



**FvLuoky FLOAT**  
**Metal float flowmeter**

**FFA60 Series**

# User Manual

**FY/JC 60 A / O 15/07 v 1.5**



**FuYi Intelligent Instrument (Shanghai) Co., Ltd.**

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### **Special tips :**

- 1、 When the instrument is installed, it is necessary to clean the welding slag!**
- 2、 When installing the instrument, the measuring tube must be on the same axis as the pipe, and the hole in the gasket should not be smaller than the hole in the measuring tube.**
- 3、 When installing the instrument, the tightening torque of the flange' s fastening bolts should be moderate, so as not to damage the sealing surface. It is not permissible to weld the flange after the instrument is installed, which may cause the instrument to be scrapped.**
- 4、 For the correct and reliable operation of the instrument, the magnetic coupling parts of the head cannot have magnetized particles adsorbed on its surface.**
- 5、 For remote instruments, in order to achieve the best electromagnetic compatibility, the shell must be reliably grounded.**
- 6、 For instrument with communication function, please consider the influence of electromagnetic interference to instrument. Try to use a dedicated cable.**
- 7、 When measuring high-temperature medium with liquid-crystal**

**display, the insulation material shall be used to isolate the head from the measuring body.**

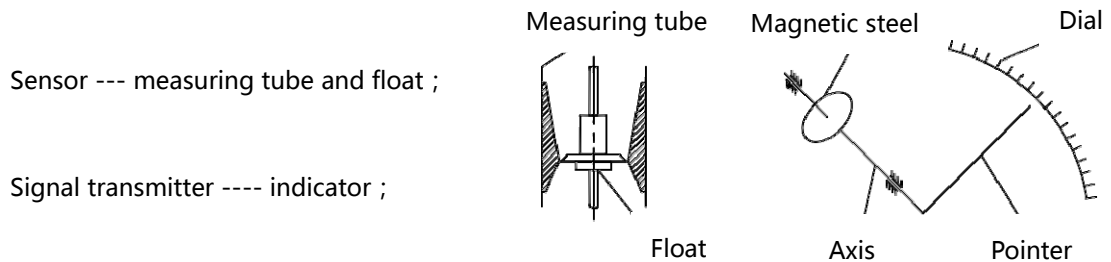
- 8、 When wiring, make sure the wires are in reliable connection with the terminals.**
- 9、 Please properly handle the waterproof problem of cable joint so as to avoid the rain entering the watch shell.**
- 10、 If the measuring medium contains magnetic particles, a magnetic filter shall be installed at the entrance of the instrument. When a non-magnetic particle is contained, a strainer shall be installed.**
- 11、 Liquid crystal display and keyboard operation will be subject to change without further notice. Please refer to our website.**

# 1、 Summary

FFA60 series intelligent metal tube float flowmeter is a variable area flow meter based on float position measurement. It adopts all-metal structure, has small volume, small pressure loss, large range ratio (10~20:1), optional HART communication function transmitter, easy installation and maintenance, etc. It is widely used in complex and harsh environments in various industries. Flow measurement and process control for small flow rates, low flow rates, and harsh media conditions.

## 2、 Structure and principle

FFA60 series intelligent metal tube float meter consists of two parts:



There are four kinds of liquid contact materials for the sensor: stainless steel, Hastelloy, titanium, and stainless steel lining FEP; users can choose different liquid contact materials according to different process pressures and corrosive requirements of the medium to meet the pressure resistance of the process. And the need for media anti-corrosion.

According to different measurement requirements, users can choose different indicator combinations to achieve different measurement requirements when selecting the model. The specific indicator form and its corresponding function are shown in the indicator type.

The flow is measured by the transmitter in the indicator through the coupled magnetic steel to sense the change in the position of the float to complete the flow indication and the far-distance transmission of the signal. When the measured medium flows through the measuring tube from bottom to top, the float is balanced by the force of gravity, buoyancy and fluid velocity on the vertical upward direction of the float. The float is relatively stationary at a certain position. This position follows the float and the cone. The annulus area and the fluid flow rate change, and the position of the float corresponds to the flow rate of the measured medium.

## 3、 Product features

Rugged all-metal construction

Suitable for the measurement of gases and liquids in various industries.

The new case structure allows for high temperature environments without adding parts.

Specially designed conical measuring tube for a wider measuring range and better measurement linearity.

Flanges, clamps, threads and other process connections are available for most plant applications.

Measurement materials are available in stainless steel, titanium, Hastelloy, PTFE, FEP, etc.

The specially designed magnetic coupling system can significantly improve the accuracy and stability of the measurement.

Far away from the characteristics of the instrument.

## 4、 Technical parameters

Measuring range	water (20°C)	16 ~ 150000 l/h.
	air ( 0.1013MPa 20°C )	0.5 ~ 4000 m <sup>3</sup> /h.
Range ratio		10:1 ( Special type 20 : 1 ) .
Accuracy class		2.5 ( Special type 1.5% or 1.0% ) .
Working pressure	DN15 ~ DN50	PN16MPa ( Special type 25MPa ) .
	DN80 ~ DN150	PN10MPa ( Special type 16MPa ) . pressure rating of jacket 1.6MPa.
Medium temperature		Normalized type -80°C ~ +220°C.
		High-temperature type 300°C.
		Lined with FEP type ≤85°C.
Ambient temperature		-40°C ~ +120°C(Remote display without LCD≤85°C).
		(Remote display with LCD≤70°C).
Dielectric viscosity		DN15 : ≤5mPa.s.
		≤30mPa.s
		DN25 : ≤250mPa.s.
		DN50 ~ DN150 : ≤300mPa.s.
LCD		Display range of instantaneous flow:0.000 ~ 99999.
		Display range of accumulated flow:0.00 ~ 99999999.
Output		Standard signal: two-wire system 4 ~ 20mA (with HART communication).
		Standard signal: 3-wire system 0 ~ 10mA.
		Alarm signal: 1、 Two-way relay output (limit value 125VAC/0.25A).
		2、 One-way or two-approach switches (switching requirements according to customer requirements).
		Pulse signal output: 0-1KHz isolated output (output level Vpp>4.5V).
Power supply		Standard type:24VDC±20%.
		AC type:220VAC(85 ~ 265VAC)( custom required).
		Battery type: 3.7@4.4-5.2AH lithium batteries are available for each group (3~12 months) depending on the usage, and two groups are replaced.

Connection mode	Standard type: HG20592 flange. Special type: user provides flange standard. Threaded connection type: user specified.
Electrical interface	M20×1.5、PG11、1/2NPT or user specified.
Overall height	Standard type:250mm (See other forms for installation)
Levels of protection	IP65/IP67.
Ex-mark	Intrinsically safe:ExiaIICT3 ~ 6. Ex type:ExdIICT4 ~ 6.

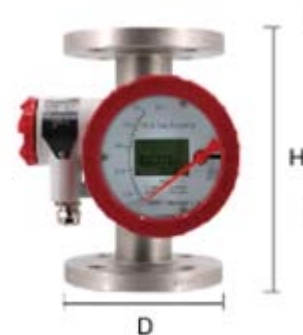
## 5、 Measuring range

DN mm	Range			Pressure loss ( KPa )	
	Liquid		Gas	Water	Atmosphere
	Routine ( L/H )	Anticorrosive ( L/H )	Routine( Nm <sup>3</sup> /H )		
15	16-600	16-400	0.5-16	2-3.4	7-14
20	600-6000	400-4000	16-180	4-12.5	7-33
25	600-6000	400-4000	16-180	4-12.5	7-33
32	1000-6000	600-4000	30-180	4.1-12.5	8-33
40	2500-10000	1600-4000	70-250	5.2-12.5	19-33
50	6000-25000	4000-16000	180-600	4.7-8	8-35
65	16000-25000	10000-16000	400-600	6.2-8	22-35
80	25000-60000	16000-40000	1000-1600	5.3-8.3	15-25
100	60000-100000	40000-60000	1800-3000	11.4-16.7	35-45
125	100000-125000	40000-50000	3000	11.4	42-45
150	150000	100000	4000	17	47

Note: Special specifications can be customized according to customer needs

## 6、Dimensions

DN	MPa	H	D
15	4.0	250	95
25	4.0		115
40	4.0		150
50	4.0		165
80	1.6		200
100	1.6		220
150	1.6		285



FFA60-F

DN	MPa	A	H
15	4.0	φ32	250
25	4.0	φ50	
40	4.0	φ63.5	
50	4.0	φ76.2	
80	1.6	φ102	



FFA60-W

## 7、Additional structure and installation instructions

The correct selection of smart metal-tube float flowmeter and additional structure is crucial to the stable operation and accuracy of the system. In the selection and installation of the flowmeter, we should pay special attention to the following points:

- 1) For the selection of remote-output type, we must select the flowmeter suitable for the use of Exd type; When installing, we should also note the tightness of the outer shell of the meter and the sealing of the connection terminal, and for the intrinsic safety type, we also need to select the proper safety barrier and the proper wiring to meet the requirements of Exd, protection and erosion prevention.
- 2) For places where the temperature of the medium under test is too high (> 220 °C) or too low, it is necessary to take heat insulation for the sensor part of the flowmeter. An indicator of



high temperature shall be selected to ensure the normal environmental temperature of the signal converter-the indicator (... /G/...).

- 3) For some media that need to be insulated, pick a jacket-type flowmeter (... /T/...). We adopt G3 / 8 " pipe thread connection in the heating or cooling interface. If you need other flange or thread connection, please indicate it when ordering.
- 4) For the unstable pressure of the inlet medium of the flowmeter, especially for the measurement of gas, the damping structure should be used to ensure the accuracy and service life (... /Z/...).
- 5) When the pressure level of the medium is higher and exceeds the standard pressure grade, the high-pressure type structure should be selected in the selection (... /G/...). High pressure type is through welding neck by HG20595-97 RF steel pipe flange. If other standards are used, please specify it when ordering.
- 6) When the flowmeter is installed, the verticality of the measuring pipe shall be better than 5 degrees, and the bypass shall be installed so as to be convenient for maintenance and cleaning without affecting the production.
- 7) The installation position should ensure the straight length of inlet is over 5DN, the straight length of outlet is not less than 250mm; If the medium contains ferromagnetic substances, a magnetic filter shall be installed on the flowmeter. ( See dimensions of magnetic filter and straight length )

Magnetic filter and straight pipe section dimensions

## Magnetic filter and straight pipe section dimensions

Straight pipe section	Lining FEP straight pipe section		Lining FEP filter		Filter	
Caliber	DN15	DN25	DN50	DN80	DN100	DN150
Front straight pipe section $H1 \geq$ (mm)	75	125	250	400	500	750
Back straight pipe section $H2 \geq$ (mm)	250	250	250	250	250	250
$\Phi d$ (mm)	95	115	165	200	220	285

Note: straight pipe section and magnetic filter are connected with HG20592 flange, special standard is specified by user.

- 8) The control valve in the measurement and control system shall be installed downstream of the flowmeter. When measuring gas, the work pressure should be no less than 5 times of the pressure loss of the flowmeter, so that the flowmeter can work stably.
- 9) Before installing the flowmeter, clean the welding slag in the pipeline; When installing, take out the stop element in the flowmeter; After installation, use the slow opening of the control valve to avoid damage to the flowmeter.

## 8、Electrical signal output and wiring related

The flow indication and electrical signal output of the FFA60 Series Smart Metal Tube Float Flowmeter is done by an indicator. According to the explosion-proof form, it can be divided into three types: ordinary type, intrinsically safe type and explosion-proof type.

The functions that the intelligent indicator can realize are: pointer local indication, pointer local indication +4~20mA far transmission (HART communication) + liquid crystal display, pointer local indication + upper and lower limit alarm (alarm point adjustable) + pulse output And other functions. The intrinsic safety mark of the intelligent indicator is iaIIC T6, the explosion-proof type mark is dIIB T4~6, and the explosion-proof intelligent indicator function is the same as the intrinsic safety type. A safety barrier is required for the intelligent indicator.

The above functions of the intelligent indicator are completed by an ESD-II intelligent magnetic coupling transmitter consisting of a magnetic sensor, an MCU microprocessor and corresponding functional

circuits installed in the housing. The transmitter has a two-line display liquid crystal. The display screen can complete the man-machine dialogue with only four keys, for parameter modification and sub-menu entry.

The upper and lower limit alarms of the intelligent indicator are completed by the relay of the intelligent magnetic coupling transmitter installed in the indicator. Through liquid crystal display

The display and buttons can be used to set the upper limit alarm, lower limit alarm and alarm return. The upper limit alarm setting range is 50-100%, the lower limit alarm setting range is 0-50%, and the alarm hysteresis setting range is 0-5%. When the relay outputs an external safety barrier, it can constitute an intrinsically safe explosion-proof system.

The intelligent indicator provides a pulse output function with a corresponding flow rate of 0-100% output of 0-1KHz. An external safety barrier can form an intrinsically safe explosion-proof system.

Within the measurement range allowed by the instrument diameter, the user can perform on-site calibration according to the change of process parameters. The M1/M2 indicator panel will be updated with the version, and the panel will be different. The product panel will be subject to the actual product. Electrical

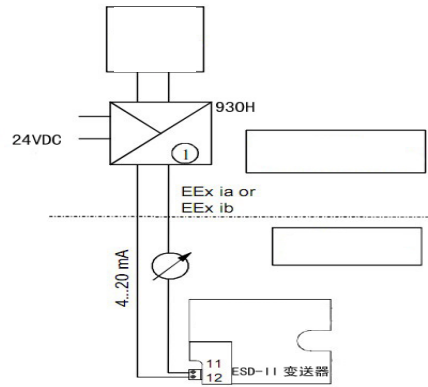
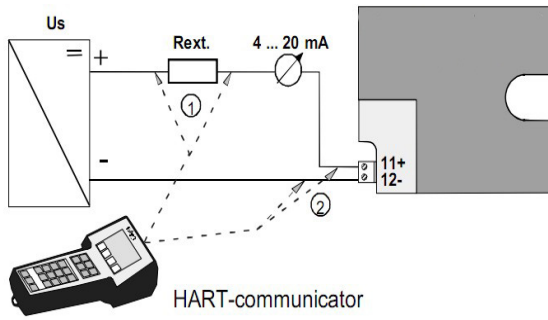
<b>wiring diagram:</b>	<b>41</b> -----	Positive isolated output of pulse signal
	<b>42</b> -----	Pulse signal isolated output negative
	<b>32</b> -----	Common port of relay for upper limit alarm output
	<b>33</b> -----	Normally closed port of relay for upper limit alarm output
	<b>31</b> -----	Normally open port of relay for upper limit alarm output
	<b>35</b> -----	Common port of relay for lower limit alarm output
	<b>36</b> -----	Normally closed port of relay for lower limit alarm output
	<b>34</b> -----	Normally open port of relay for lower limit alarm output
	<b>13</b> -----	24VDC power supply grounding
	<b>(-)12</b> -----	4-20mA output
	<b>(+)11</b> -----	24VDC power supply +
	<b>(⊥)10</b> -----	protective grounding(The identification of the two-wire 4-20mA output in parentheses)

**Note 1. When wiring according to the requirements of intrinsic safety type, please refer to the wiring method of the relevant safety barrier.**

**Note 2. 24VDC power supply and pulse output are not common ground! Standard for square wave of 0-1KHz, 5Vp-p, optional with OC gate output, instructions when ordering.**

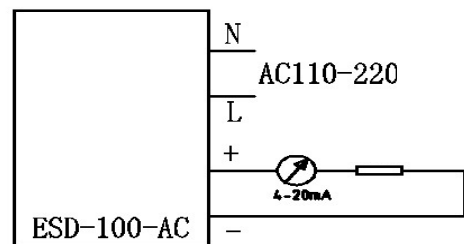
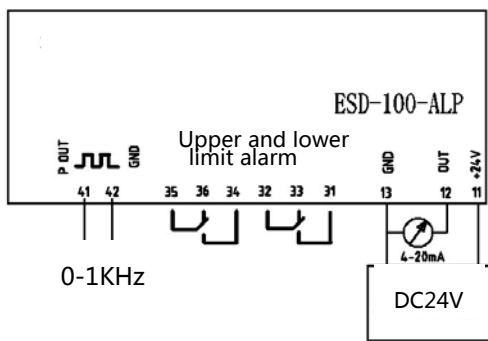
**Note 3. The battery is powered by a special power socket and has no remote output. Other functions are the same as those of remote transmission. The M1 and M2 headers support the function of battery power supply.**

# Electrical wiring diagram



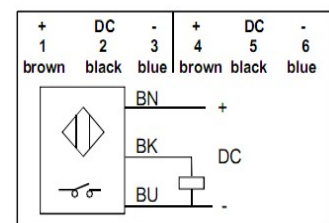
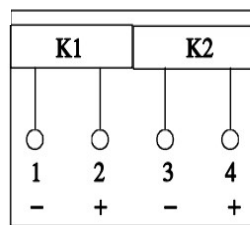
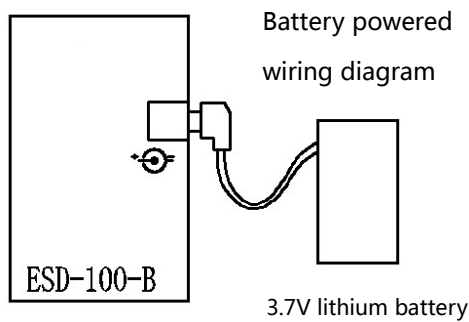
Two wire 4-20mA output (with HART communication)

The wiring diagram of intrinsic safety type system



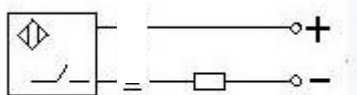
Wiring diagram for relay output alarm and pulse output

Wiring diagram for AC power supply

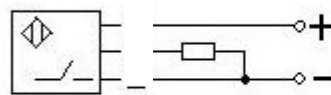


Wiring diagram for battery type

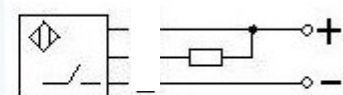
Wiring diagram for limit switch



DC two-wire system



PNP normally open



NPN normally open

Illustrative diagram for two-wire limit switch

Illustrative diagram for three-wire limit switch

## 9、 Selection Code

Sensor code								Transmitter code					Optiona	Description
FFA60	-X	-X	( )	-X	X	X	X	-X	X	X	-X	X	-X	-Range (m3/h)
Type	-F												flange	
	-W												clamp type	
	-L												Threaded type	
Ex type	—												standard type	
	Ex												CT5	
Caliber		DN												Digital show
Floater material		-N												SUS 304
		-L												SUS 316L
		-H												HC
		-T												Ti
		-F												SUS 304+PTFE
Medium temperature		1												0~80°C
		2												0~120°C
		3												0~220°C
		4												0~300°C(high)
Protection level		1												IP65
		2												IP67
Pressure class		1												1.6MPa
		2												special negotiation
Shell material		-1												Circular pointer
		-2												pointer LCD display
Power supply+ Signal output		1												Pointer display
		2												220V AC+4~20MA
		3												24V DC+4~20MA
		4												24V DC+4~20MA+Relay
Communication protocol		0												----
		1												RS485
		2												HART
Electrical interface		-M												M20*1.5
		-N												1/2"NPT
Accuracy class		A												1.5
		B												1.0
Additional structure													-J	Jacket、 Filter
Accessory														flange, signal wire ( _m )

### Illustration

Model : FFA60-W(50)-N111-232-MA-2.5-25m<sup>3</sup>/h

Clamp type metal float flowmeter, Caliber :DN50 ,Pipe material :SUS 304 ,Floater material :SUS 304 , Temperature range:0~80°C , protection level :IP65, pressure class : 1.6MPa , power supply : 24V DC , signal output : 4~20mA, protocol : HART , Electrical interface : M20\*1.5internal thread, Cast aluminum housing with LCD head , Accuracy class : 1.5 , No explosion-proof , Range : 2.5-25m<sup>3</sup>/h



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