

PULSE/ANALOG TRANSDUCER

MODEL TW-3K

INSTRUCTION MANUAL



Warning

This marking indicates that the erroneous operation of this transducer may result in death or serious



Precautions

- (1) If voltage or current exceeding the input allowable voltage or current is applied to the input terminals, the transducer may be damaged.
- (2) Apply power within the applicable range of the transducer. Otherwise fire, electric shock or transducer damage may result.
- (3) The contents of this instruction manual are subject to change without prior notice.
- (4) This instruction manual is carefully prepared. However, if any mistake or omission is found, contact your nearest Watanabe Electric Industry sales agent or Watanabe Electric Industry directly.
- (5) Make this manual available easily anytime.

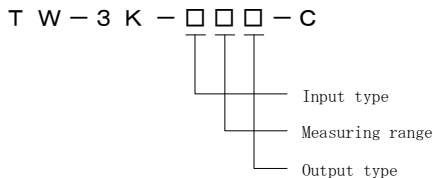
■Outline

The TW-3K electrically insulates and transducers pulse inputs into DC voltage or current, then outputs them. The input and output ranges can be changed by customers by way of the communication setting. Using a microcomputer circuit, the TW-3K transducers pulse inputs into standardized signals and outputs them. The output level can be adjusted using a tactile switch (within ± 5 percent of full scale) on the front panel. The transducer also incorporates a 12V/30mA power supply for sensors, which is provided with short-circuit protection. The cut point setting function can output 0 percent signals when the input level is lower than a preset value.

■Model and suffix codes to specify

Each code and the standard specifications are as follows.

First check whether or not your desired specifications are correct by comparing them to the following specifications.



■General specifications

Accuracy	: Within $\pm 0.20\%$ F.S
Allowable fluctuation range for power supply load	: Within $\pm 0.15\%$ F.S
Temperature characteristic	: $\pm 0.02\%$ F.S/ $^{\circ}$ C
Response time	: 1.5secnds+one cycle of pulse input (from 0 to 90%)
Power supply voltage	: 24V DC $\pm 10\%$
Insulation resistance	: Between the input and output or power supply, More than 100M Ω
Dielectric strength	: Between the input and output or power supply, For 1 min. at 1500V DC
Consuming current	: Within 110mA (sensor power supply: 30mA)
Operating ambient temperature/humidity	: -5 to +50 $^{\circ}$ C/Less than 90%RH (No-condensing)
Storage temperature/humidity	: -10 to +70 $^{\circ}$ C/Less than 60%RH (No-condensing)
Zero adjustable range	: Within $\pm 5\%$ F.S
Span adjustable range	: Within $\pm 5\%$ F.S
Case material	: Black PBT 94-VO
Weight	: Less than 150g

■Input type codes

See page 2 for a detailed description of the inputs.

Code No.	Input type
A	TTL(5V)
B	Voltage pulse(0 crossing of the input voltage)
C	Voltage pulse (Not 0 crossing of the input voltage)
D	Open collector (detected voltage : 5V DC/1mA)
E	Open collector (detected voltage : 12V DC/1mA)
F	Contact switch (detected voltage : 5V DC/1mA)
G	Contact switch (detected voltage : 12V DC/1mA)

*When Code No. C is chosen, measuring range code are 5 to 7.

*When code No. F or G is chosen, measuring range code are 1 to 4. And measuring range is 0 to 30Hz.

■Measuring range codes

Code No.	Measuring range	Minimum span
1	0 to 0.1Hz	At least 0.01Hz
2	0 to 1Hz	At least 0.2Hz
3	0 to 10Hz	At least 2Hz
4	0 to 100Hz	At least 20Hz
5	0 to 1kHz	At least 100Hz
6	0 to 10kHz	At least 1kHz
7	0 to 100kHz	At least 10kHz
Y	Other than the above	See note below

Note: The minimum span for code Y is the same as that for the code covering the desired measuring range.

■Output type codes and their specifications

Code No.	Output type	Load resistance
0	0 to 5V DC	At least 2k Ω
1	1 to 5V DC	
2	0 to 10V DC	At least 4k Ω
A	4 to 20mA DC	Less than 550 Ω
Y	Other than the above	

*When the input frequency exceeds 100 percent of the full scale, signals ranging from 105 to 110 percent of the full scale are output.

For code No. Y limit of specifications

Voltage : 0 to 10V in 1V increments

Current : 0 to 20mA in 1mA increments

■Output calibration and button lock function

The output signals need to be calibrated using the tactile switch on the front panel, which is normally prohibited when the button lock function is in place. Cancel the button lock before calibrating the output signals.

Canceling the button lock function : Press the SPAN/UP▲ and ZERO/DOWN▼ buttons and hold them for at least 3 seconds, then release them.

Adjusting the output signals : A signal press of the tactile switch changes the output by 0.01 percent of the full scale.

Press the switch for at least 300 msec. The output can be changed by 0.1 percent of the full scale by pressing and holding the switch for over 3 seconds.

Note: When 30 seconds have elapsed without any buttons being pressed after the button lock has been canceled, the buttons are automatically locked again. Contact WATANABE to change this time limit.

When the transducer is to be calibrated for securing prolonged accuracy, use standard measuring instruments with 10-fold or greater accuracy compared with the TW-3K.

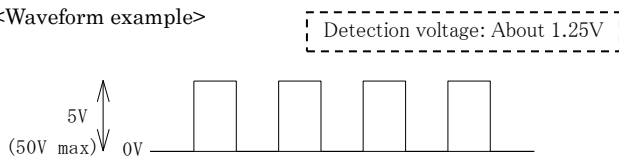
■Input types and their details

The input type cannot be changed using the communication setting.
Be sure to specify it during the ordering procedures.

< Code No.:A > TTL

Measuring ranges : From 0 to 0.1Hz, to 0 to 100kHz
Detected level : 5V DC(duty ratio:20 to 80%)

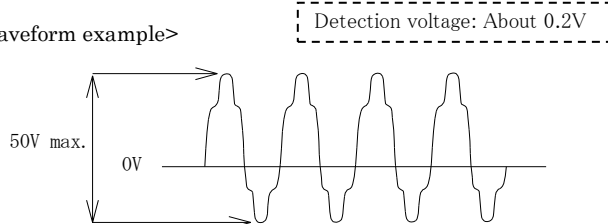
<Waveform example>



< Code No.:B > Voltage pulse(0 crossing of the input voltage)

Measuring ranges : From 0 to 0.1Hz, to 0 to 100kHz
Detected level : 4V to 50Vp-p including DC offset components
(duty ratio:20 to 80%)

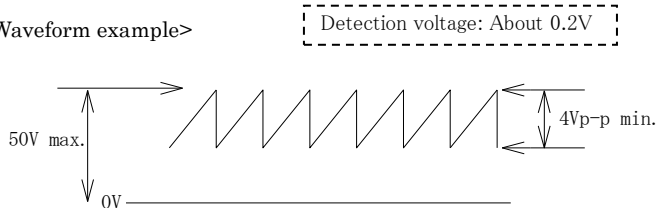
<Waveform example>



< Code No.:C > Voltage pulse(Not 0 crossing of the input voltage)

Measuring ranges : From 0 to 1000Hz, to 0 to 100kHz
Detected level : 4V to 50Vp-p, including DC offset components
(duty ratio:20 to 80%)

<Waveform example>



< Code No.:D > Open collector for 5V detected voltage

Measuring ranges : From 0 to 0.01Hz, to 0 to 100kHz
Detected level : On at 700Ωmax. and off at 3kΩ min.
(duty ratio:20 to 80%)

Detection voltage: About 1.25V

< Code No.:E > Open collector for 12V detected voltage

Measuring ranges : From 0 to 0.01Hz, to 0 to 100kHz
Detected level : On at 700Ω max. and off at 2.4kΩ min.
(duty ratio:20 to 80%)

Detection voltage: About 1.25V

< Code No.:F > Contact switch for 5V detected voltage

Measuring ranges : From 0 to 0.01Hz, to 0 to 30Hz
Detected level : On at 700Ω max. and off at 3kΩ min.
(duty ratio:40 to 60%)

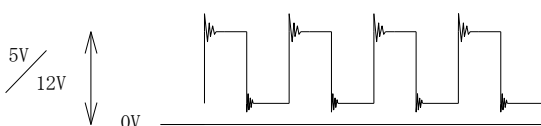
Detection voltage: About 1.25V

< Code No.:G > Contact switch for 12V detected voltage

Measuring ranges : From 0 to 0.01Hz, to 0 to 30Hz
Detected level : On at 700Ωmax. and off at 2.4kΩ min.
(duty ratio:40 to 60%)

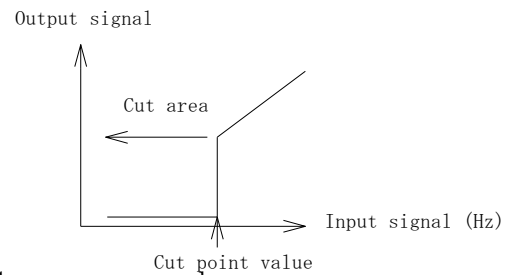
Detection voltage: About 1.25V

<Waveform example>



■Cut point

The transducer outputs 0 percent signals when the input level is lower than preset cut point. The cut point can be set to 0.0 to 99.9 percent in units of 0.1 percent.



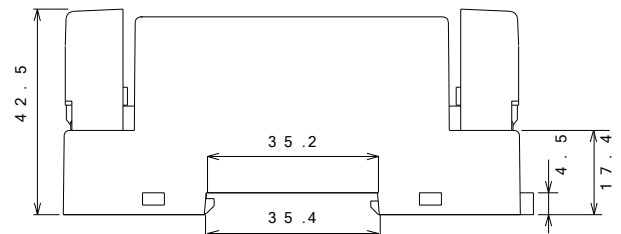
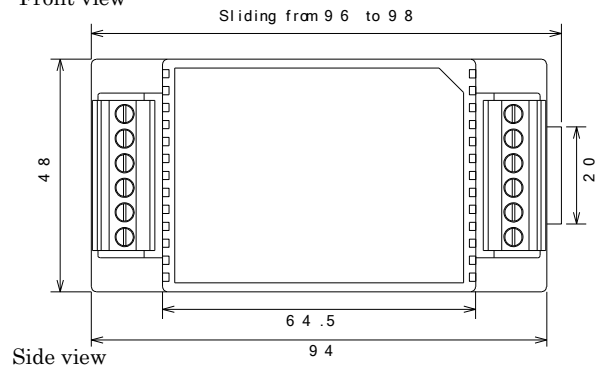
■Sensor power supply

12V DC±1% and 30mA

Short-circuit protection provided: Outputs approximately 360mA for short-circuits

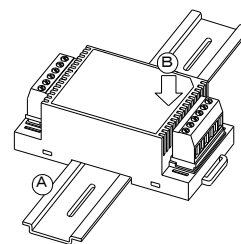
■Dimensions

Front view



■Mounting/Dismounting

■Mounting

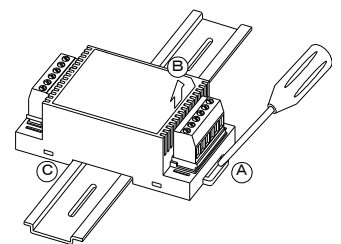


(A) Engage the left side of the transducer with the rail.

(B) Push up the right side of the transducer.

(B) Push the right side of the transducer into the rail.

■Dismounting



(A) Push down the slider with a screwdriver.

(B) Push up the right side of the transducer.

(C) Disengage the left side of the transducer from the rail.

*If the transducer is likely to be dislocated after its mounting, it is recommended that a clamp be used.

(For example E/NS35N made by PHOENIX CONTACT)

■Communication setting

The measuring range, output, adjustment range, and cut point can be changed using the communication setting as follows. Be sure to read “Input type and their details,” “Measuring range codes,” “Output type codes and their specifications,” and “Cut point” before changing these settings.

<Setting items>

- ①Measuring range
- ②Output type and range
- ③Output type and adjustment (adjustable range)
 - Zero adjustment
(using the tactile switch on the front panel)
 - Span adjustment
(using the tactile switch on the front panel)
 - Adjustment of 25% level
 - Adjustment of 50% level
 - Adjustment of 75% level
- ④Cut point

<Communication specifications>

The TW-3K parameters can be set with communication software using an RS232C port of a personal computer.

Recommended software: Hyper Terminal in Windows

A communication cable must be provided by the user.

①Electrical characteristics : EIA RS232C compliant ⑦Error detection : None

②Communication method: Full duplex ⑧Stop bit : 1 bit

③Synchronization method: Asynchronous ⑨Transmission control protocol:

Non-procedural

④Transmission speed: 9600 bps

⑤Start bit : 1 bit

⑥Data length : 8 bits

⑩Character code: ASCII

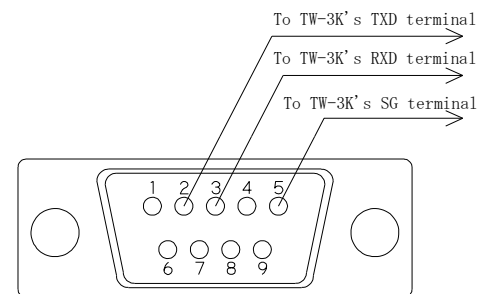
⑪Required signals: TXD, RXD, and SG only

⑫Delimiter : CRLF

<Command conventions>

- ①Commands must be entered in capital letters.
- ②Entering a command name and the enter key returns the current data for the specified command from the TW-3K.
- ③Entering a command name, the space key, then a setting value transmits the setting for the specified command to the TW-3K.
- ④When the command has been successfully transmitted, the transducer returns “Yes”.
- ⑤When an erroneous command name is entered, the transducer replies with “No”.
- ⑥When the setting is not adequate including being outside the range, the transducer returns “Error”.

Wiring arrangement for 9-pin D-sub connector



<Command list and description>

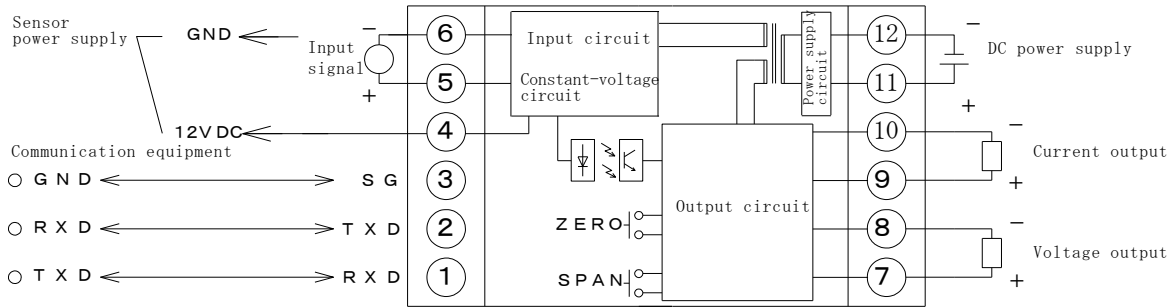
Before changing the setting, connect the power supply, an input and output, and an RS232C port to the TW-3K by consulting the wiring diagram on page 4. When the output type and range have been changed, be sure to adjust the 25%, 50%, and 75% levels as well.

Setting item	Command name	Description
Measuring range	FIN	<p>FIN [Enter key] ← Returns the current input range.</p> <p>space key</p> <p>Maximum input</p> <p>Minimum input</p> <p>FIN 0.00.1000.00 [Enter key] ← The setting transmission formats are “minimum input, maximum input”. *Enter the settings to two decimal places in Hz.</p>
Output type and range	OUT	<p>OUT [Enter key] ← Returns the current output range and type.</p> <p>space key</p> <p>Output type</p> <p>OUT 1.5.0 [Enter key] ← The setting transmission formats are “minimum output, maximum output, output type”. *Enter the settings as integers. *Output type : 0:voltage (in 1V increments) 1:current (in 1mA increments)</p> <p>Maximum output</p> <p>Minimum output</p>
Zero adjustment (Span adjustment)		<p>See “Output calibration and button lock function” on page 1. The normal adjustable range is ± 5 percent of the full scale. To change the range, use the following commands: ZSCP command : Changes zero adjustable range SSCP command : Changes span adjustable range Note that although the zero and span ranges can be increased and decreased, the TW-3K does not actually output signals outside of 0 to 10V (from 0 to 20mA). The allowable setting range is 5 to 99 percent of the full scale (enter the setting as integers).</p>
Adjustment of 25% level (Adjustment of 50% level) (Adjustment of 75% level)	S25 (S50) (S75)	<p>S25 [Enter key] ← Returns the current 25 percent level setting.</p> <p>space key</p> <p>S25 +10 [Enter key] ← The setting transmission format is “sign (\pm) setting”. Setting Sign</p> <p>Enter the setting as integers.</p> <p>The adjustment setting is possible within $\pm 100\text{mV}$ (μA) range in 1mV (μA) increments.</p> <p>Adjust signals as necessary by inputting 25 percent signals of the full scale (50 percent and 75 percent) and measuring the outputs.</p>
Cut point	FCP	<p>FCP [Enter key] ← Returns the current cut point setting.</p> <p>space key</p> <p>FCP 10.00 [Enter key] ← The setting transmission format is “setting”. Setting</p> <p>Enter the setting to two decimal places in percentage.</p> <p>The allowable setting range is 0 to 99.99 percent of the full scale.</p> <p>Allow for a cutting error of ± 0.05 percent of the full scale.</p>

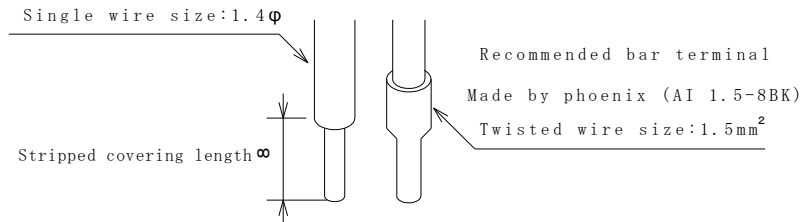
■Block wiring diagram



Exercise caution to ensure the correct polarity.

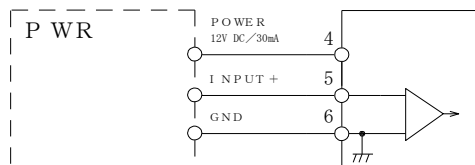


■Recommended treatment of wires connected to connector type terminal board

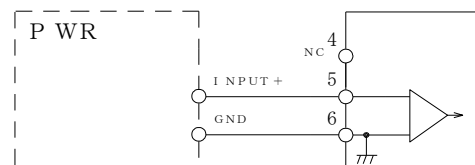


■Wiring example

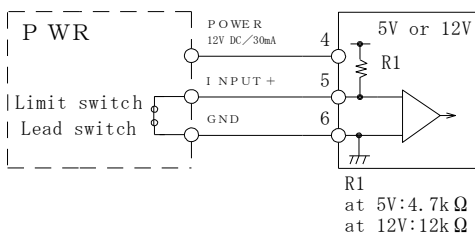
Voltage pulse input



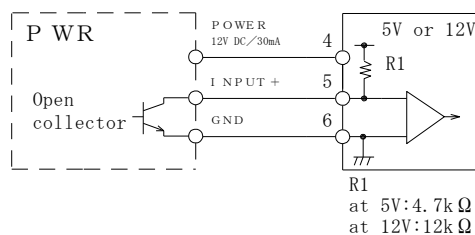
Input pulse input



Contact switch



Open collector



■Caution

- Store the converter at a location having a storage temperature of -10 to +70°C and a humidity of less than 60% RH.
- Use the converter at a location where there are no chemicals or gases harmful to its electrical parts or there is no dust.
- Do not apply any vibration or impact to the converter.
- In order to lessen the effect of noise, etc. do not bundle the input/output wires with the power supply wires, nor put these wires in the same duct.

■Warranty

This transducer is warranted for a period of one year from date of delivery. Any defect which occurs in this period and is undoubtedly caused by Watanabe Electric Industry faults will be remedied free of charge. This warranty does not apply to the transducer showing abuse or damage which has been altered or repaired by others except as authorized by Watanabe Electric Industry.

■After-sale service

This transducer is delivered after being manufactured, tested and inspected under strict quality control. However, if any problem does occur, contact your nearest Watanabe Electric Industry sales agent or Watanabe Electric Industry directly giving as much information on problem as possible.

■Accessories

- Terminal Cover 2pc.
- Detachable 6-P connector 2pc.

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