Instruction Manual

Manufacturing Certificate
CMC Shanghai No.02220105

TYPE LHS

Helix (Single Rotor) Flow Meter

SHANGHAI NO. 9 AUTOMATION INSTRUMENTATION CO.LTD.

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LXLJ-B042-C-Z

CONTENTS

READ THIS MANUAL CAREFULLY BEFORE INSTALLATION AND USE

1. General Description

This manual is for the installation, application and maintenance of Type LHS Helix (Single Rotor) Flow Meter designed and made by SAIC No.9.

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The company reserves the right to the explanation and modification of this manual, which is subject to change without prior notice.

LHS Helix (Single Rotor) Flow Meter (hereinafter refers to Flow Meter) is specially designed for the flow of crude oil and other fluids with wide range of viscosity, it is mainly used in high-accuracy flow measurement of crude oil with high sand or water contents, wasted water with oil, Diesel oil, gasoline, light oil and other chemical fluids.

Features:

1. Helical Rotor: it allows accurate measuring of fluids with wide range of viscosity while minimizing the affection of wax or other viscose substances.
2. Stainless Steel Measuring Components: made of stainless steel to avoid the severe corrosion to the Meter caused by high water or other corrosive contents.
3. Robust Bearing System with friction-endurable materials: this design ensures the prevention of the bearing damage from sand or stone.
4. In case of its rotating parts stall, fluid will still pass through the Flow Meter without causing any sudden pipe pressure increasing due to blockage.
5. To meet the user's requirements the Flow Meter can be equipped with different flow convertor that provides with optional Reading modes so as to comfort the user, meanwhile it also delivers pulses or standard electrical current signals (with extra options) that might be sent to the remote display instruments or computers for data processing.
6. Exquisite structure, easy installation

LHS Flow Meter goes with different flow convertors as per user's needs for the assigned purpose :

- FI Flow Convertor:no on-site flow LCD Display
- FI/TBS Flow Convertor: on-site instant flow LCD Display (5-digits); totalized (7-digit)
- FI/TBT Flow Convertor: on-site totalized flow LCD Display (12-digits)
- FI/TBL Flow Convertor: on-site instant flow LCD Display (5-digits); flow in percentage (4-digits-LCD display)

  All above can be equipped with pulse signal and standard DC electrical current signal (4-20mA) output ,for the latter, the full scale flow-rate must be offered
- TBS Flow Convertor: on-site instant flow LCD Display (5-digits) and totalized (8-digits) , with self-power-supplier, in the case of external power supply, equipped with pulse signal and Communication Signal RS485.

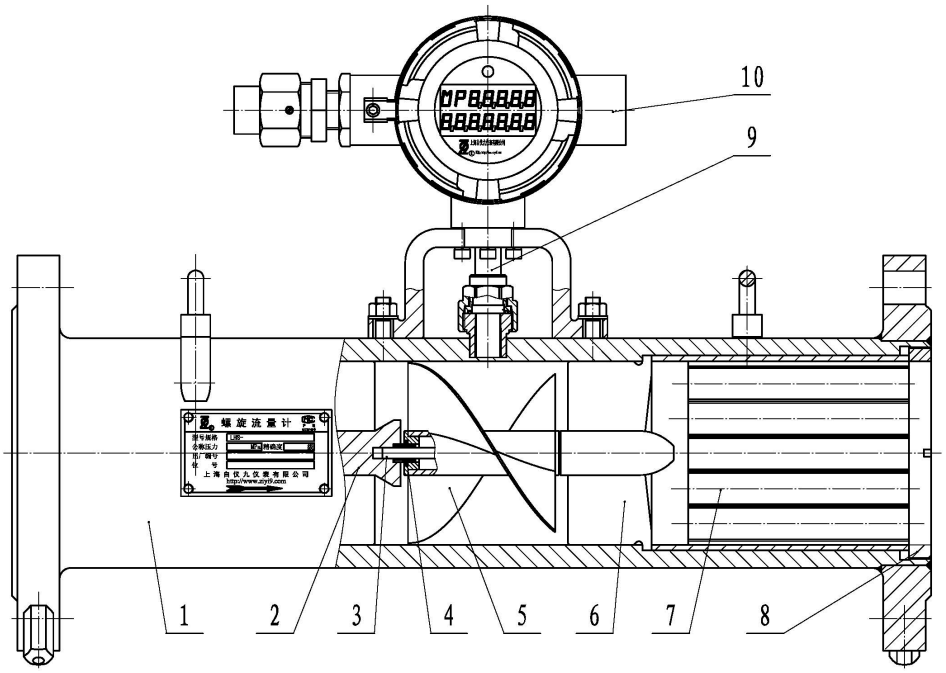
The Flow Meter is of simple structure, less moving parts, stable performance, good reliability and high accuracy. Supposedly during the Meter failure, the pipe line will not be blocked. It is also easy for maintenance, and without special restrictions to its up/down -stream pipe line conditions. The Flow Convertor is designed with power failure data protection. It also consumes less power, and is easy to maintain, use or operate.

The Product Standard : Q/TDSM 12-2014

2. Working Principle & Structure

While fluid forces the helical rotor attached on the glossy axis rotating, the vane of the rotor swipes the detector, which in turn, generates electrical pulse signal. Within certain flow range, the number of pulse is proportional to the flow. The flow convertor processes and calculates the electrical pulse signal, displaying the flow of fluid through the pipeline.

The structural scheme is shown on the right.



1.Body 2.Front-guide 3.Shaft 4.Plain bearing 5.Halical rotor 6.Back-guide
7.Flow straightener 8.Retaining ring 9.Pick-up 10. Convertor/Display

Structure of LHS Helix Flow Meter

3. Technical Specifications

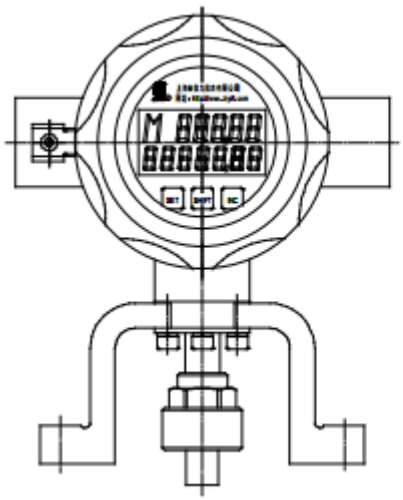
1) For Measuring:

Measuring Medium	Crude oil with high sand and water contents; wasted water with oil, Diesel oil, gasoline, light oil, other chemical raw materials
Medium Viscosity	0.3~400mPa· s
Medium Temperature	0~300℃
Nominal Diameter	25~250mm
Nominal Pressure	PN1.6, 2.5, 4.0, 6.3, 2.0, 5.0 MPa
Measuring Range	1.2~1200 m³/h
Accuracy	Classification 0.2, 0.5, 1.0
Materials: Body Rotor Bearing	Stainless Steel 1Cr18Ni9Ti 2Cr13 Harden Alloy YG6X
Flange *	JB/T75-1994, GB/T9112-2000
Installation	Horizontal piping
*User's Special Flange is negotiable	

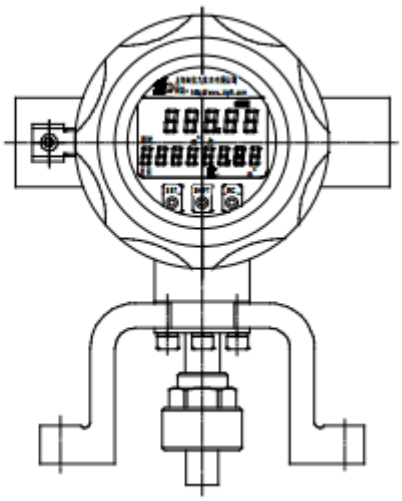
2) Flow Range:

Nominal diameter DN(mm)	Flow at Maximum m³/h	Fundamental Tolerance		
		Range Ratio		
		3:1	5:1	10:1
25	12	±0.2%	±0.5%	±1.0%
40	25			
50	50			
80	120			
100	180			
150	350			
200	600			
250	1000			

3) Flow Convertor:



Type FI Series Flow Convertor



Type TBS Flow Convertor

Basic Functions:

Functions	FI Series	TBS
Totalized Flow Display	Decimal 7 digits, ±1 display unit	Decimal 8 digits ±1 display unit
Instant Flow Display	Decimal 5 digits ±0.01%(REL)	Decimal 5 digits ±0.01%(REL)
Meter Coefficient Range	0.10000~99999	
Pulse Output	Square Wave: Low: ≤1V High:≥ Supply Voltage Vpo−2V (Load Impedance: 10kΩ)	
	original pulse	a) original pulse b) scaled pulse with error correction in sections
Electrical Current Output	Current Signal Standard 4~20mA (or 1~5V special order)	
Communication Signal		RS485(Modbus protocol)
Power Supply	DC 10V~30V	a) Dry Battery built-in b) DC 10V~30V (when need output)
Power Consumption	no more than 1W	
Protected Duration if Power Failure	not less than 5 years	
Electric Conduit	G1/2" Cylinder Tube Thread	
Ambient Temp.	−20℃ ~ +60℃	−20℃ ~ +60℃
Relative Humidity	≤ 85%	≤ 85%
Explosion-proof	d Ⅱ CT1~T6	d Ⅱ CT1~T6
Weight	approximately 2.5 kg(FI/TBS) 1.2kg(FI)	approximately 2.5 kg

Optional RS485 Output (MODBUS Protocol) on request, please specify

4. Correct Choice of Type

Type Code

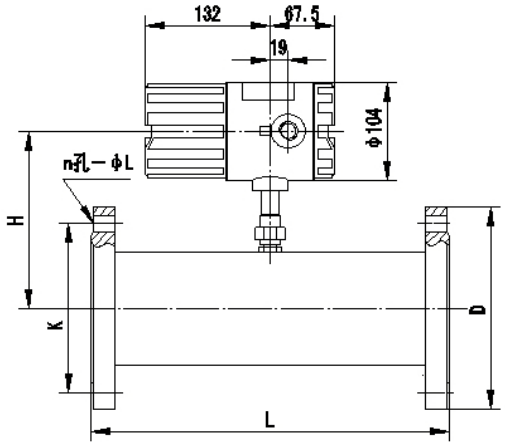
Project and Content	**Code**										**Example**
Helix Flow Meter	LHS										LHS
Nominal Diameter(mm) 25 (32) 40 50 (65) 80 100 (125) 150 200 250		 25 32 40 50 65 80 100 125 150 200 250									100
Feature Code (Bearing) Regular(Harden Alloy Bearing) Others: on user's request			 A Z								A
Material (Rotor) Stainless Steel Cr13 Stainless Steel SUS329J1 Others: on user's request				 0 1 9							0
Nominal Pressure PN1.6 PN2.5 PN4.0 PN6.3 PN2.0 PN5.0					 A B C D E F						B
Accuracy Classification Class 0.2 Class 0.5 Class 1.0						 2 3 4					3
Output None Pulse signal 4~20mA standard current RS485							 A B C D				C
Display No on-site display On-site instant flow and numerical percentage (TBL) On-site flow totalized (TBT) On-site instant flow & flow totalized (TBS)								 0 1 2 3			3
Explosion-proof None Explosion-proof (dⅡCT1-T6)									 /D		
Special Flow Special flow										(max Flow)	-90

Example: LHS-100A0B3C3-90 means Helix Flow Meter with nominal diameter DN100mm, pressure PN2.5MPa, accuracy class 0.5, output 4-20mA standard current, display on-site instant flow and flow totalized (TBS), non-explosion-proof, maximum flow 90m³/h

5. Dimensions & Installation Reference

Dimensions and installation reference for the Flow Meter are shown on the following drawing and tables.

Dimensions and installation reference



Nominal Diameter mm	L mm	H mm	Weight kg
DN25	260	154	≈ 7
DN40	300	162	≈12
DN50	360	167	≈16
DN80	460	182	≈25
DN100	500	192	≈33
DN150	650	215	≈54
DN200	700	242	≈84
DN250	1000	267	≈138
*Weight estimation as per PN1.6; others generally vary with flange weight			

Table for Dimensions

Installation Reference

DN	PN	D	K	N－Φ L	DN	PN	D	K	N－Φ L
DN25	1.6	Φ115	Φ85	4-Φ14	DN100	1.6	Φ215	Φ180	8-Φ18
	2.5	Φ115	Φ85	4-Φ14		2.5	Φ230	Φ190	8-Φ23
	4.0	Φ115	Φ85	4-Φ14		4.0	Φ230	Φ190	8-Φ23
	6.3	Φ135	Φ100	4-Φ18		6.3	Φ250	Φ200	8-Φ25
	2.0	Φ110	Φ79.5	4-Φ16		2.0	Φ230	Φ190.5	8-Φ18
	5.0	Φ125	Φ89.0	4-Φ18		5.0	Φ255	Φ200.0	8-Φ22
DN40	1.6	Φ145	Φ110	4-Φ18	DN150	1.6	Φ280	Φ240	8-Φ23
	2.5	Φ145	Φ110	4-Φ18		2.5	Φ300	Φ250	8-Φ25
	4.0	Φ145	Φ110	4-Φ18		4.0	Φ300	Φ250	8-Φ25
	6.3	Φ165	Φ125	4-Φ23		6.3	Φ340	Φ280	8-Φ34
	2.0	Φ130	Φ98.5	4-Φ16		2.0	Φ280	Φ241.5	8-Φ22
	5.0	Φ155	Φ114.5	4-Φ22		5.0	Φ320	Φ270.0	12-Φ22
DN50	1.6	Φ160	Φ125	4-Φ18	DN200	1.6	Φ335	Φ295	12-Φ23
	2.5	Φ160	Φ125	4-Φ18		2.5	Φ360	Φ310	12-Φ25
	4.0	Φ160	Φ125	4-Φ18		4.0	Φ375	Φ320	12-Φ30
	6.3	Φ175	Φ135	4-Φ23		6.3	Φ405	Φ345	12-Φ34
	2.0	Φ150	Φ120.5	4-Φ18		2.0	Φ345	Φ298.5	8-Φ22
	5.0	Φ165	Φ127.0	8-Φ18		5.0	Φ380	Φ330.0	12-Φ26
DN80	1.6	Φ195	Φ160	8-Φ18	DN250	1.6	Φ405	Φ355	12-Φ25
	2.5	Φ195	Φ160	8-Φ18		2.5	Φ425	Φ370	12-Φ30
	4.0	Φ195	Φ160	8-Φ18		4.0	Φ445	Φ385	12-Φ34
	6.3	Φ210	Φ170	8-Φ23		6.3	Φ470	Φ400	12-Φ41
	2.0	Φ190	Φ152.5	4-Φ18		2.0	Φ405	Φ362.0	12-Φ26
	5.0	Φ210	Φ168.5	8-Φ22		5.0	Φ445	Φ387.5	16-Φ29.5

6. Installation & Wiring

1) To install the Flow Meter:

(1)Flow Meter should be installed horizontally

(2)Flow direction within the pipe should be in accordance with the direction indicated on the Meter nameplate

(3)Any valve for the flow adjusting purpose should be arranged at the Flow Meter downstream

(4)The inner diameter of flow pipe should match the Flow Meter nominal diameter, and must be concentric with each other.

(5)Be sure, do not stretch the sealing pad into the pipe inner area when attaching.

2) Flow Converter

(1)Installation

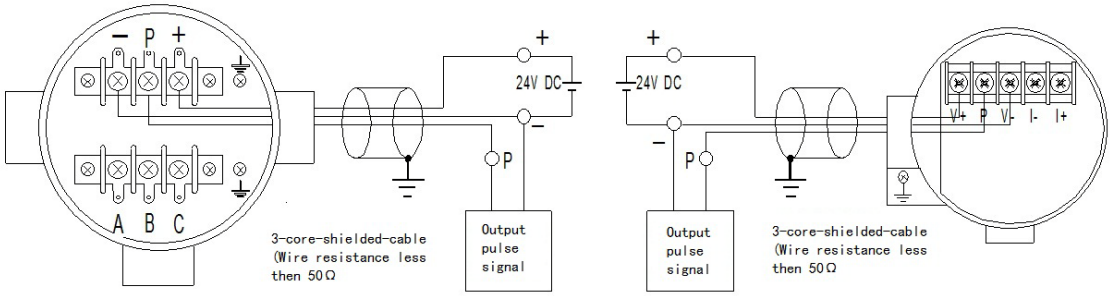
In general, the convertor is installed on the flow meter.

(2)Explosion-proof sealing connection

Fix the explosion-proof connector, and wiring as per Chapter 7 of this manual

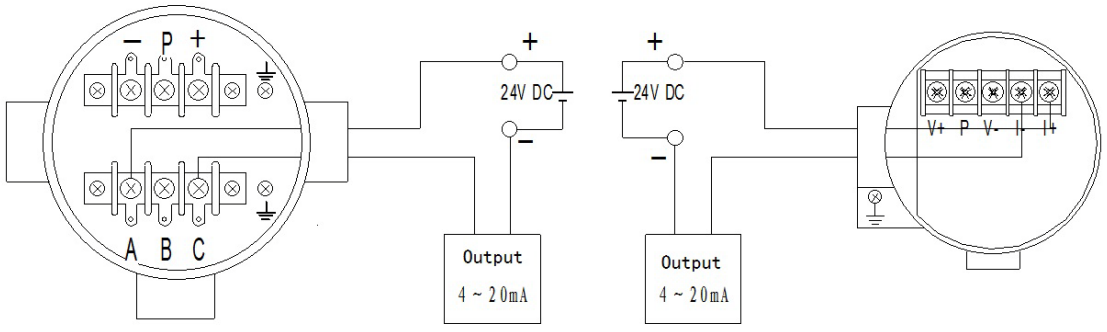
(3)Wiring:

The Flow Converter wiring depends on different output as shown below:



Type FI/TBS,FI/TBT,FI/TBL Type FI

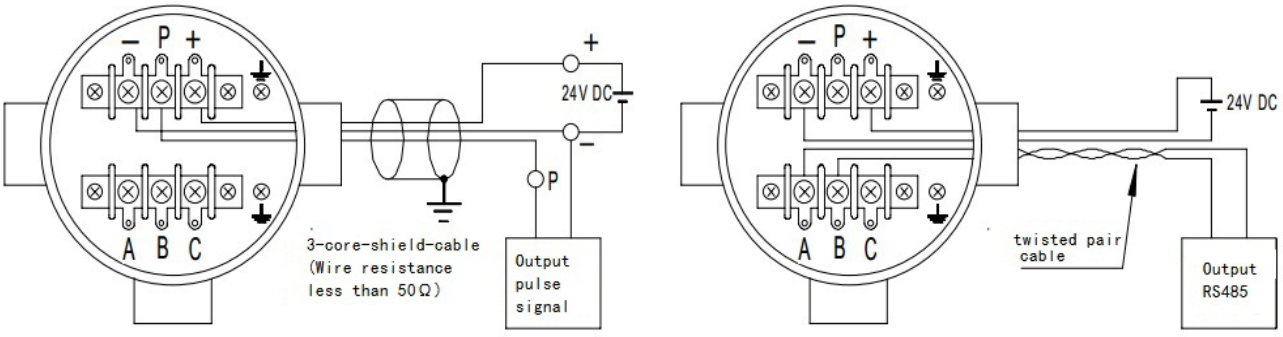
A:Pulse output



Type FI/TBS,FI/TBT,FI/TBL Type FI

B: Current output

Wiring 1 Type FI Series Flow Convertor



Pulse Output RS485 Communication Signal Output

Wiring 2 Type TBS Flow Convertor

(4)Ground connection :

When shielded-cable is used, the cable shall be connected to the ground at one terminal, where usually Flow Totalizer is located; please to minimize the AC power noise that interferes the output signal cable, such cable should be apart from Power lines as far away as possible.

Note: Wiring is always carried out at the time of power off; correct wiring saves Flow Converter from damaging

7. Key Points to the Installation of Explosion-Proof products

Products marked with "ExdIICT1~6" can be used in the environment stipulated in the following standards:

GB3836.1-2010 《Explosive atmospheres – Part 1: Equipment – General requirement》 and GB3836.2-2010 《Explosive atmospheres – Part 2: Equipment protetion by flameproof enclosures "d" 》

for Explosion Class not higher than Explosion Class Ⅱ, Grade C, Natural Temperature T1-T6 Group, Zone I or Zone II hazardous areas;

To secure SAFETY, user must be very careful in installation with bolts, cables and pipes and should pay high attention to safety regulations during maintenance;

1) Installation of Explosion-Proof Seal Connector: (see Fig.3)

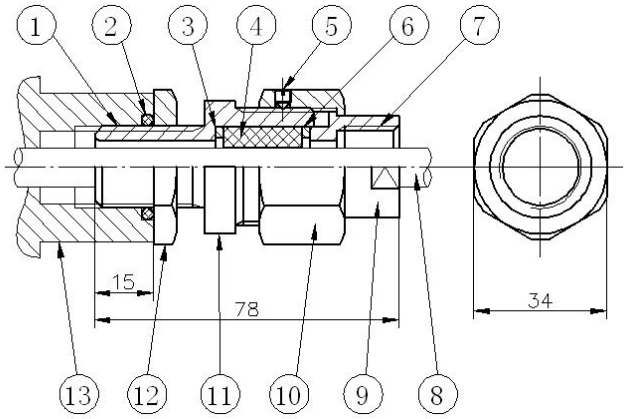
(1)Ground terminal is available; well- "grounded" is necessary in use

(2)During operation or maintenance on site, strictly observe the WARNING:

"**Open the cover only when power is off**"

(3)The out-diameter of leading cable is approximately φ9-10(mm); 3-core-shielded-cable is recommended;

(4) Maintenance must be carried out in the safe area, where no combustible gas exists.



1. G½ External Thread
2. O Ring
3. Washer
4. Seal Sleeve
5. M4 Set Screw
6. Washer
7. G½ Inner Thread
8. Cable
9. Pipe Connector
10. Nut
11. Connector
12. Lock Nut
13. Converter Housing

Fig. 3 Explosion-Proof Seal Connector

2) Ambient Conditions for Installation:

(1) Ambient atmosphere pressure 80kPa ～110kPa; temperature -20℃～+60℃, maximum relative air humidity 90%

(2) If there are combustible gases or vapors of flammable liquids working around, their explosion class must not be higher than Class II /Grade B; Natural Temperature within T4 Group; and Installation of the product is within Zone I or Zone II hazardous area.

(3) Listed below is a Table that stipulates the temperature limitations; within the Temperature Grade, the maximum out-exposed-surface temperature between explosion-proof product and equipment as well as the medium temperature are not allowed to exceed the limitations;

Temperature Group Grade	T1	T2	T3	T4	T5	T6
Maximum Medium Temperature (°C)	450	300	200	135	100	85

3) Usage:

(1) If housing corrosion happens, replace it promptly;

(2) Both internal and external ground terminals must be “grounded” properly; During maintenance, taking off the Terminal Box cover must be under power -off condition;

(3) The seal ring within the cable-leading connector and the O ring within the cover must be replaced in time, as soon as they are ageing;

(4) The connecting between wires and wiring-strips must be in firm and reliable way, meanwhile using insulation sleeve is also necessary, which shall be bent into right angle, to ensue the electrical gap bigger than 4mm

(5) Leading cable should be suitable to the corrosive and high temperature enduring conditions on site;

(6) During Terminal Box mounting, please to be sure, do not damage the thread and explosion-proof linkage surface;

(7)On-site installation, application and maintenance of the product shall also abide by stipulations related to« GB50058-92 Design Requisition for the Electrical Equipment on Explosion & Fire Hazardous Site » and «GB3836 .15-2000».

8. Settings on the Flow Converter

The setting of the flow conwertor see the corresponding Instruction Manual:

TYPE FI/TBS,FI/TBT,FI/TBL,FI Flow Convertor

TYPE TBS Flow Convertor

9. Use & Cares

1) Use:
   (1) Check the installation and wiring of the Flow Meter, make sure no mistaken
   (2) Switch the power/on
   (3) Open the upstream valve for the Flow Meter, then, open the downstream valve smoothly. To ensure the Flow is within the Flow Meter measuring range when the downstream valve is being opened.

2) Cares:
   (1) Take care of strong vibration or impact during the Flow Meter operation.
   (2) For maintenance, do not take off the Flow Convertor Cover when Power is on
   (3) Be sure to prevent the dust from entering the Flow Convertor, if the cover needs to open for wiring.
   (4) For remote transmission, if the signal decays through the transmission lines, please try much bigger cable.

10. Transportation & Storage

1) During transportation or moving of the Flow Meter (dispatching it to the job-site or returning it for repair), please to keep the Ex-works packing condition that is initially provided by this company.

2) The Flow Meter shall be stored within the room where temperature ranges from 5-40C° and relative humidity does not exceed over 85%, with good ventilation and without corrosive gases.

3) Strictly prohibit from directly taking the Flow Convertor on the Flow Meter for the whole set moving .

11. Notice for Ordering

Cable for the Flow Convertor Output is not included in the delivery. It is customer's own option. This company offers RVVP metal-shielded-cable with Polyethylene insulation, in 3 specifications as 3×23/0.15, 3×28/0.15; 3×32/0.15.

If require, please specify the specification and length during order placing.

12. Accessories

1) Instruction Manual 1
2) Quality Certificate 1
3) Seal Ring 2
4) Wiring Strip 6
5) Hexagon socket screw key 1

The end.