



Handbook

ABDT-LD Dosing Electromagnetic Flowmeter

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I. Product Features and Application

1.1 Product Overview

ABDT-LD dosing electromagnetic flowmeter is specially designed for the filling and bottling of conductive liquids, and can directly measure volumetric flow. ABDT-LD dosing electromagnetic flowmeter is designed for compact application space and is the preferred product for system integrators, pry manufacturers, and dosing equipment manufacturers. It directly measures volumetric flow and supports bidirectional flow measurement, unaffected by pressure, temperature, density, and viscosity.



This product follows the standard JB/T9248-2015; Verification regulation: JJG1033-2007.

1.2 Product Features

- High and stable filling performance- high measuring accuracy and repeatability in shortest filling time;
- Energy saving flow measurement-the cross-section of the instrument is consistent with the pipeline ,no flow barriers, and no pressure loss;
- Maintenance-free - No moving parts;
- Versatile and convenient wiring-aviation plug connector;
- Display/Operation-no local operation, configuration via debugging software;
- Industry optimization-ultra-compact design, optimizing the footprint of machine devices;
- Meet sanitary requirements- stainless steel housing;
- The wetted material is CIP and SIP cleanable;
- Modbus RS485 digital communication signal output and pulse/frequency output (passive output).

1.3 Ambient Condition

Ambient temperature: Sensor (-25~+60) °C

Relative humidity: (5~85)% RH

1.4 Working Condition

Seal material EPDM: -20 to +130 °C (-4 to +266 °F)

Seal material Silicone: -20 to +130°C (-4 to +266 °F)

Seal material Viton: 0 to +150°C (+32 to +302 °F)

Fluid conductivity: $\geq 5\mu\text{S/cm}$

II. Working Principle

The working principle of the electromagnetic flowmeter is based on the Faraday law of electromagnetic induction. When a conductor moves in a magnetic field, an induced electric potential is generated at both ends of the conductor perpendicular to the direction of the magnetic field. The magnitude of the electric potential is proportional to the motion velocity of the conductor and the magnetic induction strength of the magnetic field.

When the conductive fluid flows at an average velocity of $V(\text{m/s})$ through an insulating catheter with an inner diameter of $D(\text{m})$ containing a pair of measuring electrodes, the pipeline is in a magnetic field with a uniform magnetic induction strength of $B(\text{T})$, then the induced electric potential $E(\text{V})$ is generated on a pair of electrodes. Its direction is perpendicular to the magnetic field.

Faraday law of electromagnetic induction is: $E = B \cdot D \cdot V$ (1)

Volume flow is: $Q_v = \frac{\pi D^2}{4} V (\text{m}^3/\text{s})$ (2)

Formulas (1) and (2) indicate that: $Q_v = \frac{\pi D}{4} \frac{E}{B} (\text{m}^3/\text{h})$ (3)

Therefore, electromotive force can be expressed as: $E = \frac{4B}{\pi D} Q_v (V)$ (4)

When B is a constant, a certain fixed caliber D is also a known number, in formula (3) $\frac{\pi D}{4} \frac{1}{B} = K$ (a constant), then formula (3) can be overwritten to: $Q_v = K \cdot E (\text{m}^3/\text{h})$. (5)

By formula (5) it is seen that the flow Q_v is proportional to the electric potential E .

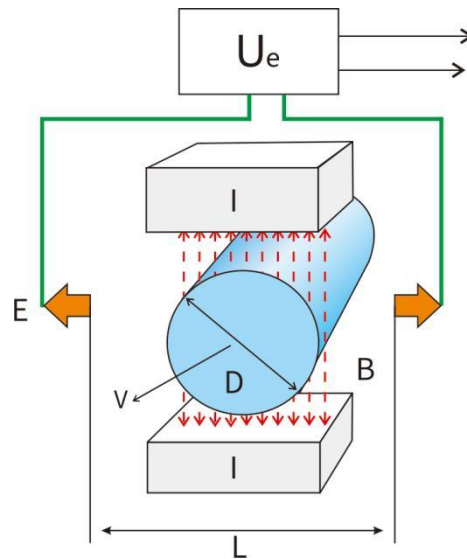


Figure 1. Working principle of electromagnetic flowmeter

III. Composition and Type

3.1 Composition

The dosing electromagnetic flowmeter consists of two main parts: an electromagnetic flow converter and an electromagnetic flow sensor. It comes with two external quick connectors and one 8-pin female aviation plug (two meters cables).

3.2 Type

The ABDT-LD series dosing electromagnetic flowmeter is divided into two structural forms: integrated type and split type. It also can be used in specific explosion-proof locations.

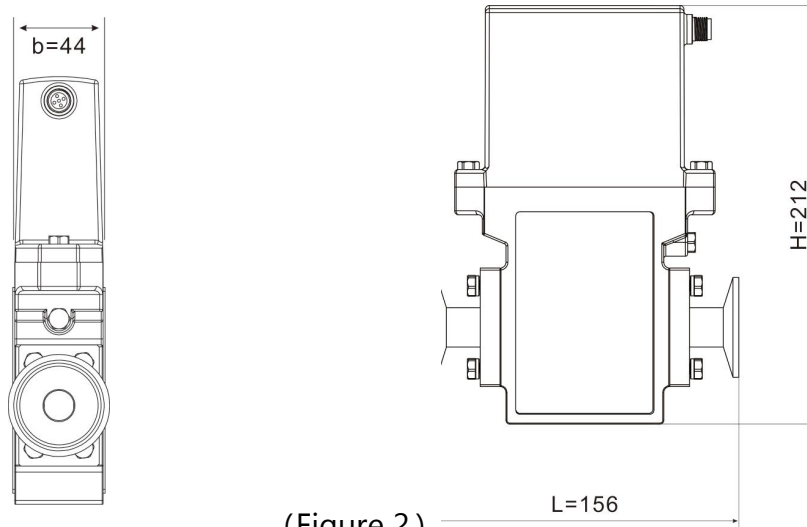
IV. Performance Parameters

Nominal diameter	DN4-20
Applicable medium	Water, soft drinks, baijiu, beer, dairy products, drinks with pulp, tea, coffee, hot drinks, etc.
Medium temperature	Max 140℃ (ambient temperature is less than 40℃)
Flow rate range	(0.3~5)m/s
Accuracy	±0.25% of measurement value

Repeatability	0.08%
Process pressure	1.6MPa, 2.5MPa
Conductivity	$\geq 5\mu\text{S/cm}$ (Water $\geq 20\mu\text{S/cm}$)
Lining material	PFA
Electrode material	316L, HB, HC, Titanium, Tantalum, Platinum-Iridium alloys
Protection	Standard IP67, IP68 optional
Power supply	(20~24)VDC
Output signal	One pulse/frequency output(passive), one RS485 communication
Cleaning temperature	SIP:Maximum 1 hour at 150°C; CIP:Maximum 1 hour at 140°C
Temperature shock	$\leq 3\text{K/s}$
Housing material	Stainless steel 1.4404/1.4408

V. Product Dimension

Dosing type electromagnetic flowmeter shape and installation size (unit: mm, as Figure 2)



(Figure 2)

Nominal diameter(mm)	L(mm)	H(mm)	b(mm)	PN(MPa)
4	156	212	44	1.6
8	156	212	44	1.6
12	156	212	44	1.6
15	156	212	44	1.6
20	156	212	44	1.6

VI. Parameters Setting

Due to the compact design of this meter, there is no display unit designed, so it cannot be operated locally, but it can be tested through debugging software.

Debugging software parameter list:

First menu	Secondary menu	Third menu
Main interface	Instantaneous velocity	m/s
	Instantaneous flow	m ³ /h
	Forward flow	m ³
	Reverse flow	m ³
	Percentage	%
	Accumulated flow	m ³
	Empty pipe ratio	%
Parameters setting	Measured pipe caliber	4mm~15mm
	Damping time	0~99 second
	Instantaneous flow unit	L/h,L/min,L/s,m ³ /h,m ³ /min
		m ³ /s ,t/h ,t/min ,t/s,kg/h,
		kg/min ,kg/s ,GPH,GPM,GPS、
		BBL/m,BBL/ h,CF/ s,CF/m、
		CF/h,AF/m,AF/h
	Accumulated flow unit	0.001m ³ ,0.01m ³ ,0.1m ³ ,1m ³ , 0.001L, 0.01L,0.1L,1L,1t, 1kg , 1GAL ,1101 m ³ , 1102 m ³ , 1103 m ³ , 1BBL,1CF, 0.001AF, 0.01AF,0.1AF,1AF
	Meter range	Setting
	Excitation frequency	37Hz,75Hz
	Excitation current	0%~ 100%
Function settings	Flow direction selection	Forward and reverse
	Reverse measurement allowed	Enable/disable
	Reverse output allowed	Enable/disable
	Cutting small signal allowed	Enable/disable
	Small signal cutting point	Setting
	Excitation alarm allowed	Enable/disable
	Empty pipe alarm allowed	Enable/disable
	Empty pipe alarm threshold	Setting
	Upper limit alarm allowed	Enable/disable
	Upper limit alarm threshold	Setting
	Lower limit alarm allowed	Enable/disable
	Lower limit alarm threshold	Setting
Calibration settings	Flow zero correction	Setting
	Auto zero correction	Auto
	Sensor coefficient	Setting
System settings	Total accumulation clearing	Clearing

Output settings	Pulse output mode	Frequency/pulse
	Pulse unit equivalent	Unit: L, set between 0.0001L~ 2000.000L
	Frequency output range	0~ 10000Hz

VII. Model Selection

7.1 Selection of Electrode Materials

Electrode material	Characteristics and scope of use
316L	Applicable: 1. Food, soft drinks, baijiu, beer, dairy products, drinks with pulp, tea, coffee, hot drinks, domestic water, industrial water, raw water, well water. 2. Weak corrosive acid, alkali and salt solution.
Hastelloy B	Applicable: 1. The hydrochloric acid (concentration is less than 10%) and so on non-oxidized acids. 2. Sodium hydroxide (concentration is less than 50%), all concentrations of ammonium hydroxide alkali solution. 3. Phosphoric acid, organic acid. Not applicable: Nitric acid.
Hastelloy C	Applicable: 1. Mixed acid, such as the mixed solution of chromic acid and sulfuric acid. 2. Oxidation salts such as Fe^{+++} , Cu^{++} , sea water. Not applicable: the hydrochloric acid.
Titanium (Ti)	Applicable: 1. Salt, such as (1) chloride (chloride/magnesium and aluminum/calcium/ammonium/iron, etc.); (2) Sodium salt, potassium salt, hypochlorite salt, sea water. 2. Potassium hydroxide, amine hydroxide and barium hydroxide alkali solution whose concentration are less than 50%. Not applicable: hydrochloric acid, sulfuric acid, phosphoric acid, hydrofluoric acid and other reductive acid.
Tantalum (Ta)	Applicable: 1. Hydrochloric acid (concentration is less than 40%), dilute sulfuric acid and concentrated sulfuric acid (excluding fuming sulfuric acid). 2. Chloride dioxide, iron chloride, hypochlorite, sodium cyanide, lead acetate, etc.; 3. Nitric acid (including fuming nitric acid) and other oxidizing acid, aqua regia whose temperature is less than 80 degrees. 4. Not applicable: alkali, hydrofluoric acid.
Platinum-iridium alloy	Applicable: Almost all acid, alkali and salt solutions (including fuming nitric acid, fuming sulfuric acid) Not applicable: aqua regia, ammonium salt.

7.2 Lining Material

Lining material	Main performance	Scope of use
PFA	1. Chemical stability, electrical insulation, lubricity, non-viscosity and combustible properties are similar to F46, but the PFA material strength, aging resistance and	1. Long-term use temperature resistance $\leq 150^{\circ}C$. 2. It can be used to measure most strong corrosive mediums such as

	temperature resistance are better than F46. 2.Good adhesion with metal and better wear resistance than PTFE, F46. 3. Low smoke, refractory, high temperature resistance and high temperature mechanical strength are higher than PTFE and F46.	strong acid, strong alkali and strong oxidizer; but it is not for KOH, nitric acid, hydrofluoric acid, etc.
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VIII. Instrument Structure

8.1 Instrument Output Type: with 1 Pulse (Figure 3)

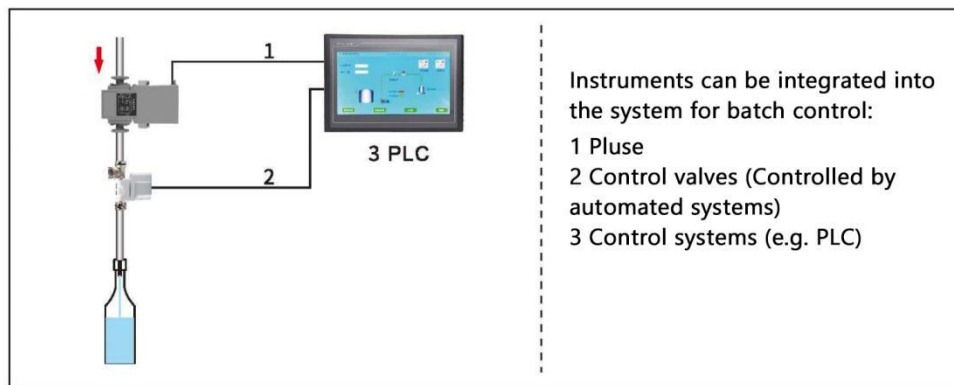


Figure 3

Pin Assignments and Meter Plugs (Figure 4)

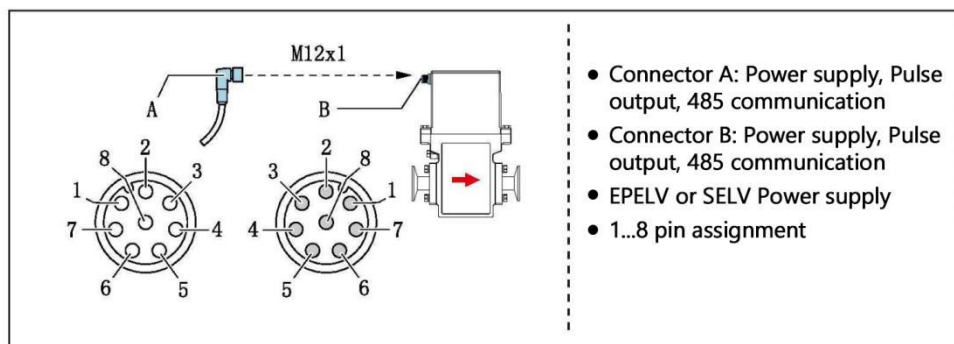


Figure 4

Pin Assignments Table(Table 4)

Connection: connector (A)-connector (B)

Pin	Assignment	Exegesis	Pin	Assignment	Exegesis
1	L+	Power DC 24V+(White)	5	GND	Grounding(Brown)
2	L-	Power DC24V-(Brown)	6	TX	Communication 485+(Pink)
3	P+	Pulse output(Green)	7	RX	Communication 485-(Blue)

4	P-	Pulse output(Yellow)	8	—	Service interface GND(Red)
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8.2 Wiring Example

The filling equipment is mainly connected to Siemens PLC. The following picture is the wiring diagram of the dosing electromagnetic flowmeter matching Siemens PLC.

8.2.1 Match one 1k Ω resistance(Figure 5)

8.2.2 No need to match a 1k Ω resistance (Figure 6)

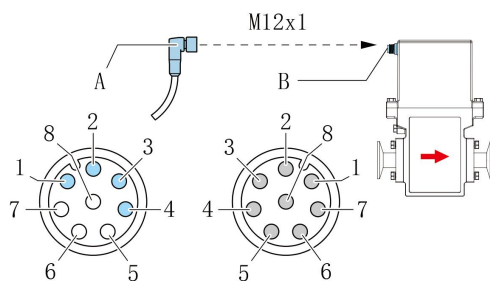
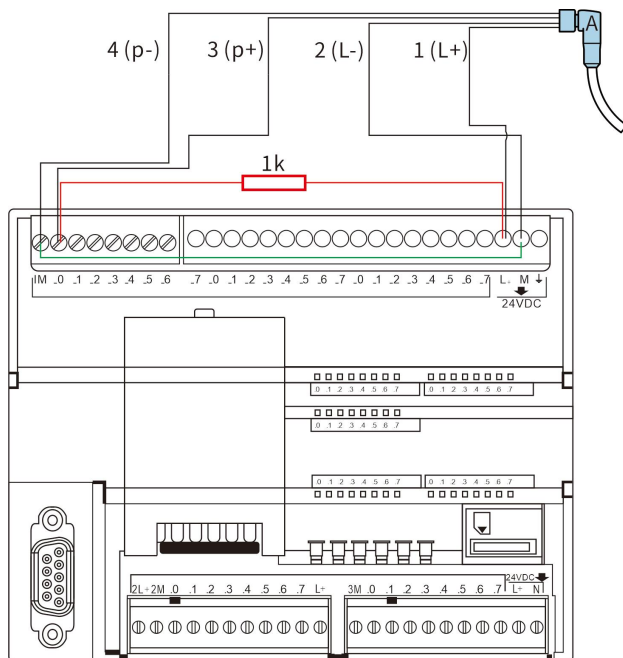


Figure 5

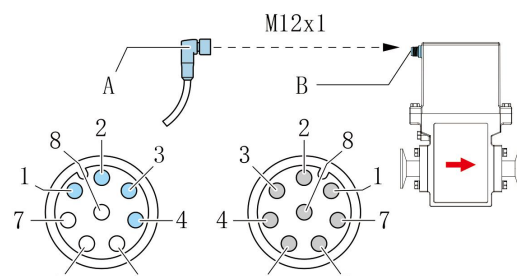
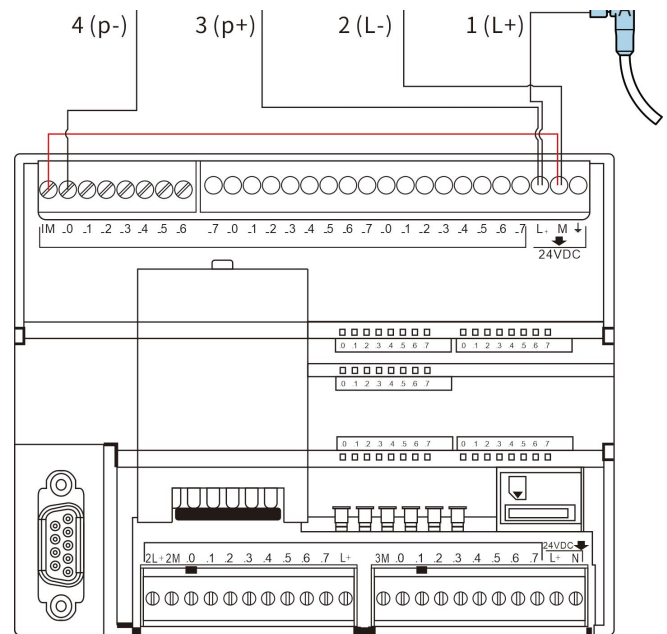
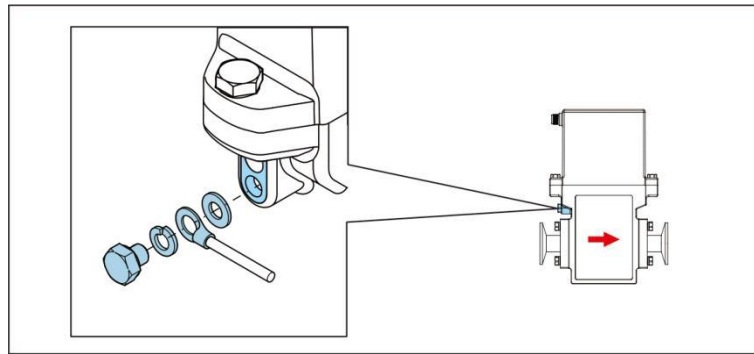


Figure 6

IX. Grounding Requirements

Grounding: Grounding is achieved via the cable socket.(Figure 7)



Potential Equilibrium: No potential equilibrium is required for grounded wires.

X. Cable Specifications

Permissible temperature range: -40°C (-40°F)... $+80^{\circ}\text{C}$ ($+176^{\circ}\text{F}$).

ModbusRS485: The electrical connection between the shield and the instrument housing must be established correctly (e.g. using a knurled nut).

The following cable loads must be noted :

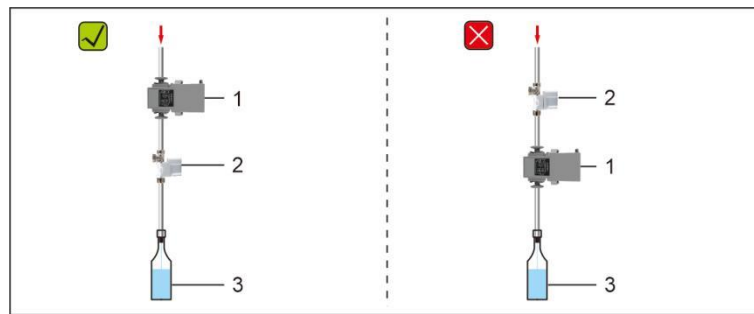
- Voltage drop caused by cable length and cable type.
- Valve performance.

Use shielded cables when the total cable length in the network must not exceed 50 meters in Modbus internet; when it exceeds 50 meters, use shielded twisted-pair cables in RS485 applications.

XI. Installation

11.1 Installation Precautions

It is prohibited to install the sensor in the piping downstream of the filling valve. When the sensor is completely emptied, this will result in an incorrect measured value. Correct measurement results can only be ensured when measuring with a full tube. The sample is first used for filling before the filling operation is initiated in the production process.(Figure 8)

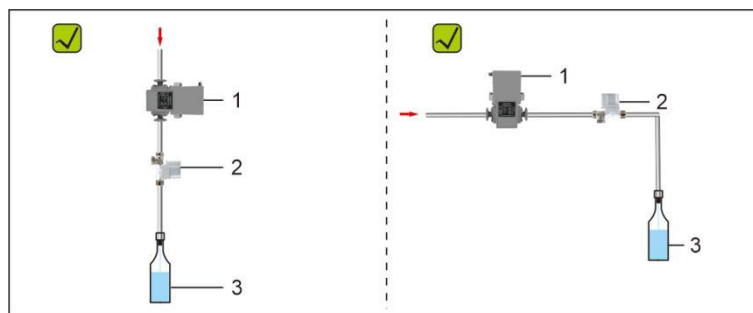


1. Measuring instrument 2. Filling valve 3. Container

Figure 8

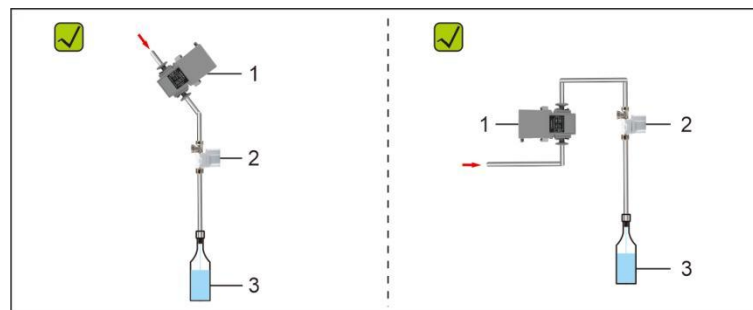
11.2 Full Pipe Installation Requirements

It must be ensured that the measuring tube is full, which is a prerequisite for optimal measurement results.



1. Measuring instrument 2. Filling valve 3. Container

Figure 9

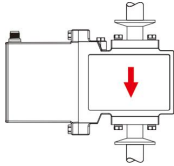
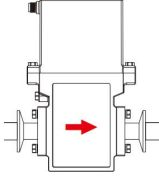
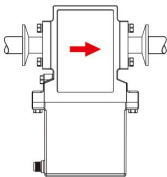


1. Measuring instrument 2. Filling valve 3. Container

Figure 10

11.3 Installation Method Under Special Working Conditions

Install according to the direction of the arrow on the sensor nameplate, and be sure that the direction of the arrow is consistent with the flow direction of the medium in the pipe.

Installation direction		Exegesis	
A	Vertical pipe		
B	Horizontal piping transmitter head facing up		-In low-temperature applications, the ambient temperature may drop. This mounting orientation is recommended to ensure the transmitter does not fall below the minimum ambient temperature of the transmitter.
C	Horizontal piping transmitter head facing down		-In high temperature applications, the ambient temperature may increase. This mounting orientation is recommended to ensure that the maximum ambient temperature of the transmitter is not exceeded.

XII. Accessories

Supply the dosing electromagnetic flow meters according to the contract.

Random files and accessories include:

2nos quick connectors;

8nos M6 * 16 stainless steel hex screws;

1nos 8-pin female aviation plug (with two wires);

1nos user manual;

1nos conformity certificate

1nos factory verification certificate

XIII. Transportation and Storage

To prevent damage of the instrument during transportation, please maintain the packaging status as shipped from the manufacturer before arriving at the installation site. When storing, the storage location should meet the following conditions:

- A. Rainproof and moisture-proof;
- B. Low mechanical vibration and avoidance of impact;
- C. Temperature range (-20~+60) °C, humidity ≤80%.

XIV. Run

Before using the flowmeter, the following checks should be carried out:

- A. Is there any damage to the flowmeter during transportation and installation;
- B. Does the voltage of the power supply match the voltage on the nameplate;
- C. The instrument is wired correctly.

After inspection, open the pipeline valve to fill the pipeline with liquid, and pay attention to eliminating leaks and residual gases in the system. Then turn on power supply. Generally, the flow meter can work normally after being powered on and preheated for 10 minutes.

If there are any problems during operation, please contact our company on time.

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