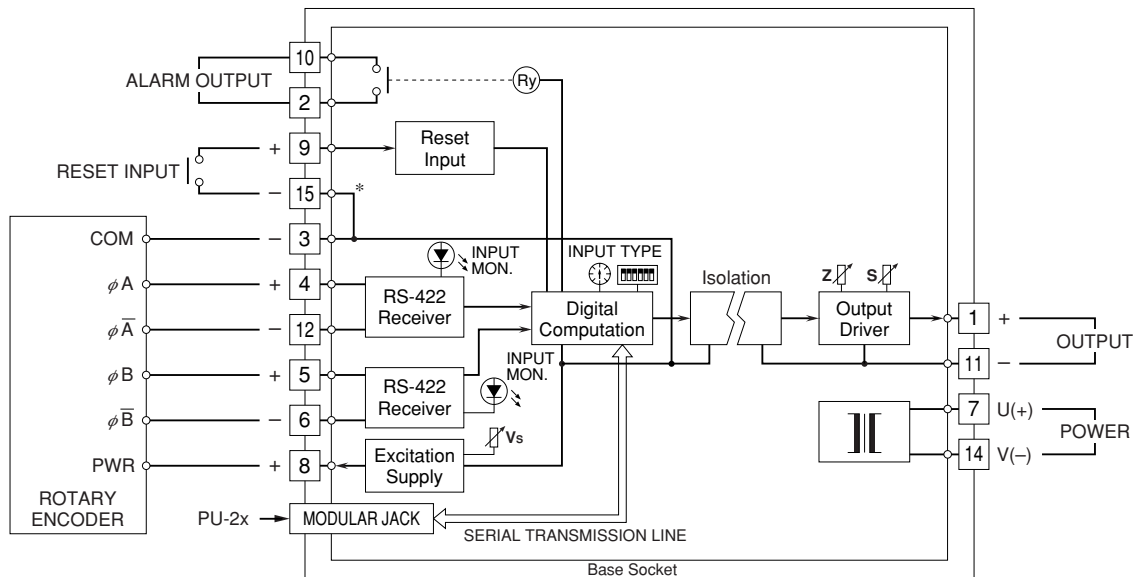
Pulse counts are added or subtracted according to the rotary encoder's rotating directions. The counts are added when Phase A leads Phase B by 90 degrees (Forward rotation), and subtracted when Phase A lags behind Phase B by 90 degrees (Reverse rotation).

**SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM**

■ OPEN COLLECTOR or VOLTAGE PULSE INPUT



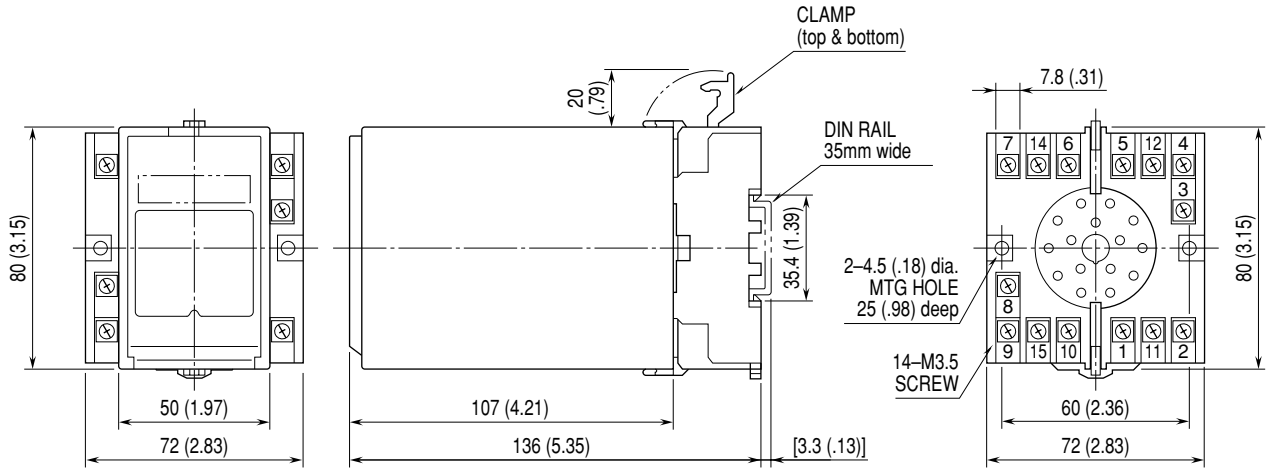
■ RS-422 LINE DRIVER INPUT



\*Terminals 3 and 15 are internally connected.  
COM terminals of the rotary encoder and the reset input can be connected to either one.

Specifications subject to change without notice.

**EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENT mm (inch)**



•When mounting, no extra space is needed between units.