

HOPE

HASECP190E

SECTRON AUTOMATIC AIR-FUEL RATIO CONTROLLER

PRODUCT MANUAL

S E C - V 型

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1. Checking the Contents

Thank you for purchasing HOPE SECTRON Model SEC-V. In order to fully utilize the performance of SECTRON, secure safety, and perform appropriate checkup and maintenance, carefully read this instruction manual.

Below is the packing list according to the composition of SECTRON. Check whether you have received them all.

Also, check them for damage and other troubles due to transportation.

2. Composition

Fuel : Gas

	Equipment Name	Model	Remarks
Standard set	SECTRON	SEC-V	AC100~240V
	Air Differential Pressure Sensor	P-3000	0~3.0kPa (0~10V) DC24V
	Gas Differential Pressure Sensor	P-3000	0~3.0kPa (0~10V) DC24V
	Air Temperature Sensor	KL-200	Sheath TypeK (φ8×200L)
Optional items	Air Orifice Flow meter	MO-15~400F	
	Gas Orifice Flow meter	MO-15~400F	
	Control Valve For Gas	AZP-20~80	
	Control Motor	CM-101T H/L	Equipped With Limit Switch
	Gas Balance Regulator	GIK-15~150F	
	Gas Temperature Sensor (Option)	KL-200	Sheath TypeK (φ8×200L)

Fuel : Oil

	Equipment Name	Model	Remarks
Standard set	SECTRON	SEC-V	AC100~240V
	Air Differential Pressure Sensor	P-3000	0~3.0kPa (0~10V) DC24V
	Oil Flow Sensor	LSF40, 41, 45	Pulse Output
	Air Temperature Sensor	KL-200	Sheath TypeK (φ8×200L)
	Oil Filter	FH150-02, 04	
Optional	Air Orifice Flow meter	MO-15~400F	
	Oil Control Valve	CR-10, 15	
	Control Motor	CM-101T H/L	Equipped With Limit Switch
	Oil Ratio Regulator	FD-3	

3. Safety Precautions

Be sure to read this instruction manual and all documents attached to the manual and ensure your familiarity with the information of the equipment, safety and precautions before starting the work of the installation, mounting, commissioning, adjustment and checkup and maintenance.

In this instruction manual, the safety precautions are classified into 「BE SURE TO DO」 「DANGER」 「WARNING」 and 「CAUTION」.

Symbols and Meanings



「BE SURE TO DO」 Indicates the compulsion that you have to do without fail.



「DANGER」 Indicates the contents of the danger that is assumed to occur with death or serious injury if you operate against the contents of this indication.



「WARNING」 Indicates the contents of the danger that is assumed to occur with serious injury if you operate against the contents of this indication.



「CAUTION」 Indicates the contents of the danger that is assumed to occur with moderate or light injury or physical damage if you operate against the contents of this indication.

Safety Precaution Statements



WARNING



ELECTRIC SHOCK

When connecting/disconnecting the cable, be sure to turn OFF the power supply to the main unit and instruments connected to the main unit, or you could have electric shock or the main unit could be disordered.



CAUTION



ELECTRIC SHOCK

Do not disassemble or remodel the main unit, or fire could break out or you could have electric shock when the main unit is used.



CAUTION

In any of the following cases, be sure to turn OFF the power supply, or fire could break out, you could have electric shock or the main unit could be disordered.

- Water or extraneous matter enter the main unit.
- The main unit is dropped or the case is broken.
- The main unit emits smoke or odor.

4. Outline

SEC-V is a new air-fuel ratio controller equipped with a 4.3-in LCD touch panel. As a succession equipment of SEC-IV having an actual sales record of 500 units, the upgraded SEC-V will substantially contribute to the CO₂ reduction and energy saving of industrial furnaces.

5. Specifications

1. SECTRON power input

- Power voltage : AC100~240V (50/60Hz)
- Mass : 1.9kg
- Power consumption : 37VA 以下

2. Temperature input

- Number of input : 2 point
- Input name : Air temperature sensor input Gas temperature sensor input (option)
- Measurement range : 0~800°C
- Display range : 0~800°C
- Display resolution : 1°C

3. Voltage input

- Number of input : 2 point
- Input name : Air differential pressure sensor input, Gas differential pressure sensor input
- Measurement range : DC0~12V
- Display range : 0.00~3.60kPa
- Display resolution : 0.01kPa
- Sampling period : 200ms

4. Voltage pulse input

- Number of input : 1 point
- Input name : Oil flow sensor input
- Measurement range : 0~60Hz
- Display resolution : 0.01L/h

5. No-voltage contact input

- Number of input : 5 point
- Input name : RUN (Start of operation), A1 (Fully closed limit), A2 (Fully open limit)
K1 (Air ratio selection), K2 (Air ratio selection)
- The minimum input time : 500ms

6. Power input for fuel control motor

- Number of output : 1 point
- Power voltage : AC100~240V (50/60Hz)

7. Power output for sensor

- Number of output : 3 point
- Output name : Air differential pressure sensor power output
Gas differential pressure sensor power output
Oil flow rate sensor power output
- Power voltage : DC24V±10%

8. Relay contact output

- Number of output : 1 point
- Output name : Checkout output
- Contact form : 1a contact
- Contact capacity : AC100V/DC24V 1A (Resistance output)
- Minimum applicable load : DC5V 10mA
- Contact protection : Surge absorber

9. Output for Fuel control motor drive

- Number of output : 2 点
- Output name : MH (Open)、ML (Close)
- Output capacity : AC100~240V 1A
- Contact protection : Surge absorber

10. Display

- LCD size : 4.3 inch
- Touch panel system : Resistance film system

11. Buzzer

- Buzzer sound pressure : 85dB

12. RS-422 Com

- Com standard : RS-422 (1 : 31)
- Protocol : MODBUS (RTU) /MODBUS (ASCII)
- Interface : RS-422 (4-wire)
- Com system : Full duplex
- Synchronization system : start/stop synchronization
- Transmission code : ASCII
- Com speed : 2400/4800/9600/19200/38400bps
- Start bit : 1 bit fixed
- Stop bit : 1/2 bit
- Data length : 7/8 bit
- Parity : Non/Odd/Even
- BCC check : Non
- Address : 1 to 247

13. Loader Com

- Com standard : TTL (1 : 1)
- Protocol : TOHO Protocol / MODBUS (RTU) /MODBUS (ASCII)
- Interface : TTL Level
- Com system : Half duplex
- Synchronization system : start/stop synchronization
- Transmission code : ASCII
- Com speed : 2400/4800/9600/19200/38400bps
- Start bit : 1 bit fixed
- Stop bit : 1/2 bit
- Data length : 7/8 bit
- Parity : Non/Odd/Even
- BCC check : Off/On※In the case of MODBUS it becomes disable
- Address : 1 to 99※In the case of MODBUS it becomes 1 to 247

14. Date/Time Function

- Accuracy of time : Lunar equation About 1 minute (Ta=25°C Under the conditions)
- Backup system : Size AA batteries×2 (Clock function held)
- Backup time : More than five years in a continuous power outage
(Ta=25°C 1 per 2000mAh)

※It is not a reference value guaranteed value

6. Installation Environment



This product is not recommended for use in the following locations

- The place where the ambient temperature is outside a range of 0 to 45°C.
- The place where the relative humidity is outside a range of 20 to 85%RH.
- The place where is subject to dust, salt or iron.
- The place where is subject to corrosive gas or combustible gas.
- The place where is Vibration or impact of shock.
- The place where is flooding or oil.
- The intense place of the temperature change.
- The place where receives the heat dissipation of the heating element.
- Near equipment that generates a high-frequency noise.
- Wiring, noise, induction influence, high voltage as much as possible, should be wiring away from the power lines of high current

7. Installation in Control Panel



Mounting in the control panel, operability, maintainability, please take into account such as a sufficient environmental resistance.

7-1 Consideration of ambient temperature

The operating ambient temperature of this product is in a range of 0 to 45°C.

- Secure ample space for ventilation.
- Do not install this product near instruments with high heat value (e.g. , heater, transformer, large-capacity resistance)
- If the ambient temperature is above 45°C, provide a forced fan or a cooler.

7-2 Consideration of operability and maintainability

- For the safety of maintenance work and operation, install this product away from high-voltage instruments and power instruments as much as possible.

7-3 Consideration for improving noise resistance

- Do not install this product in the control panel, if a high-voltage instrument has been mounted there.
- Install this product at least 200 mm away from the power cable.

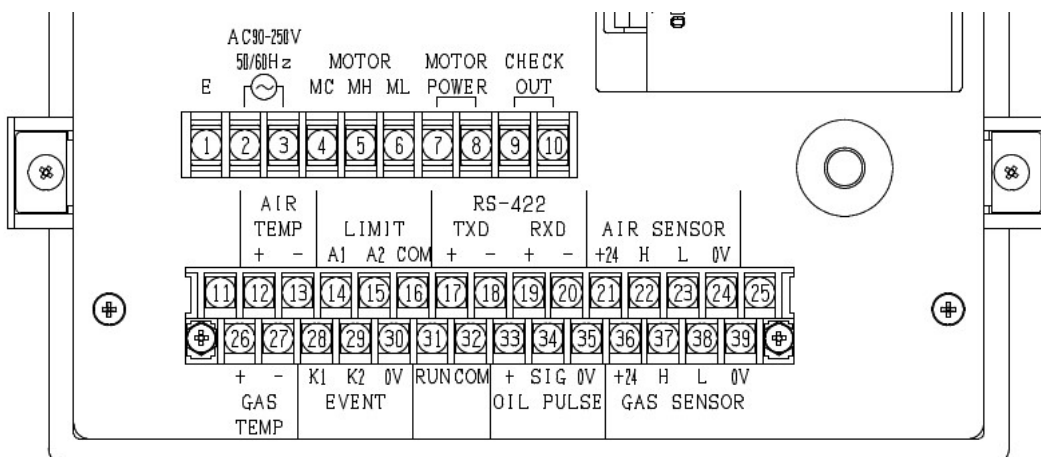
8. Wiring

8-1. Terminal sequence (Upper terminal block)

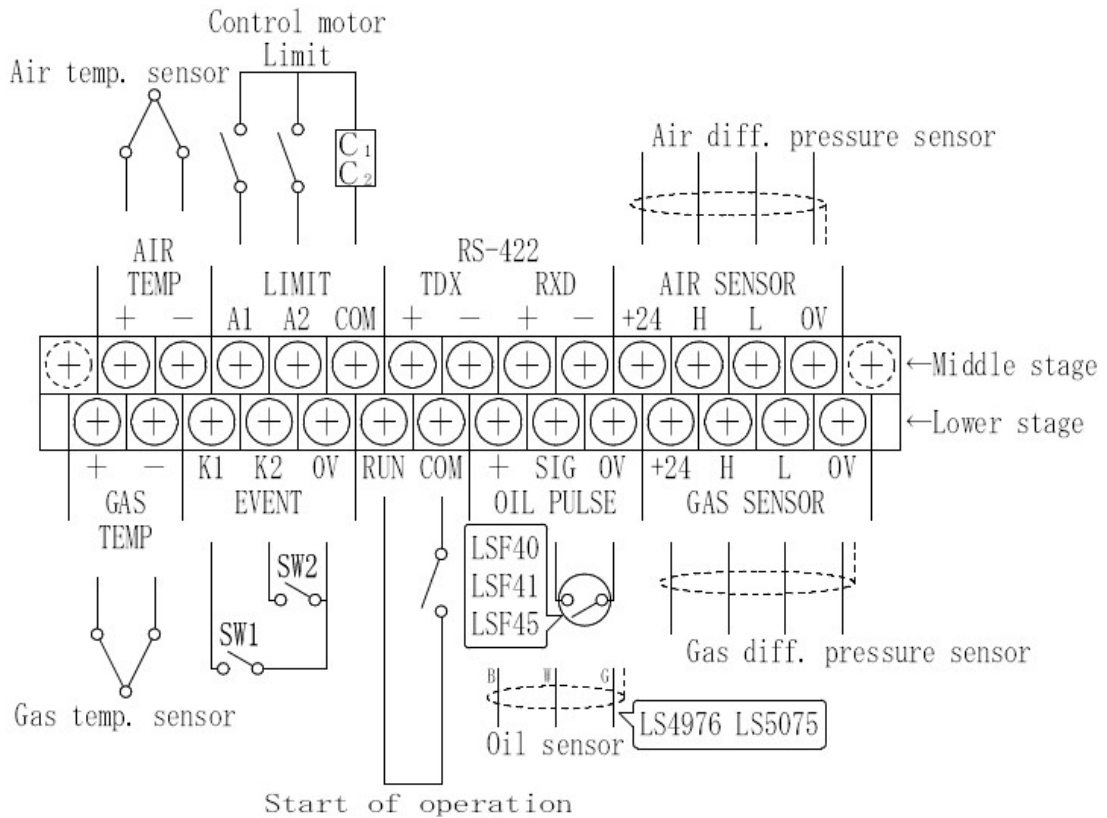
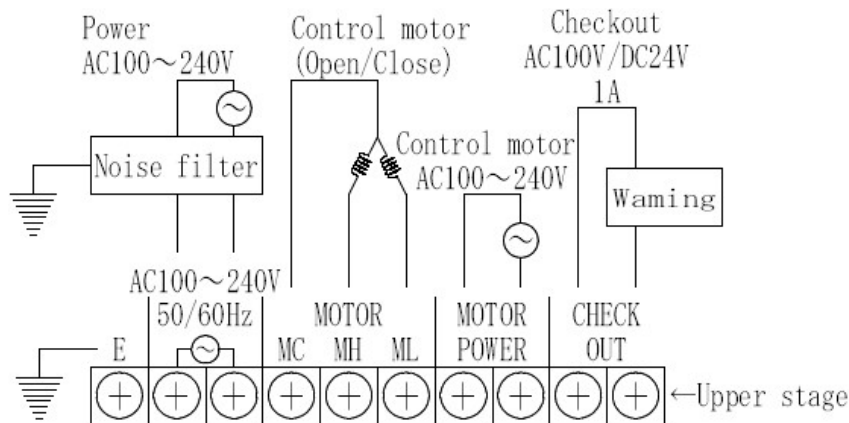
NO.	Name		NO.	Name	
①	Earth	E	⑦	Fuel control motor	
②	SECTRON Power input		⑧	Power input AC100~240V	
③	AC100~240V		⑨	Alarm output	CHECK OUT
④	Motor Driving output	MC	⑩		
⑤		MH(Open)			
⑥		ML(Close)			

8-2. Terminal sequence (Lower terminal block)

NO.	Name		NO.	Name	
⑪	unused		⑳	Gas temperature	+
⑫	Air temperature	+	㉑	Sensor input	-
⑬	Sensor input	-	㉒	Air ratio selection Contact input	K1
⑭	Motor limit Contact input	A1(Fully open)	㉓		K2
⑮		A2(Fully closed)	⑳		COM
⑯	RS-422 Com	COM	㉑	RUN Contact input	RUN
⑰		TXD(+)	㉒		COM
⑱		TXD(-)	㉓	Sensor Power output	+
㉑		RXD(+)	㉔	Oil pulse input	SIG
㉒	RXD(-)	㉕	0V		
㉓	Sensor Power output	+24	㉖	Sensor Power output	+24
㉔	Air Differential pressure sensor input	H	㉗	Gas Differential	H
㉕		L	㉘	pressure sensor input	L
㉖	Sensor Power output	0V	㉙	Sensor Power output	0V
㉚	unused				



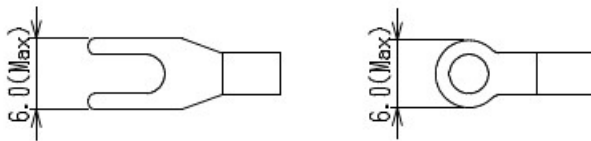
8-3. Wiring Diagram



※Use a shield cable for wiring the air sensor, the gas sensor, the oil sensor (LS4976,LS5075) and the temperature sensor.

8-4. Crimping terminals

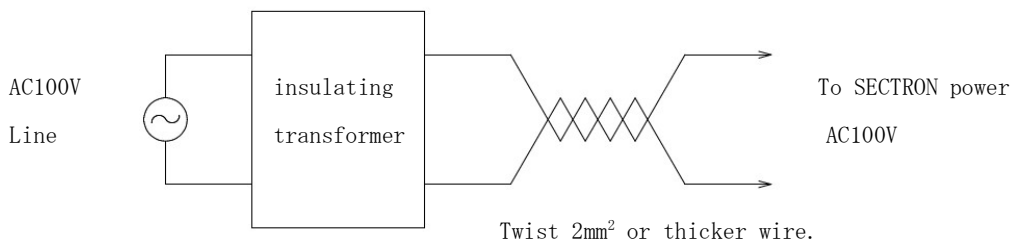
Connect crimping terminals as shown below firmly to the terminal block of SECTRON.



Crimping terminals for M3

8-5. Power input

Do not lead in the power supply from the power-supply line or the like, or SECTRON could not operate normally due to voltage drop at the time of startup. Noise superimposed on the power-supply line can be suppressed by the countermeasures against noise set in SECTRON, but if power is supplied via an insulating transformer of 1:1, ground noise can be attenuated substantially.

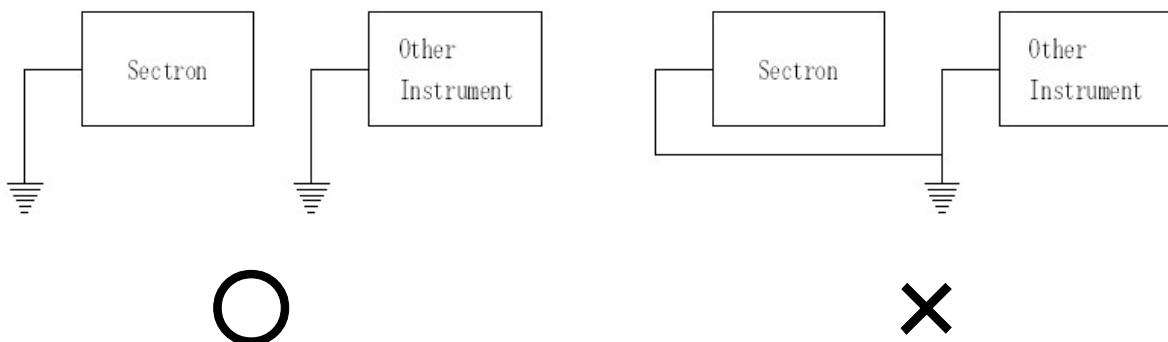


Insulating transformer : Toyozumi Dengen Kiki Co., Ltd.

: Sugano Electric Laboratory, Ltd.

8-6. Ground wiring

Be sure to provide Class 3 grounding (Grounding resistance: 100Ω or less) with a dedicated ground wire (2 mm² or more). The appropriate length of the ground wire is within 20 m. Note that if the ground wire is shared with any other instrument or connected to a building beam, its effect is opposite, and SECTRON could be adversely affected. (Particularly, do not share the ground wire with a strong electric earth wire.)

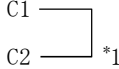
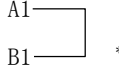


8-7. Fuel control motor wiring

- If the load connected to the control motor output terminals (HM, MC, ML) is short-circuited, burnout could be caused to the output elements or the printed circuit board. Therefore, it is recommended to insert a protecting fuse (1A) in the output (control motor).
- The control motor output terminals (MH, ML) are of semiconductor relay output (250VAC, 1A). Connect the control motor and SECTRON firmly in accordance with the wiring diagram (for the control motor manufactured by Nissho Instrument Co., Ltd.).
- Limit contact inputs for fully opening (A1) and fully closing (A2) the control motor. When a relay is used, select the twin contact type.

Recommended twin contact type relay : Omron (MY2ZY)
 : Panasonic (HC-4D-HL)
 : Fuji Electric (HH52PW-L)

[Fuel control motor wiring table]

SECTRON terminal block name (SEC-V)		NISSYO INSTRUMENT CO.,LTD. terminal block name (CM-101T H/L)	azbil CO.,LTD terminal block name (ECM3000D□110)
MOTOR	MC	MC	3
	MH	MH	1
	ML	ML	2
LIMIT	A1	A1	A2
	A2	A2	B2
	COM	 C1 ———— C2 ———— *1	 A1 ———— B1 ———— *1

*1 In the control motor terminal block, please crossover.

8-8. Checkout wiring

- SECTRON has a built-in relay output contact (Max. 1A) for the checking purpose.
 It is output when the alarm display is displayed.

8-9. Air and gas differential pressure sensor wiring

- Use crimp terminals for wiring in the air / gas differential pressure sensor (see 8-4 crimp terminals).
In addition, use a 4-core shielded cable for the cable between the sensor and the SECTRON.
- Do not connect the sensor side shield of the shield cable but leave.
- Connect the incoming wiring from the sensors (air, gas, oil, temperature), etc. directly without passing through the terminal block in the control panel, if possible.
- The cable may be extended up to 50m. Generally, control the cable length to 20m or less for ensuring the safety.
- Pass the power circuit cable through a separate duct (for inside and outside the control panel).

「Air and gas differential pressure sensor wiring table」

SECTRON terminal block name (SEC-V)		Air and gas differential pressure sensor terminal block name		
		P-3000	P92M-30	PU-30
AIR (GAS) SENSOR	+24	24VDC	13	11
	H	Vout +	1	2
	L	Vout -	2	1
	0V	GND	11	13



- Do not load power 24VDC to the output signal terminal block, or the differential pressure sensor could be broken.
- After wiring, turn ON the power supply to SECTRON, and the power 24VDC will be supplied to the differential pressure sensor.

8-10. Oil flow rate sensor wiring

- Cannot be used together with the gas differential pressure sensor.
- For LSF40, LSF41 and LSF-45 oil sensors Use the attached connector and terminal for connection to the oil sensor.
- For LS4976 and (Flow pet with transmitter) Power is supplied from SECTRON to the transmitter.

「Oil flow rate sensor wiring table」

SECTRON terminal block name (SEC-V)		Oil flow meter sensor wiring color	
		LSF40/41/45	LS4976/5075
OIL PULSE	+	Do not use	Brown
	SIG	Contractor arrangements	White
	0V	Contractor arrangements	Green

8-11. Temperature sensor wiring

- Use the attached $\phi 8$ sheath type thermocouple as an air temperature input.
- Connect the thermocouple with a compensating lead wire exclusively for thermocouples by directing care to the polarity (plus = red, minus = white) not to make mistake.
- If preheated air is used, the correctable temperature is up to 600°C.

※Fuel gas temperature is also correctable, but consult with us beforehand. By ordinary, when normal temperature gas is used, the information of the gas thermocouple is not displayed on the display of SECTRON.

「Temperature sensor wiring table」

SECTRON terminal block name (SEC-V)		Temperature sensor wiring color (KL-200)
AIR(GAS) TEMP	+	Red
	-	White

8-12. RUN (start of operation) wiring

- When the contact is open, SECTRON is on standby with the fuel valve control motor fully open. When the contact closes, SECTRON starts control operation.
- When a relay is used, select the twin contact type

8-13. Select air ratio switching wiring

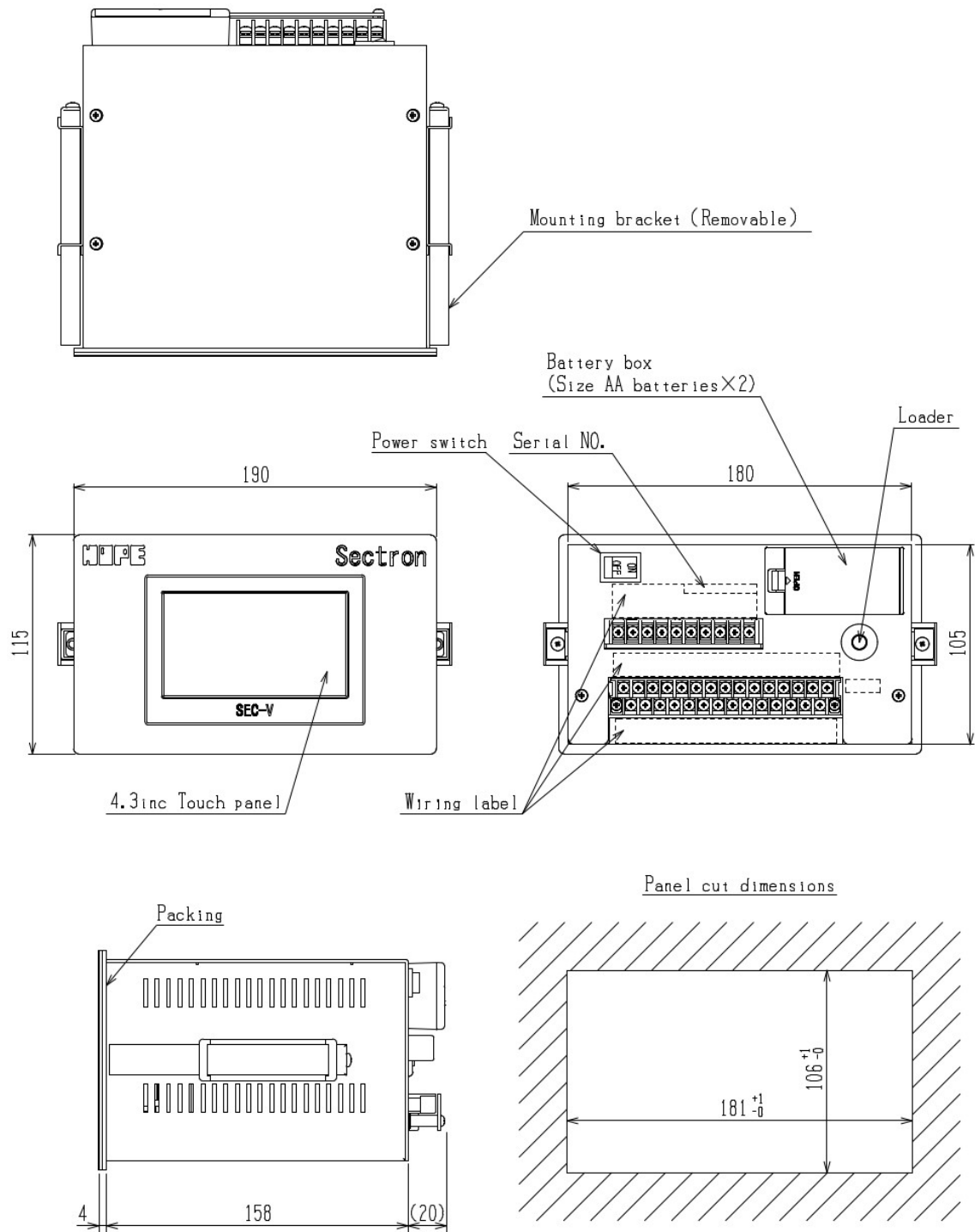
- SECTRON can select air ratio from among 4 air ratios.

「Select air ratio switching wiring table」

SECTRON terminal block name (SEC-V)		Select air ratio
EVENT1 (K1-0V)	EVENT2 (K2-0V)	
OFF	OFF	M1
ON	OFF	M2
OFF	ON	M3
ON	ON	M4

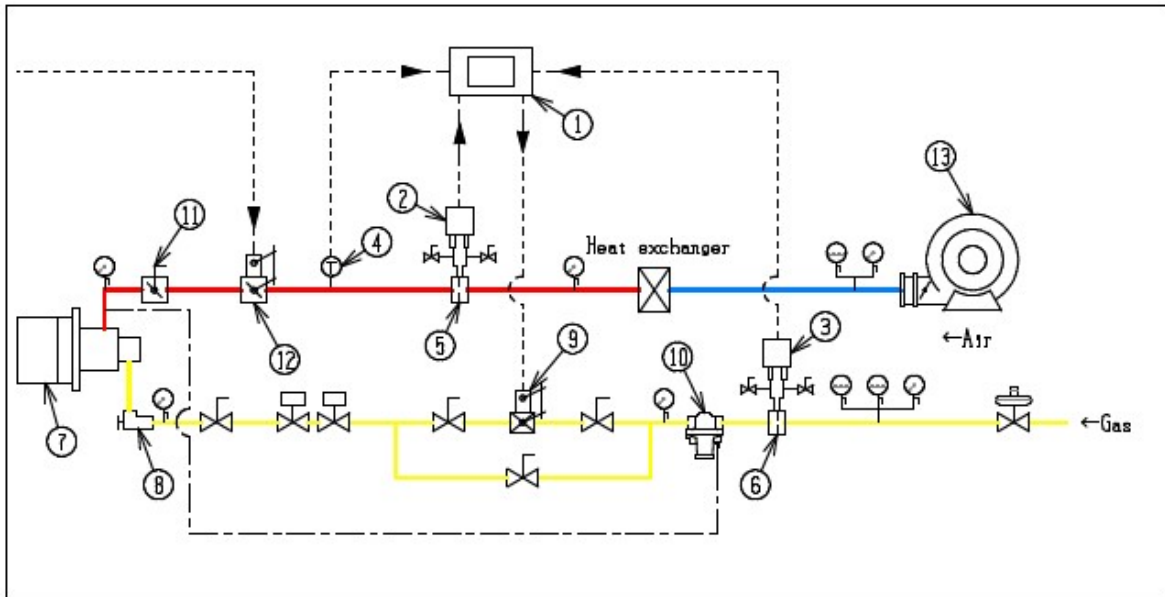
9. Outline View

9-1. Outline View



10. Burner equipment flow diagram

10-1. Gas Burner equipment flow diagram



10-2. Gas Burner component

No.	Component	Model
①	SECTRON	SEC-V
②	Air Differential pressure sensor	P-3000
③	Gas Differential pressure sensor	P-3000
④	Temperature sensor	KL-200
⑤	Air Orifice flowmeter	MO-15~400F
⑥	Gas Orifice flowmeter	MO-15~400F
⑦	Gas Burner	EXA, LXG Etc.
⑧	Gas Limiting valve	LV-15~80、LVF-100
⑨	Gas Control valve	AZP-20~80
⑩	Gas Equalizing valve	GIK-15~150F
⑪	Air Butterfly damper	HD-20~HDF-350
⑫	Air Control damper	CD-20~CDF-350
⑬	Blower	SSTB, WTB

11. Test Operation

11-1. Preparing

1. Make sure that all the gas cocks (oil valve) are closed.
2. Use air, nitrogen or other appropriate gas (oil) to check the leak inside the gas piping.
3. Check if all the equipment for air and gas (oil) lines work properly.
4. Make sure that the gas is supplied as per specified pressure and that the gas (gas) inside the piping has been replaced.
5. Start the blower and check if the outlet pressure is per specifications.
6. The air flow quantity at the time of the maximum combustion and the minimum combustion is set up by air control damper, air butterfly damper.
7. In the SECTRON Manual Setting screen, set the gas (oil) control valve aperture.
When the LOW LIMIT lamp is ON, set the aperture to "0" of the scale. When the HIGH LIMIT lamp is ON, set it to the highest possible value.

11-2. Adjusting

1. Check to confirm that the gas cock (oil valve), solenoid valve and limiting valve (regulating cock) located immediately before the burner have fully been closed.
2. Activate the blower.
3. In the ignition operation, open the main gas (oil) solenoid valve, and at the same time, turn ON the RUN lamp of SECTRON.
4. At the time of maximum combustion, adjust the gas limiting valve (regulating cock) so that the gas (oil) control valve aperture is set to around the center of the scale.
5. At the time of minimum combustion, adjust the gas pressure equalizing valve (oil proportional valve) so that the gas (oil) control valve aperture is set to around the center of the scale, too.
6. When the temperature in the furnace has risen to the set temperature, check the control valve aperture again.
7. In the extinguishment operation, close the main gas (oil) solenoid valve, and at the same time, turn OFF the RUN lamp of SECTRON.

12. Accessory

12-1. Differential Pressure Sensor

<Outline>

The differential pressure sensor (P-3000) is a high-precision digital minute differential manometer developed for the purpose of fine pressure measurement, monitoring and flow rate control. Since the microprocessor is mounted, minute displacement can be detected by inductance method according to differential pressure, positive pressure and negative pressure.

Automatic zeroing ensures long-term stability.

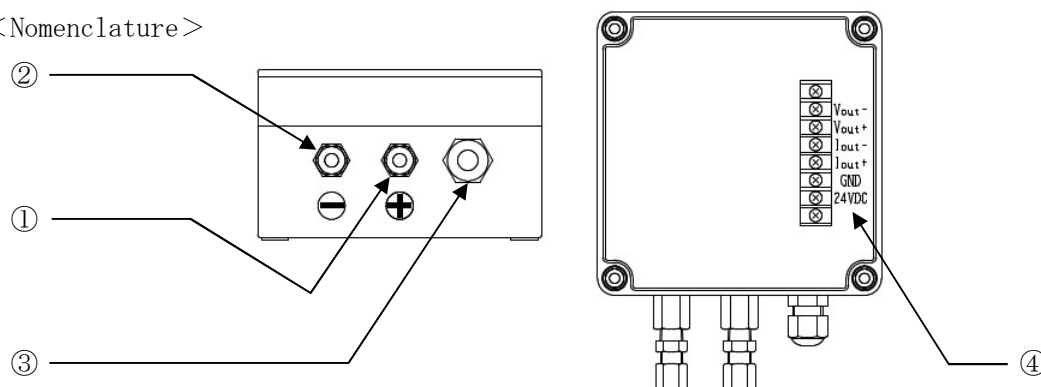
This automatic zeroing is performed every 20 minutes.

<Specifications>

• Power	: DC24V ($\pm 10\%$)	• Measurement range	: 0-3kPa
• Output	: 0-10V	• Max. line pressure	: 200kPa
• Max. differential pressure	: 10kPa	• Pressure inlet port	: 2-Rc1/8
• Mass	: 750g	• Power consumption	: 2W

(In automatic zero point + 1.5 W [1.5 sec])

<Nomenclature>



①. Positive pressure inlet port : Introduce the orifice primary (upstream) pressure.

②. Negative pressure inlet port : Introduce the orifice secondary (downstream) pressure.

- For the pressure pipe, use $\phi 6$ copper pipe.

- The copper pipe length is appropriate when it is 1 - 5 m.

- When hot air is used, set the copper pipe length to 2 m or more to protect the sensor from heat.

③. Cable inlet port : • Introduce the cable.

- For the cable, be sure to use a shield cable.

④. Terminal block : Connect the power cable and the output cable here.

※ The current output signal (Iout +, Iout-) is not used in the SECTRON.

<Mounting Environment>



Do not mount the differential pressure sensor at any of the following places

- The place where the ambient temperature is outside a range of 0 to 45°C.
- The place where the relative humidity is outside a range of 20 to 85%RH.
- The place where is subject to dust, salt or iron.
- The place where is subject to corrosive gas or combustible gas.
- The place where is Vibration or impact of shock.
- The place where is flooding or oil.
- The intense place of the temperature change.
- The place where receives the heat dissipation of the heating element.
- Near equipment that generates a high-frequency noise.
- Wiring, noise, induction influence, high voltage as much as possible, should be wiring away from the power lines of high current.

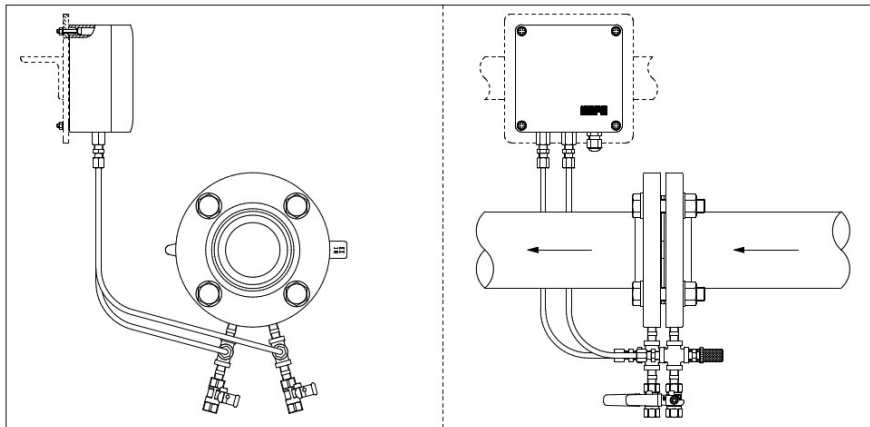
<Mounting Method>



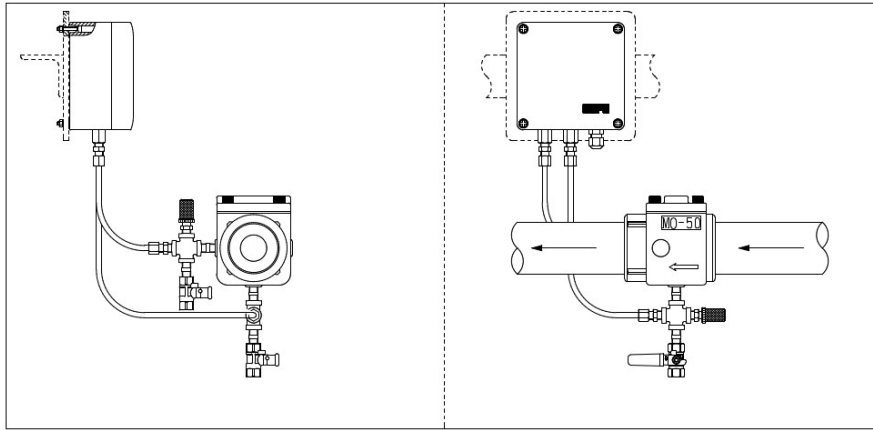
When mounting the differential pressure sensor, carefully consider the operability, maintainability and environment resistance.

1. In mounting, position the differential pressure sensor vertically with the pressure inlet port downward. If drain clogs inside the pressure conduit or differential pressure sensor, malfunction could be caused to the differential pressure sensor and a resultant serious accident. If drain is generated, be sure to remove it on the upstream side of the sensor in order to prevent drain clogging in the pressure conduit of the sensor and in the sensor itself.
2. In mounting the differential pressure pressure sensor, mount it at a place where the sensor is little affected by vibration and firmly fix the sensor with M6 hexagon socket head bolts and M6 nuts.
3. As shown in the mounting examples ① and ②, be sure to attach a drain cock and periodically check for drain.

● Differential pressure sensor mounting example ①



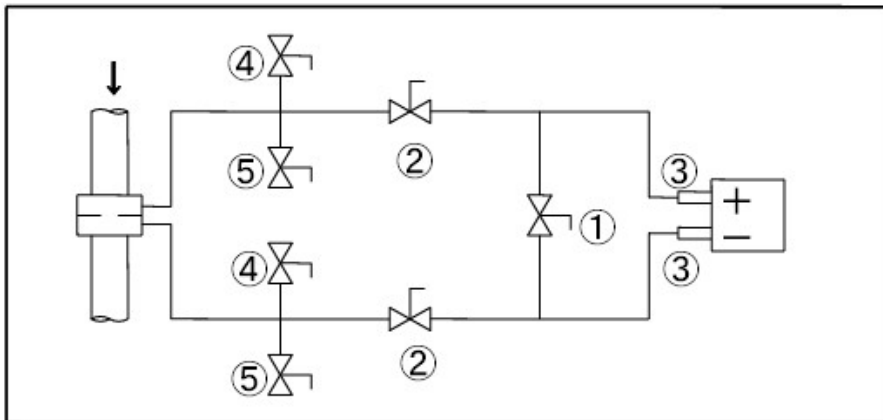
●Differential pressure sensor mounting example ②



<Notes for Medium Pressure>

1. Introduction from the medium-pressure line to the sensor

The maximum line pressure of the differential pressure sensor is 100kPa. However, if a line pressure of 15kPa or more is applied to only the one-sided pressure inlet port (differential pressure: 15kPa or more), the sensor could be failed. Therefore, when using the sensor under a line pressure of 15kPa or more, provide a bypass pipe to between (+) and (-) as shown in the diagram. This can prevent failure in the differential pressure sensor due to overpressure.



- ① : Bypass cock
- ② : Pressure inlet cock
- ③ : Pressure conduit joint
- ④ : Pressure checkup cock
- ⑤ : Drain cock

<Orifice Flowmeter>

The orifice flowmeter is used to measure the fuel gas and air supplied to the burner and set the appropriate combustion capacity and air ratio. From Rc1/2 to 400A, the orifice flowmeter is available in 16 sizes. For each size, several types of orifice plates are available.

<Mounting Method>

The orifice flowmeter sends the most important signal for SECTRON Model SEC-V. If the orifice flowmeter is mounted improperly, not only the precise differential pressure cannot be obtained but also the control by SECTRON becomes totally useless. Therefore, carefully mount the orifice flowmeter by using the following mounting method.

1. In accordance with the arrow mark, mount the MO main unit with the upstream and the downstream in the right position. For the flange type, follow the IN/OUT indication impressed in the orifice plate flange (with the IN impression on the upstream side).
2. When the orifice flange is detached from MO-65 - 400, direct the utmost care not to make mistake in the direction of upstream and downstream.
※The orifice plate inside diameter portion with no chamfering is the upstream side (Refer to the below figure).
3. On both the upstream side and the downstream side, provide a straight pipe as long as over 6 times of the pipe diameter. Do not attach any pipe fittings, such as flexible tube, butterfly valve and elbow, or they could cause disturbance.
4. It is recommended to attach a checkup cock at the differential pressure checkup port for use in commissioning or checkup (Refer to the below figure).
5. Avoid as much as possible differential pressure measurements is the flow rate measurement in the 0.1kPa below.

12-2. Oil Flow Sensor (LSF40, LDF41, LSF45)

<Outline>

The oil flow sensor is a small-sized oil flowmeter that is the best suited to uses of a fuel consumption meter for burners. It is a small-sized oil flowmeter exclusively for pulse transmission type remote control.

<Specifications>

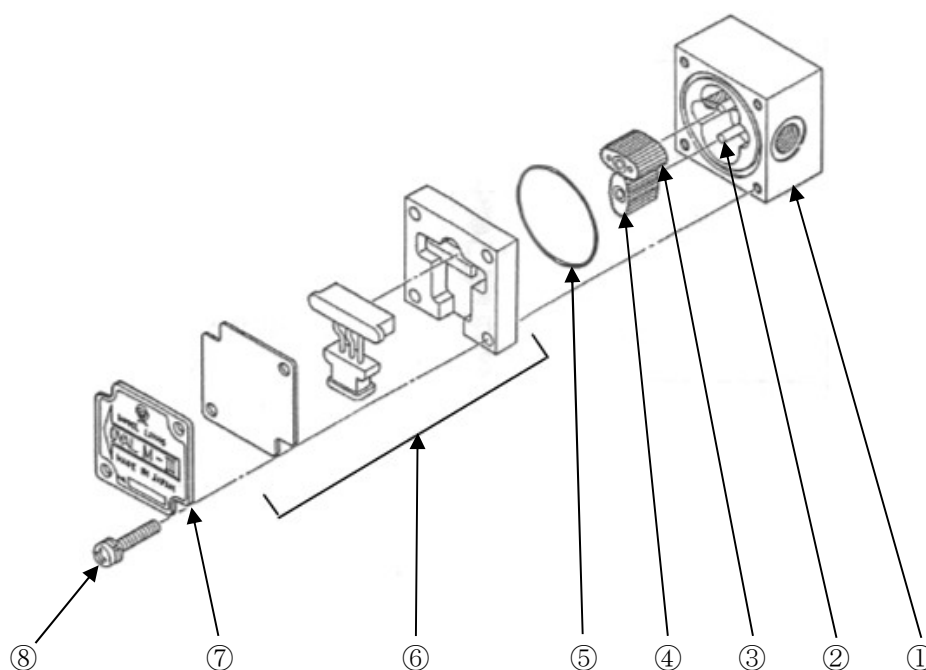
Output : Contact output by reed switch

Withstanding pressure : 0.98MPa

Applicable fluid : Kerosene, light oil, Bunker A

Model	Oil pulse (mL/P)	Oil maximum flow rate (L/h)	Connection (R)
LSF40	0.5	50	1/4
LSF41	1.0	100	1/4
LSF45	5.0	500	1/2

<Nomenclature>



- | | |
|---------------------|----------------------------------|
| ① : Main unit | ⑤ : O-ring |
| ② : Rotor shaft | ⑥ : Front cover with reed switch |
| ③ : Primary rotor | ⑦ : Nameplate |
| ④ : Secondary rotor | ⑧ : Pan head machine screw |

<Mounting Environment>

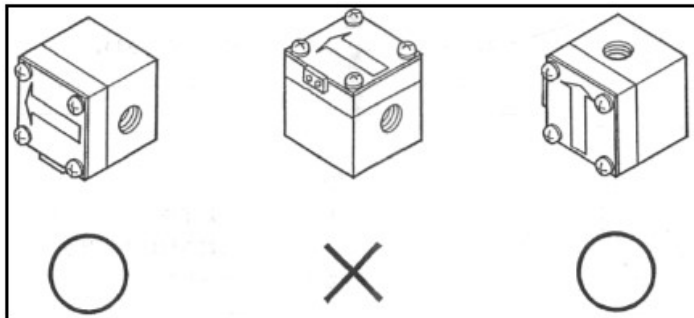


Do not mount the oil flow sensor at any of the following places.

- The place where the ambient temperature is outside a range of -20to 85°C.
- The place where the relative humidity is outside a range of 20 to 85%RH.
- The place where is subject to dust, salt or iron.
- The place where is subject to corrosive gas or combustible gas.
- The place where is Vibration or impact of shock.
- The place where is flooding or oil.
- The intense place of the temperature change.
- The place where receives the heat dissipation of the heating element.

<Mounting Method>

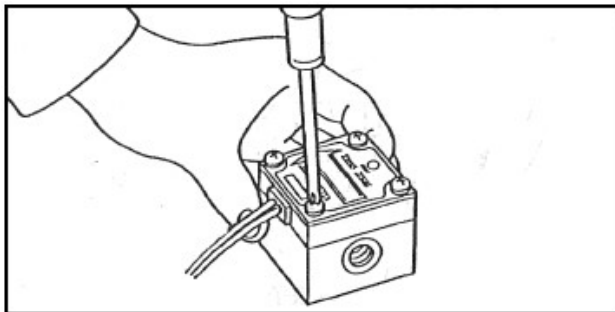
- Be sure to flush the piping before mounting the flowmeter.
- Do not mount the flowmeter near magnetism generating component, such as solenoid valve.
- The clearance of the rotating part of the flowmeter is micron scale. Therefore, during the piping work, direct good care not to allow seal tape, seal agent or dirt to enter the clearance, or the rotor could stop or the rotor precision could be spoiled or the rotor could be degraded.
- Do not blow with your mouth or blow compressed air to check the rotation of the flowmeter, or the rotor could run away and be broken or the measurement chamber could be rusted.
- Set the flow-in direction correctly according to the arrow direction on the flowmeter main unit.
- Mount the strainer closely on the upstream side of the flowmeter.
- Mount the flowmeter with the nameplate positioned vertically. (Refer to the below figure.)



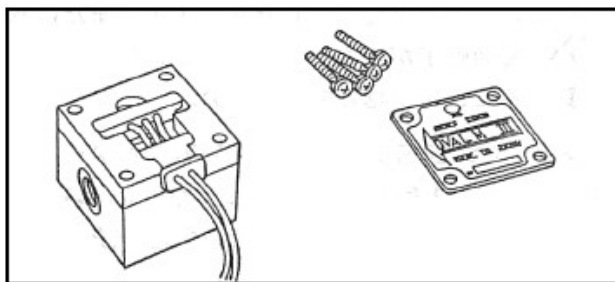
<Overhaul Procedure>

Overhaul the main unit periodically once a year, though the frequency may vary according to the operating conditions.

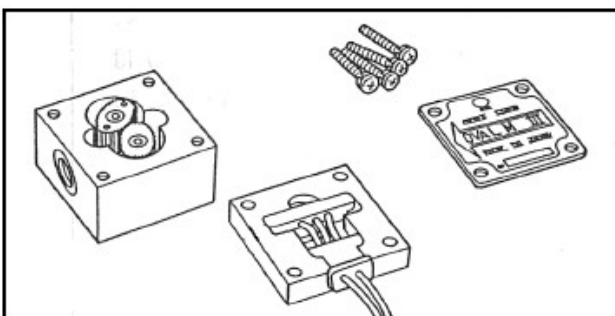
- ①. Remove all pan head machine screws (4 pcs) with a Phillips screwdriver.



- ②. When the pan head machine screw is removed, both the front cover and the pulse transmitter come off from the main unit. Be careful not to drop them.



- ③. When the front cover is removed, the measurement chamber appears, and the rotor, etc. can be seen.



- ④. Remove the rotor from the measurement chamber, and check each part of it.

Checkup item (a) Isn't any extraneous matter caught by the rotor?

(b) Aren't the rotor and the rotor shaft worn?

(c) Doesn't have a such as scratches on measurement chamber or the front lid inner surface?

(d) Isn't the magnet rusted?

After the checkup on these points, completely clean the rotor, the rotor shaft, the measurement chamber inside and the front cover with clean water and wash oil.

<Main Unit Assembling Procedures>

①. Mounting the rotors

The side of the rotor on which the transmitter magnet is built in is the front cover side.

For the primary rotor (meshing mark “·”), when the flow-in direction is right →left, mount it on the upper shaft. For the secondary rotor (meshing mark “··”), slowly mount it toward the lower axis so that the major axis and the minor axis mesh with each other.

②. Checking the meshing of the rotors

While manually rotating the rotors, check to confirm that the meshing is normal.

③. Mounting the front over

Firstly, mount the O-ring on the main unit. If the O-ring is damaged or lubricated with measurement liquid, the O-ring may not fit in the groove in the front cover. In such case, replace the O-ring by new one. Set the pan head machine screws (4 pcs), and evenly fasten them until the front cover adhere tightly to the main unit.

④. Checking the rotation

When the mounting up to ③ is over, check to confirm that the rotor rotates smoothly with air or water and the receiver integrates.



Check the rotation by rotating the rotor slowly. If the rotor is rotated rapidly, baking or other damage could be caused.

<Oil flow rate sensor of a large flow rate>

Flow pet -EG Model : LS4976, LS5076

<Specifications>

Power : 12~50VDC
 Output : Open collector
 Withstanding pressure : 0.98MPa
 Applicable fluid : Kerosene, light oil, Bunker A

Model	Oil pulse (mL/P)	Oil maximum flow rate (L/h)	Connection (JIS 10K Flange)
LS4976	5.928	800	20
LS5076	9.912	1600	20

12-3. Oil Filter (FH150-02, FH150-04)

<Specifications>

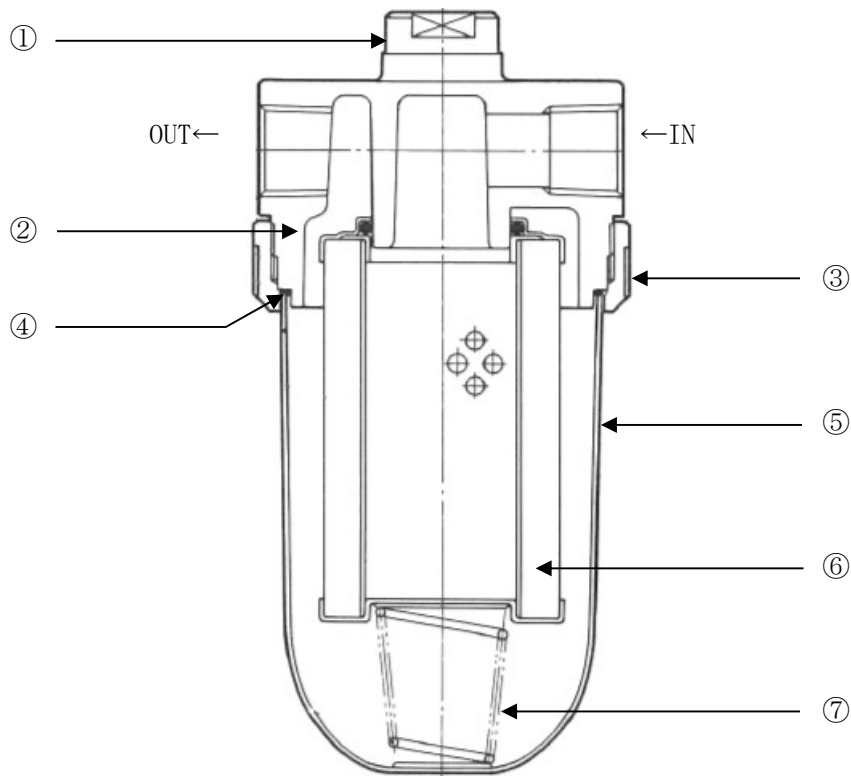
Withstanding pressure : 1MPa

Applicable fluid : Kerosene, light oil, Bunker A

<Mounting Environment>

Temperature : -20~80°C Humidity : 20~85% (with no condensation)

Model	Flow Range (L/h)	Connection (Rp)
FH150-02	0~300	1/4
FH150-04	0~1200	1/2



①. Blanking cap

②. Cover

③. Clamp ring

④. O-ring

⑤. Case

⑥. Element

Model : EP910-020N

Material : Paper

⑦. Spring

<Mounting Method>

- When mounting the oil filter, confirm “IN” and “OUT” and position the case downside.
- When the filter is mounted and flashed, be sure to replace the element before starting the regular operation.
- Before starting the regular operation, confirm no leak from each seal portion.

<Checkup and Maintenance Procedures>

• If the differential pressure reaches or exceeds 0.13 MPa during the operation, stop the operation, disassemble the oil filter and replace the element.

● Refer to the exploded view on P. 25.

<How to replace the element>

1. Loosen the clamp ring, remove the case, and discharge drain from the inside.
2. Remove the spring from the bottom of the element.
3. Remove the element from the cover.
4. Replace the removed paper element by new one.

<How to mount the element>

1. Check the O-ring for break, deformation, swell, hardening, etc. If the O-ring is defective, replace it by new one.
2. Insert the spring into the element bottom, and then insert the element into the cover.
3. Mount the cases to the cover while directing care not to damage the element, and then mount the element and fasten it with the clamp ring.
4. Before starting the regular operation, confirm no leak from each seal portion.

12-4. Temperature Sensor

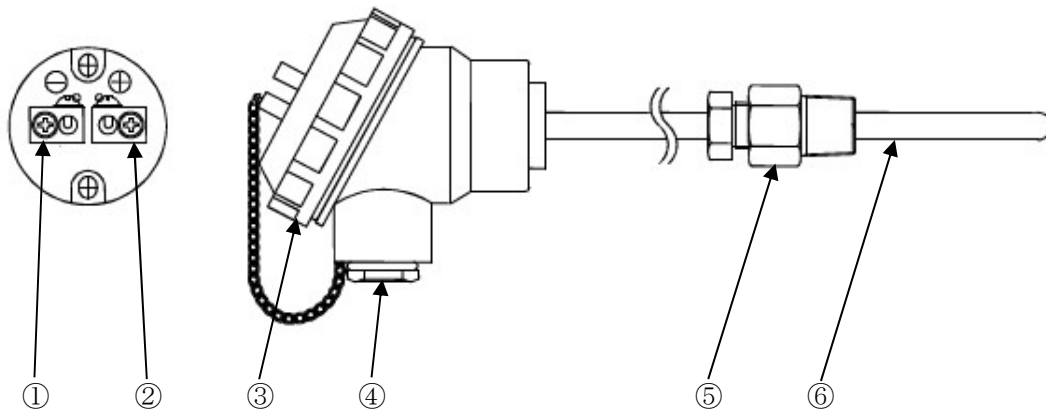
<Specifications>

Model : KL-200 (K type, $\phi 8$ sheath)

Temperature range : 0 to 600°C

Connection port : R3/8

<Nomenclature>



- ①. Plus side terminal block
- ②. Minus side terminal block
- ③. Cover
- ④. Cable inlet port
 - inlet the cable.
 - For the cable, be sure to use a shield cable.
- ⑤. Compression fitting
 - Connection : R3/8
- ⑥. Sheath
 - Diameter $\phi 8$ mm, length 200 mm

<Mounting Method>

- Insert the sheath portion for 65 mm or more. If the pipe diameter is small, mount the sensor at an angle.
- Mount the sensor as close as the pressure measurement portion.



Do not mount the sensor near the orifice (within 6D).

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The specifications are subject to change for improvement without notice.

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