

Karman Vortex Flow Meter

KSL-5/10/30/50LN

Operation Manual



REGAL JOINT CO., LTD.

1-9-49 Onodai Minami-ku Sagami-hara-shi
Kanagawa Japan 252 0331
Tel: +81-42 756 7411
Fax: +81-42 752 2004
URL: http://www.rgl.co.jp

Overview

The flow meter KSL-5/10/30/50LN measures the flow rate and temperature. At the same time, the KSL-5/10/30/50LN can output alarm signals, analog signals, and pulse signals. Because the liquid contacting part is made of a heat-resistant resin, high-temperature fluid can be measured. For the external display, our "DAM" and "DPM" are recommended.

Before use

- Before using this product, be sure to read the Operation Manual and understand the instructions in it.
- Be sure to observe the use method, use conditions, and precautions specified in the Operation Manual.

Safety precautions

The symbols used in this Operation Manual and their meanings are as follows:

	This symbol indicates that misuse of the unit could lead to death or serious injury.		This symbol indicates a prohibited action.
	This symbol indicates that misuse of the unit could lead to injury or damage to houses, household effects, and the like.		This symbol indicates a compulsory action.

WARNING

Occurrence of abnormalities and malfunctions

- Continuing to use the unit in abnormal or defective conditions such as smoke, strange smell, or instable behavior may lead to fire or accident. In this case, disconnect the power supply immediately and notify the dealer of the state. Under no circumstances should you try to disassemble and repair the product yourself.

Use environment

- Do not use this product in places where moisture or condensation is present. Doing so may cause the product to collect moisture in it, resulting in an accident or malfunction.
- Do not use the product in places subject to vibration, shock, or pulsation. Doing so may cause an illegal operation, accident, or malfunction.

- This product does not have an explosion proof structure. Do not use it in a hazardous location where flammable gas, explosive gas, or corrosive gas atmosphere is present.
- This product is designed to be installed indoors. Do not use it outdoors.
- Do not use this product in a location subject to high temperatures such as near a heater. Doing so may increase the temperature inside the product, resulting in an accident or malfunction. Use this product under the use condition.

CAUTION

- Do not place heavy objects on cables or pull a cable from the meter unit. Doing so may cause an accident or malfunction.
- If cables not in use come in contact with each other or a cable comes in contact with external equipment, an accident or malfunction may occur. Be sure to insulate each cable before use.
- If the load conditions of output or the tolerance of the power supply voltage is out of the range described in this manual, an accident or malfunction may occur. Be sure to observe the instructions described in the section of "Wiring method," "Output signals," and "Specifications."

Handling of cables

- Do not use the product in a place that is affected by electrolytic corrosion or where static electricity is charged. Doing so may cause an accident or malfunction.
- Do not use the product in a place that is affected by electrical noise such as the vicinity of a high-frequency power source. Doing so may cause an accident or malfunction.
- If there is a possibility that foreign substances such as metal pieces or seal tape are mixed into the fluid, be sure to install a filter on the upstream side.
- If air bubbles are mixed in the fluid, correct measurement cannot be performed. Remove air bubbles completely before using the product.

Usage environment

- Do not use the product in a place that is exposed to electromagnetic waves, radiation, ultraviolet rays. Doing so may cause an accident or malfunction.

- Do not use the product in a place that is affected by electrical noise such as the vicinity of a high-frequency power source. Doing so may cause an accident or malfunction.

- If there is a possibility that foreign substances such as metal pieces or seal tape are mixed into the fluid, be sure to install a filter on the upstream side.
- If air bubbles are mixed in the fluid, correct measurement cannot be performed. Remove air bubbles completely before using the product.

Unpacking and carrying

- When unpacking or carrying the product, be careful not to drop it. If the meter unit drops, an accident or malfunction may occur.

Installation

- Be careful not to pinch your fingers in the meter unit during piping, etc. Doing so may cause injury.

Other

- If you detect damage or deformation of the product in the package when unpacking it, contact your dealer and explain the situation without using it.

Maintenance

Maintenance and inspection

- The display cover is incorporated with an electronic substrate. Touching the substrate could result in an accident or malfunction. Entrust your dealer with the inspection, adjustment, and repair of the product.

- Piping and wiring work, maintenance, and inspection should only be carried out by personnel with expertise and experience.
- For safety reasons, stop the supply of water and power and put the inside of the pipe to a non-pressurized state before starting maintenance and inspection.

Storage method

- When storing our product, store it in a place that meets the following conditions.
- A place that is not subject to rain or water - A place without direct sunlight - A place without dust
- A place without vibration and impact - A static-free area
- A place air-conditioned to an ambient temperature between 0 and 40°C (without condensation and freezing)

- Store the product in the original packing state.

- The shape and specifications are subject to change without prior notice to improve performance.

Warranty and disclaimer

- Regal Joint is not responsible for any accident that is caused by incorrect or improper use of the product.

- The warranty period of Regal Joint's product is one year after the date of delivery.
- For the defect of the performance or material within the warranty period, Regal Joint will supply an alternative product when Regal Joint permits in writing that Regal Joint is responsible for the defect. It should be noted that the range of warranty here is limited to our products alone. Any damages including loss, damage, and injury that may occur directly or indirectly due to the malfunction of the product will be excluded from the warranty.

- If the alternative product is provided in advance upon request of the user and subsequent investigation of the defect has revealed that Regal Joint was not responsible for the defect, the cost of the alternative product will be charged.

- Though the alternative product is basically the same product, there are cases where an equivalent product is supplied because of the reason of manufacturing.

- Examples of defects for which Regal Joint is not responsible include:

- Use of the product outside the range of the description in the Operation Manual (latest version)
- Carelessness in use
- Disassembly and remodeling of the product

About the Operation Manual

- It is not allowed to reprint and/or reproduce a part or all of this manual without a prior permission by us.
- The description in this manual is subject to change without prior notice for performance improvement or other reasons.
- When using the Operation Manual, reference the latest version. The latest version is available in our website URL: http://www.rgl.co.jp/.
- The operation overview and specifications described in this manual is intended to explain the standard operation and characteristics of the product.

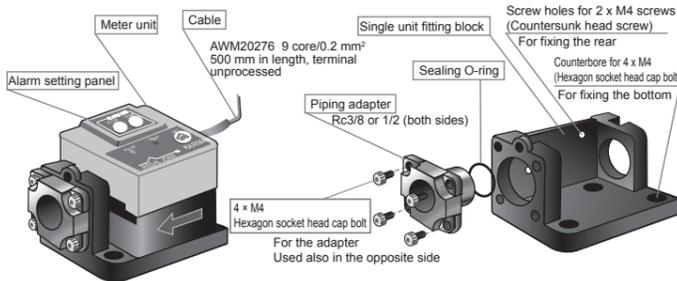
- Therefore, when using this product, perform appropriate physical design under the optimal conditions while considering external conditions.

- All efforts have been made to ensure the accuracy of all information in this manual. However, in the event you notice any unclear, incorrect, or insufficient part in this manual, contact us.

- The shape and specifications are subject to change without prior notice to improve performance.

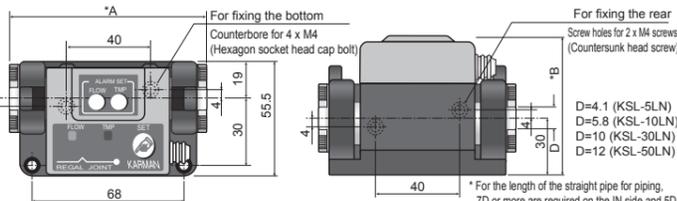
Configuration and Dimensional Drawing

As shown in the figure below, a cover incorporating an electronic circuit (substrate) is mounted on the body that contacts liquid. On the top of the cover, the control panel to set the flow rate and temperature is placed.



Note: For the single unit fitting block, it is possible to fix its bottom (by using four M4 hexagon socket head cap bolts), to fix its rear (by using two M4 countersunk head screws), or to fix with a pipe, depending on the mounting dimensions.

[Dimensions of the single unit fitting block] (Unit: mm)



Adapter size	*A width	Model	*B Height
Rc3/8	BsBM 92 SUS 98	KSL-5LN KSL-10LN	68.5 68.5
Rc1/2	115 115	KSL-30LN KSL-50LN	75 75

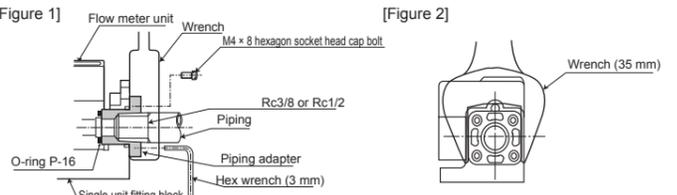
*1. The diameter of the adapter is selected when placing an order.
*2. For the KSL-50LN, only Rc1/2 is available.

Specifications

Model	KSL-5LN	KSL-10LN	KSL-30LN	KSL-50LN
Rated flow rate range	0.5-5.0 L/min	1.5-10.0 L/min	5.0-30.0 L/min	7.0-50.0 L/min
Applicable fluid	Industrial water, water			
Detecting method	Karman vortex			
Fluid temperature	0-90°C			
Ambient temperature	0-40°C (No freezing)			
Temperature measurement range	0-100°C			
Accuracy	±2.0%F.S.			
Max. operating pressure	1.0 MPa			
Power supply voltage *3	12 VDC±5% or 24 VDC±10%			
Current consumption	Max. 30 mA (Max. 70 mA with a 4 to 20 mA model)			
Cable	AWM20276 9 core/0.2 mm ² /500 mm			
Analog output	Flow rate Temperature	0-10 V or 4-20 mA/Pulse 0-10 V or 4-20 mA		
Alarm output	Photo MOS-FET A or B (Flow rate, temperature)			
Certification, standard, etc.	RoHS Directive (SUS adapter specification only)			
Material of liquid contacting part	Flow rate unit/PPS, temperature measurement unit/SUS304			
Material of connecting part	SUS or BsBM (Ni-plated)			
Sealing O-ring	Chloroprene rubber or fluoro rubber			
Pipe diameter	Rc3/8 or Rc1/2			
Weight	Approx. 380 g			

* 3 For the power supply voltage, either 12 VDC or 24 VDC may be selected when placing an order.

Piping



1. Piping must be performed by screwing the pipe into the piping adapter or by using the Kantouch joint made by Regal Joint.
2. Caution on installing piping material
When applying a wrench (35 mm), be sure to put it on the outer circumference of the piping adapter.

CAUTION Putting the wrench directly on the fitting block may cause a breakage of the fitting block. (See Figure 2.)

3. The inner diameter of the piping adapter is that of an Rc3/8 screw or Rc1/2 screw.
4. The piping adapter is fixed on the fitting block by using four hexagon socket head cap bolts M4 × 8. Use a 3 mm hexagonal screw driver or L-Type wrench to mount and detach the adapter.

CAUTION An O-Ring (Type P-16) is inserted into the sealing surface between the flow meter unit and the piping adapter.

Take care not to forget to insert it, not to twist it, and not to allow dust to enter inside.

WARNING

- Note that if the unit is installed without inserting an O-ring, water will be leaked.
- If water is very dirty when measuring water/industrial water, attach a filter to the pipe. Otherwise, sludge will accumulate in the fluid sensor, resulting in the malfunction of the sensor. (We will offer filters in response to your request.)

Wiring Method (interface)

Connect the cables to the relay terminal, connector, or the like by soldering or crimping. For connectors, the core wire sizes of #24 to #28 are recommended.

Warning Perform terminal processing for unused cables.

[Function of each cable]

Color	Name	Characteristics	Output selection*4	Operation, usage
Red	Power supply +	24 VDC±10% 12 VDC±5%	One from two choices	DC power is supplied from the equipment. KSL has no power switch and the current flows to the unit the moment the power is supplied.
Black	Power supply -	GND		Common ground line. This single line serves as a common return for all other lines including the power supply.
White	Analog output (flow rate)	0-10 V 4-20 mA	One from two choices	The flow rate is converted into an electric signal, which is sent to the equipment side.
Orange	Analog output (temperature)	0-10 V 4-20 mA	One from two choices	The water temperature is converted into an electric signal, which is sent to the equipment side.
Yellow	Alarm (flow rate)	Photo MOS FET (A)*5 Photo MOS FET (B)	One from two choices	Alarm is reported to the equipment side when the flow rate exceeds the setting value. (A): ON when flow rate is equal to or greater than the setting value. (B): ON when flow rate is smaller than the setting value.
Green	Alarm (temperature)	Photo MOS FET (A)*5 Photo MOS FET (B)	One from two choices	Alarm is reported to the equipment side when the temperature exceeds the setting value. (A): ON when temperature is equal to or greater than the setting value. (B): ON when temperature is smaller than the setting value.
Blue	Alarm common return	With grounding (G) Without grounding (COM)	One from two choices	It is possible to share the cable with GND by specifying the common return for output of the flow rate and temperature alarm. It is also possible to use this cable independently of GND.
Gray	Pulse output	Open-collector output 0 to 1 kHz	When pulse output and DPM connection is specified	0 Hz: At 0 L/min 1 kHz: At maximum specification flow rate
Brown	Spare core			Spare core. Not used in ordinary circumstances.

*4 For the cable shown in "Output selection," one of these specifications is selected when placing an order.

*5 Alarm output (A) = OFF output, alarm output (B) = ON output

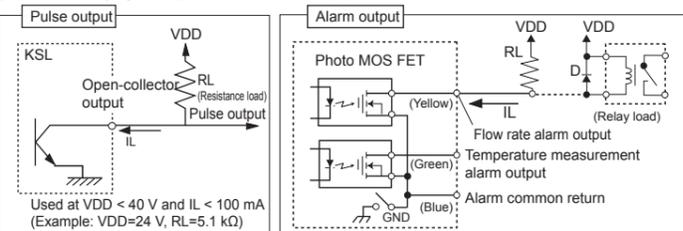
*Please wire along the model.

Warning If cables not in use come in contact with each other or a cable comes in contact with external equipment, an accident or malfunction may occur. Be sure to insulate each cable before use.

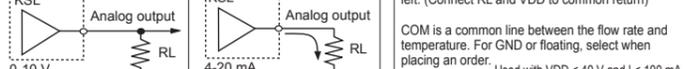
- Power supply: (1) If a voltage exceeding the specifications is applied, the unit may be broken.
- (2) If cables are connected in the reverse polarity, the unit may be broken.

- Analog output Alarm output: The unit may be broken if the output line is short circuited to the power supply.

[Method of applying a load] Standard method of applying the load resistance on the equipment side is shown below.



By specifying the alarm common return specification when placing an order, use in the reverse polarity is also possible as long as it is within the range of the rated voltage and current shown in the figure on the left. (Connect RL and VDD to common return)

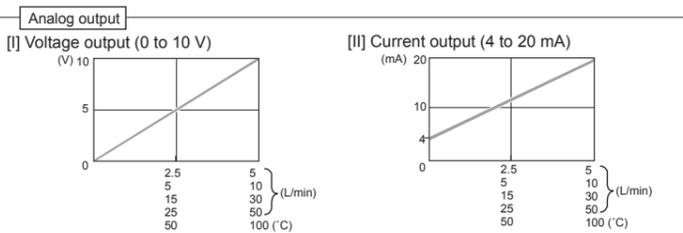


COM is a common line between the flow rate and temperature. For GND or floating, select when placing an order.

Caution - When operating the unit under a relay load, use a relay with a diode (D) to prevent breakdown of the transistor due to a counter-electromotive force.

- Because analog output is set to either voltage or current output at the factory setting, check the setting before use.

Output Signals



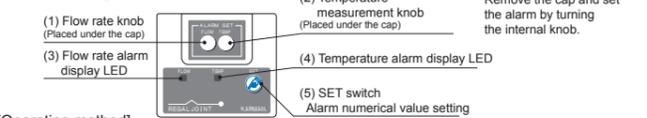
Output method	Open-collector			
Pulse shape	See the figure above (pulse width fixed)			
Flow rate per pulse	8.33 × 10 ⁻⁵ L/P	1.67 × 10 ⁻⁴ L/P	5 × 10 ⁻⁴ L/P	8.33 × 10 ⁻⁴ L/P
Remarks	Relay load invalid			

[II] DPM connection specification (for DPM connection only)

- The same as the pulse output specification
- The order format specification when using the "DPM" external display specified by Regal Joint

Operation Method

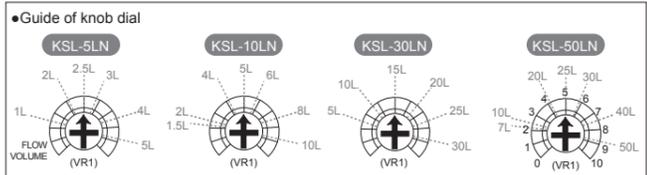
[Names of parts]



[Operating method]

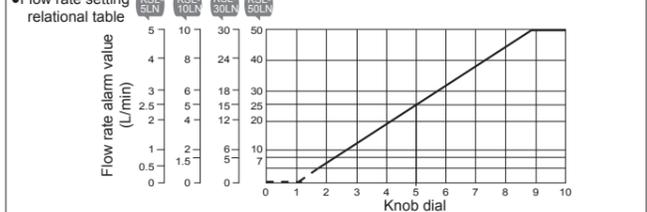
Alarm setting

1. When DC power is supplied to the unit after connecting the interface cables, operation starts and the LED is lit depending on the definition of A (or B). (Because no power switch is provided, the unit starts by connecting to 24 VDC or 12 VDC).
2. Set the alarm value. Remove the cap for (1) and (2) and adjust the dial of each internal knob in the direction of the arrow. The guide of the knob dial and the relation with the flow rate target value are shown below.



Place the tip of the arrow at the desired numerical value.
* For example, in the flow rate alarm of the KSL-30LN, the alarm setting value is 15 L/min at 5 of the dial. Note: In the actual product, no numeric value is written. Set the value by using the parting line on the knob as a guide.

Flow rate setting relational table



Caution To adjust the knob and press the button, use a Phillips screwdriver with its contact portion made of insulator (such as a plastic screwdriver, and do not use screwdriver with its contact portion made of metal).

- The minimum adjustable value with the knob is 5LN=0.5 L/min, 10LN=1.5 L/min, 30LN=5 L/min, and 50LN=7 L/min.

3. After setting to the alarm value, press (5) SET switch. The threshold value is determined.
4. To cancel the setting and set a new value, turn the knob again and press (5) SET switch. * Even if the power is turned off, it is not necessary to set the value again.

Action when the actual flow rate exceeds the threshold value
For alarm A in <Table 1>, (3) flow rate alarm display LED changes from red to green and the alarm signal of the cable is turned on. (When placing an order, the reverse polarity can also be selected.)

<Table 1>
Definition of alarm output and display LED

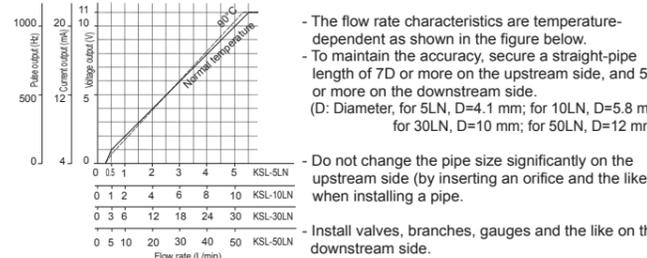
Measurement value	Alarm	A	B
Equal to or greater than the setting value	Green lamp is ON	ON	OFF
Below the setting value	Red lamp is ON	OFF	ON

The definitions of the alarm output and display LED are specified in <Table 1> by Regal Joint.

We ask the customer to specify the desired alarm in accordance with the application when placing an order.

- On the return side of alarm output, the flow rate and temperature share the common line. For the common return, either "Floating" or "Connect to GND" can be selected.
- For MOS-FET, ON is conductive and OFF is non-conductive.
- The alarm for the flow rate and that for the temperature can be set independently.

Flow Rate Characteristics



- The flow rate characteristics are temperature-dependent as shown in the figure below.
- To maintain the accuracy, secure a straight-pipe length of 7D or more on the upstream side, and 5D or more on the downstream side. (D: Diameter, for 5LN, D=4.1 mm; for 10LN, D=5.8 mm; for 30LN, D=10 mm; for 50LN, D=12 mm)
- Do not change the pipe size significantly on the upstream side (by inserting an orifice and the like) when installing a pipe.
- Install valves, branches, gauges and the like on the downstream side.

Maintenance

[Removing the meter unit]

- (1) Turn OFF the power supply. (Because the power switch is not installed in this unit, remove the power cable.)
- (2) Loosen the four M4 screws (hexagonal socket head cap screws M4 × 8) with a 3 mm hexagonal screw driver or a hex wrench.
- (3) Shift the meter unit slightly toward the adapter side loosened in Step (2).
- (4) Because a gap is generated between the adapter and the meter unit, the meter unit can be pulled towards the upper side of the unit block or toward the front. At this time, note that there is a possibility of flowing out of water in the pipe. In addition, be careful not to drop the O-rings placed on both sides.
- (5) To install the meter unit, follow the reverse procedure of removal.

Caution Do not forget to install O-rings on both sides.

- * If you have any questions on maintenance, contact us.
- We are not responsible for any malfunction caused by disassembly or dismantling by the customer.

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6th edition, August 2014