FIN FLOW

A clean chemical support system

Instruction Manual

for

FF-P Series
(for HT type)

Caution

Before using an instrument, please read this Instruction Manual with caution, and then use it properly. If any further difficulties that are not covered in this Manual, Please contact us, and we could give you appropriate advices you require. Please always keep this Instruction Manual at hand for your quick reference when necessary.

TOFLO CORPORATION

138-R03

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Safety precaution

We highly appreciate your purchasing our products of the model " FF-P Series HT type ".
Please read through this Instruction Manual in order to use properly and safely, and also for the purpose of prevention from disaster that might be caused upon making sure that following descriptions.
The **" Safety precaution "** intends to prevent injury from the user or persons in charge or to take precaution against preventing damage to the property which may happen so that it is required to read through with a better understanding.

⚠ **Warning**	This is the safety –alert symbol which indicates the potential for the death or serious injury which might be caused.
⚠ **Caution**	This is the safety-alert symbol which indicates the potential for injury or material damage which might be caused.

⚠ Warning

《 Setting precaution 》

- ●Never flow solid matters and gaseous matters (including air purging), because that the FF-P Series HT type has been designed for the use in liquids flow and their flow measurement.
- ● Never use the flowmeter as it is immersed in liquid.
- ● Use the flowmeter under the rated voltage.
- ● Use the flowmeter under the rated pressure.
- ● Use the flowmeter within the range of max operating temperature.
- ● Use the flowmeter tube in a state that has been always filled fully with fluid.
- ● Decide the installation posture based upon the Instruction Manual.
- ● Be sure to keep the instructins indicated on the label attached and use it properly.
- ● Such tubes for use in making up pipe should be used as PFA, stainless steel, or non-flexible.
- ● Flow control valve should be installed at a higher place than the position of flowmeter, or install it to outlet side. If there is a throttle such as a valve at a place other than as said above, liquid inside the flowmeter will flow out, air bubbles (Cavitation) will appear due to the pressure reduction and may fail to measure. Provided that this does not need to apply to the piping configuration and the usage, where inside of the flowmeter is filled fully with liquid, and also where cavitation phenomena do not occur.
- ●FF-P series HT type shall be applied to the industrial use as an industrial instrument only and may not be applied to any other application.

⚠ Caution

《 Installation precaution 》

- ● Since the flowmeter has been packed in the clean room when it had been shipped, handle with caution. Unpack the product in a place, where is clean in air.
- ● Adequate care must be taken for installing the flowmeter in a correct flow direction of fluid.
- ● FF-P Series are different in installing posture according to the type.
  Install it in confirmation of the items relating to "Installing posture of the flowmeter" in this Instruction Manual.

● Never mount foot on the flowmeter nor put things on it. Neglecting this may result in failure and damage.
● If pipe connection is made by tube fitting(Joint), connect it according to the instruction manual attached.
● As to how to install the flowmeter, be sure to use the mounting hole given and securely fix it with screws and the like. If used in a state of floating in the air, the forced stress is exerted on the tube at inlet/outlet of the flowmeter, and it may leak resultantly.

● In connecting the flowmeter to the process equipments, a great care should be taken for the deviation from the pipe. Also the alignment of pipe connection shall be done correctly. If due to deviation errors have been produced, the forced stress will exert to the metering device so that they may cause failure, malfunction and damage.

⚠ Warning

《 Wiring 》

● The wiring shall be carried out after turning off the power source.
● Verify the power source and voltage to ensure that the rated power source is not exceeded.
● In case that the devices which produces noises are used near the flowmeter such as a switching regulator or inverter motor, take steps for the noises to provide the devices with a frame ground(F.G.).
● Avoid kinking, twisting and pulling out the sensor cord or connected cable.
● Be sure to confirm the lead wire color to ensure that the wiring should be securely made to the indicator or sequencer.
● Avoid continuously turning on/off the power source.
● Do not apply any pressure and tensile stress, when connecting wires to the terminal block. Otherwise it may result in disconnection.
● Use direct-current power source with isolating transformer.
● The connected wires coming from the flowmeter shall not be bundled together with heavy current cables (power source cable, power cable, high tension cable and the like), the parallel-wiring and metal-conductor wiring tube. If bundled together, the noises may ride the signal lines and results in malfunction.
The extension of the cable shall be up to 20mm at maximum length, using the lead wire more than 0.3mm sq. As the shielded cable is apt to be affected by the noises and may cause malfunction, it is suggested not to use it (For further information please contact us).

⚠ Warning

《 Operating environment 》

● In no case shall the flowmeter be used in an explosive atmosphere.(excluding the intrinsic safety explosion-proof type photosensor specification).
● Never use the flowmeter in an atmosphere of the corrosive gases.
● Do not set the flowmeter in places, where is no condensation and water-spraying, since it has not been constructed water and moisture-resistant. (Use it in a place, where is less than 80% at humidity).
● Set the flowmeter in places, where the ambient temperature is between 0℃ and 30℃ and where is not subjected to the direct sunlight.

● Use the flowmeter in a place, wherer is not affected the electromagnetic induction disturbance.

● Avoid setting the flowmeter near the high frequency devices such as a high frequency lighting or rapid starting typed fluorescent lamp and inverter which may generate the lighting and noises very similar to the modulation frequency of photosensor.

● Use the device in the place, where it is not affected by the electromagnetic field.

● Set the flowmeter in a place, where the ambient intensity of illumination is less than 300 lux. (Max guaranteed intensity of illumination of the photosensor as a single unit).

● Use the flowmeter in a place, where is less mechanical vibration.
If affected vibration from the outside, it may cause cable disconnection and chattering, and may result in error in the flow measurement and generating the particles(Dust).

⚠ Caution

《 As to fluid 》

● Do not get air bubbles mixed into the fluids.
Due to air bubbles reflect the light of photosensor diffusely, thereby not alone becoming unstable in flow measurement, but disabling it for measuring. Also due to the air bubble producing inside the flowmeter resistance occurs in the fin to rotate, thereby becoming unstable in flow measurement, or disabling it for measuring.

● Do not get the foreign matters mixed into the liquids.
The foreign matters by which light is reflected, thereby becoming unstable in operation and disabling it for measuring.
The foreign matters have been lodged between sapphire shaft and bearing, and may become cause of trouble.

● There may be the case that the viscosity of operating fluid is too high to measure.

● Be sure to flow the liquids to the flowmeter within the specified range of the temperature.
Flowing the temperature controlled water to the Teflon flowmeter without range of temperature specified, their materials of Teflon and polypropylene may be changed in shape, and may result in the errors in flow measurement and the leakage.

●Although FF-P Series have, regardless the type with or without the high sensitivity-adjusting relay volume, been designed and adjusted for applying to almost conceivable chemicals as it is, a change occurs in the light-receiving sensitivity, and it becomes an unstable operation depending upon the fraction transmitted and the refractive index of the operating fluid. And also there may be a case where it cannot be used according to the color intensity (or concentration). Please consult us, when such a case occurred.

⚠ Caution

《 Flow measurement 》

● When purchased the flowmeter and the indicator at the same time, all the data necessary for the flow indication have been all configured to the indicator at the shipment of the factory.
Only you have to do is to connect it to the pipe, and to flow water so that the indicator will indicate the accurate flowrate. Provided that the data input regarding the output with no reference directly to the flow

indication such as comparative output, unless otherwise specified, have been configured by the standard numerical values, and is shipped.

- Use the flowmeter while restraining it from pulsation using a damper as much as possible, because it structurally can cause it to read inaccurately and /or malfunction, if the pumps having a great pulsation such as bellows pump and diaphragm pump, etc. have been used.
- When flowing liquid to the flow path(At the time, when starting up the system), the air bubbles entered into the inside of the flowmeter and deposited on the inner wall, or air trapping occurs and can cause it to read inaccurately and/or malfunction. For the reasons mentioned above, make the velocity of fluid faster once, and flash out the bubbles, when starting up the system.

⚠ Caution

《 Others 》

- Carefully handle the flowmeter "FF-P Series", as it is a precision instrument.
  It may cause failures to leak or break the sapphire shaft, if the products are dropped and shocked from the outside.
- Do not use the damaged cord such as unsheathed wire and disconnection as it is, and ask us to repair or replace it promptly.
- During the operation, stop operating at once and turn off the switch of power source, if found out to be abnormal in the flowmeter and indicator (emitting smoke, or offensive smell) has been used, please ask us to repair in our service, after confirming that the abnormality has been improved.
- If the flowmeter which employs a photosensor (EX-11B series made by SUNX or UM-T15 series) other than that of the photsensor (Intrinsic safety explosion proof type photosensor, light fiber sensor, Hall IC sensor, etc.) are to be used, read through the Instruction Manual with caution attached separately).
- The FF-P type has a function to produce the continuous signal only.
  We would like to request you to understand that the flowmeter itself does not perform any supply operation and automatic flow control.in the single unit alone.

⚠ Warning

《Requesting and notice 》

- Do not disassemble this product(FF-P type). If disassembled, we cannot warrant it.
- Specifications and dimensions of this product are subject to change due to improvements without prior notice.
- Warranty period of the product shall be one year from the date of purchase. (For one year counting from the next month of the month shipped from factory).
- During the warranty period, if the fault occurred which is liable to us, only the faulty part shall be repaired by us, or replaced it with new one only.
- A series of the type of FF-P itself do not have any controlling function to protect from disaster and accident.
  We are kindly requesting you to understand that we are not liable to the compensation for damage caused by disaster and accident arising out of or related to this devices in which these metering devices are used.

Greeting

We highly appreciate your purchasing the rotary flow meter typed “FF-P Series”.
We would like to request you to read through the Instruction Manual with caution in order fully to display the performance and to use it safely.

《 General description 》

- “FF-P “ series HT type is a rotary type flowmeter which has been designed mainly for the use of semiconductor processing and flat panel display processing. The flowmeter takes signal from converting the rotational frequency to the pulse signal through the photosensor. As the materials in the contact area of liquid are comprised of PFA and PTFE and also for the shaft and bearing the sapphires are used, it is most suitable for flow measurement of the liquids which is needed to grade up purity and almost industrial fluids.
  The indicator receives the pulse signal from the flowmeter and computes, and displays the instantaneous and integrating flowrates and the total discharge flow rate per one minute in accordance with the sampling time and pulse counting.

《 Accessories 》

Check to ensure that the following has been all set.

- Flowmeter body: (FF-P Series HT type body)
- Flow indicator (Optional)
- Each instruction Manual
- Accessories (Joints, connecting cord, analog output unit, BCD output unit and others)

《 Specifications 》

【 Flow accuracy 】

Within FS±5.0%

- FF-P150 : 0.3 – 3.0 L/min

【 Operating pressure 】 : Max 0.35MPa (G)

【 Withstand pressure 】 : Max 0.5MPa(G)

【 Max operating temperature 】 : Max 80℃

【 Heat resistance 】 : Max 90℃

《 Type selection : FF-P (HT) Series 》

Std.	Fluid	Unit of flowrate	Max flowrate	Optional	For specific items
150	-1	-B	3	-ET	For instance of entry / Description
				HTS	For high temperature(Stainless steel plate) ✱1
				HTP	For high temperature(PPS plate) ✱1
				DT	Instantaneous flow indicator ✱1
				DR	Instantaneous flow indicator ✱1
				P1	With a function of sensitivity adjustment(For 24VDC spec.) ✱2
				P2	With a function of sensitivity adjustment(For 12VDC spec.) ✱2
				F	With fiber sensor ✱1
			3		
		B	L/min		
	1	For pure water			
	9	For specific fluid			

Std	Max flowrate	Pipe connection
150	0.5 – 3 L/min	TV 3/8(φ9.52x6.35)

✱ **1:** For specific items specify them at the end of Type selection in order.

✱ **2:** For standard specification, a type of photosensor without a function of sensitivity adjustment is used.(12 – 24VDC).

《 Specifications on photosensor 》

【 EX-11B Series made by SUNX 】

- Output : NPN transistor ･Open collector
  Sink current Max 50mA(30VDC) at max.
- Power supply voltage : 12 – 24VDC ±10% (Free power supply)
  Ripple less than 10%
- Power consumption : Less than 25mA
- Protective construction : IP67(IEC), Watertight type(JIS)
- Operation mode : Dark-on

【 UM-T15 Series made by TAKENAKA Electronics industry 】

- Output : NPN transistor/Open collector
  Sink current Max 80mA(30VDC) at max.
- Power supply voltage : 12VDC ±10% or 24VDC ±10%(Confirm the specifications on voltage)
  Ripple less than 10%
- Power consumption : Less than 37mA
- Protective construction : IP64
  Teflon coating to the section of sensor head and internal substrate
- Operation mode : Dark-on

※ For the performance and specifications of any other photosensors see the instruction manual attached.

《 As to red and green LED in the photosensor 》

- The photosensor comprises the head, “transmitter” which sends out light and the head, “receiver” which is subjected to light. Also there are bicolored LED in the head of receiver and each color of LED have the following meaning.

  Red LED : Operation indicating light
  Green LED : Stability indicating light

【 Each LED status and the operation status of flowmeter in the FF-P Series 】

(Red LED)

- Lighting-up state: It is in a state that the fin inside the flowmeter has obscured light from transmitter and is not subjected to light.
  Pulse output is in an on-state.
- Lights-out state: It is in a state that the light transmittd from transmitter is subjected to light to the receiver.
  Pulse output is in a state of off-state.

(Green LED)

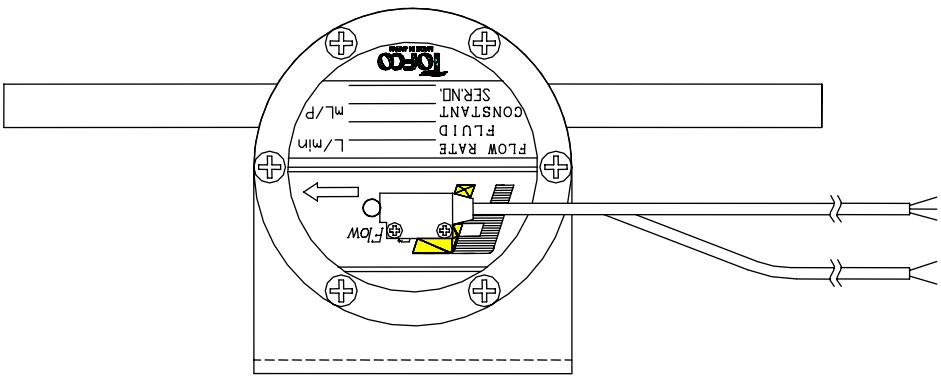
- Lighting-up state : It is in a state that the fin inside the flowmeter has completely obscured light from transmitter or that it is completely subjected to light to the receiver.
- Lights-out state : It is in a state that the fin inside the flowmeter has in a halfway manner obscured light from transmitter.
- Each LED flashes on and off repeatedly, if the liquid flows into and operates FF-P type, and as the flowrate increases, each LED flashes faster, and becomes to be in a state of lighting up.

⚠ Caution

《 Installation posture of flowmeter 》

● Types: FF-P150 for high temperature

Install the flowmeter so as to turn the round label surface affixed on the top sideways(vertically), and run the water to the arrowhead direction, if using either of them as described above.



Caution

●A great care should be taken for installation postures, as it may cause it to read inaccurately and /or malfunction, if installed in any other posture than as described above.

● Consult us prior to installing, if installing in any other posture than as described above.

Caution

● In order easily to remove air bubbles, turn the tube side upwards, fix and install it as shown in drawing.

●A great care should be taken for installation postures, as it may cause it to read inaccurately and /or malfunction, if installed in any other posture than as described above.

● Consult us prior to installing, if installing it in any other posture than as described above.

Caution

《 Combination with flowmeter and flow indicator 》

● When purchased the flowmeter and the flow indicator together at the same time, make it agree with the serial number (Manufacturing number) as shown below, and then use it.

● Appropriate data have been configured to the flow indicator at shipping.
The use of flowmeter and flow indicator different from the serial number each other may cause it to read inaccurately and/or malfunction and may cause errors in display.

● Confirm to ensure that the serial number is specified and stated in any type of flowmeter and flow indicator. . (Provided it is confined to the same purchase together with the flowmeter)

＜For instance＞

For flowmeter side (SER No.)		For flow indicator side
EDAOX001	&	EDAOX001
EDBOY001	&	EDBOY001
EDDOZ001	&	EDDOZ001

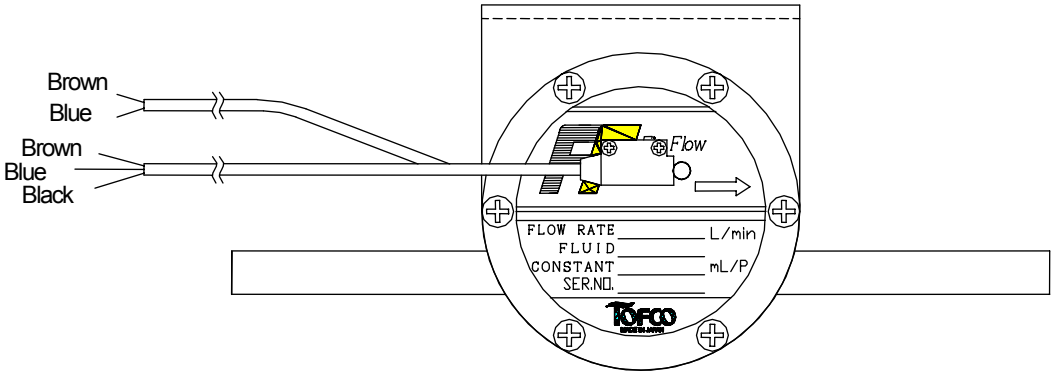
⚠ Caution

《 Explanation for flowmeter terminals 》

● Wiring shall be made according to the drawing illustrated below.

◎ The same color of the photosensor cords as in the transmitter side and in the receiver side are bundled in one to wire.

※ The following drawing shows the illustration of the sensor of EX-11B, it is also applicable to UM-T15 Series.



Cord color	Functional contents
Black	Pulse output terminal
Blue	Common terminal to sensor power supply
Brown	12 – 24VDC

⚠ Caution

《 Explanations for terminals on EM0100DT/DR 》

Cord colors	Functional contents	For the indicator side
Gray	Pulse input terminal	Black cord
Blue	Common terminals to input and power supply for sensor	Blue cord
Brown	Power supply output for sensor (12VDC)	Brown cord

《 Explanations for terminals on EM1000ET 》

Cord colors	Functional contents	For the indicator side
Black(Thin)	Pulse input terminal	Black cord
Blue	Common terminals to input and power supply for sensor	Blue cord
Brown	Power supply output for sensor (12VDC)	Brown cord

※ For more information regarding the indicators, see each instruction manual attached.

《 Explanation for the meaning of label affixed on the flowmeter body 》

- Arrowhead mark (⇒) ••••••••It shows flow direction.
- FLOW RATE •••••••••••••••••• It shows max flowrate per one minute to flow.
- FLUID •••••••••••• It shows fluid name to flow.
- CONSTANT•••••••••••• It shows the value which the discharge per one minute was calculated by "mL".
- SER. No. •••••••••••••• It shows serial number.(Manufacturing number).

⚠ Caution

《 As to "CONSTANT" 》

- There is installed fins (Six pieces of blade) made of fluorocarbon resin in the casing, liquid discharged form IN side enters in increment of a certain amount of flow into between each one of six pieces of blades, and is discharged .to the OUT side. "A certain amount of flow" which was discharged at this time is referred to as "CONSTANT".
- In case of photosensor, six pulses per one revolution of fin are transmitted , since six pieces of blade have been all counted, but in case of the specification on the magnetic fins, magnet is incorporated into two of six pieces of blade so that two pulses are transmitted per one revolution.
- Pulse number per each flowrate can be gained from the CONSTANT. Pulse number is then computed by converting flowrate to "mL" and then divide the numerical value by CONSTANT.
- The frequency values configured to the EM0100DT/DR or EM1000ET can be gained by the following way of computation; liquids are discharged at max operating flowrate of the flowmeter specified in the specification for one minute, and the total pulse numbers obtained at that time are divided by 60, thereby finding out the values to be required.

《 Maintenance 》

- If FF-P Series has been used for a long period, it may cause such defects as in the opacificaton of Teflon resion and the deterioration of light-sensitivity of photosensor resulting from the deposits, and further may cause partially lack in pulse waveform, and may cause no pulse output.
- In order to maintain a stable flow measurement we recommend that it should be overhauled periodically and also the consumable parts should be replaced. For photosensor and replacement parts it is recommended to replace them every six months.

Supporting and servicing

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Trouble shooting

(Symptom 1)
No pulses output and no display, notwithstanding that fluid is flowing into flowmeter and the internal fins are rotating.

Causes	Measures
● Air bubbles have been deposited inside of the flowmeter, and pulses are miscounted.	● Air bubbles existed in connected pipe and within the flowmeter shall be all removed.
● Liquids such as colored, opaque or the liquids to cause deposits have been using.	●If using the light-sensitivity adjustable sensor, readjust the AMP volume(※1). If not improved or if using the sensor without adjustable light-sensitivity, it may be disabled for use. For more information contact us.
● Failure of adjustment in light-sensitivity of photosensor (Restricted to the sensor with adjustable light-sensitivity).	●If using the light-sensitivity adjustable sensor, readjust the AMP volume(※1). If not improved or if using the sensor without adjustable light-sensitivity, it may be disabled for use. For more information contact us.
● Due to defect in photosensor	● Replacement of photosensor
● It is not turned on.	● Reconfirm the connected cable and turn on electricity again.
● Output cable not connected.	● Reconfirm the connected cable and turn on electricity again.
●Wiring short-circuited.	● Reconfirm the connected cable and turn on electricity again.
●Operating voltage applied wrongly.	● Supply voltage specified.
● Wrong data input configured to the side of flow indicator.	●Confirm the data input configured to the indicator side.
● Due to defect in flow indicator side, or reasons due to performance.	●Replacement of flow indicator or to use a high-speed counter(Input) type.

(Symptom 2)

Fin does not rotate, regardless of water flowing into the flowmeter.

Causes	Measures
●Foreign materials (Air bubbles) have been got mixed into inside of the flowmeter and resistant to flow.	●Take out any foreign materials (Air bubbles) mixed inside the flowmeter.
● A quantity of flow is far much less to flow	●Flow the specified amount of flowrate in accordance with specification on the flowmeter in operation.
●Shaft damaged, or body damaged.	●Replace the flowmeter body. (※2)
●Ingredient of the operating fluid has been deposited and solidified.	●Overhaul the flowmeter body.(※2) If the shaft has been broken, it cannot be reused depending upon the operating condition. For further information contact us.

(Symptom 3)

In case that the pulse output (indicated flowrate) is unstable, or that errors occur considerably in flow measurement.

Causes	Measures
●Pumps which vibrates and makes pulsation occur such as bellows pump have been used.	●Use the pumps which pulsation does not occur, or use such as damper restrictive to minimal pulsation.
●Partial lacking(like lost tooth) in pulse output waveform occurs.	●If using the light-sensitivity adjustable sensor, readjust the AMP volume(※1). If not improved or if using the sensor without adjuable light-sensitivity, it may be disabled for use. For more information contact us.
●Sampling time configured to flow indicator side and auto-zero time have been set too short, or the setting time configured has been set wrongly.	●Sampling time configured to indicator and the auto-zero time are to set them longer(More than two seconds), or confirm input setting values again.
●Flow direction is in the opposite direction, or flowmeter body is not installed by the directed posture.	●Flow the fluids according to arrow direction as shown on label applied to face of top. ●Install the flowmeter according to the installing posture of the flowmeter given in Instruction Manual.
●Foreign materials(Air bubbles) mixed into inside flowmeter and resistant to flow.	●Get rid of foreign materials entered into inside of the flowmeter.
● Flexible tube (such as rubber tubing) is used in pip line, in which flowmeter is installed.	●Use such nonflexible tubes as PFA tube, SUS tube, etc.
●Affected by the noises from outside.	●Change the installation location, or take measures against noises.
●Flowmeter is different in serial number from that of indicator.	●Use same serial number as flowmeter and indicator.

(Symptom 4)

Interface with external input unit cannot be performed normally.

Causes	Measures
●Cables not connected correctly.	●Confirm the connected cables again.
●Operating voltage applied wrongly.	●Supply voltage in accordance with specification.
●High speed counter and input type has not been used.	●Use the counter having the functions to measure ranges of more than 15000 P/min.
●Affected by noises from outside.	●Change the installation location, or take measures against noises.

(※1) For the adjusting procedures for the light sensitivity adjustable photosensor, please consult us.

(※2) As we are dealing with reassembling of the main body, please contact us at near sales office.

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