RBEF-I Insertion Type Electromagnetic Flow Meter

1.Introduction

This technical information brochure contains technical specifications of the RBEF insertion electromagnetic flow meter series and provides installation instructions for end users, specifies and design engineers.

2.Applications

The RBEF-I insertion electromagnetic flow meter can be installed in any pipeline of internal diameter from 50mm (2in) to 8000mm (360in) through a small tapping. The RBEF flow meters are ideal for use in process measurement and control, survey applications such as leakage monitoring, and network analysis and in permanent locations where cost or space limitations preclude the use of conventional closed pipe meters.

3.Specifications

3.1 Suitable for pipeline size from DN50~DN8000mm；

Probe Insertion Depth Table

Pipeline Size	Probe Insertion Depth（D=Pipeline Inner Diameter）
DN50~DN150	(1/8)*D
DN200~DN600	(1/8)*D or (1/2)*D
DN700~DN8000	(1/8)*D

3.2 Velocity range: 0.1~1m/s or 0.1~10m/s, span can be setup from 0.5m/s~10m/s.

3.3 Accuracy: velocity v≥1m/s, the accuracy is ±1.5%;

velocity 0.1m/s<v<1m/s, the accuracy is ±3%.

3.4 Liquid conductivity: >20μs/cm

3.5 Working pressure: 0.6MPa, 1.0MPa, 1.6MPa, 2.5MPa, 4.0MPa

3.6 Electrodes: SS316L，HC-22，HB3，Ti

3.7 Probe Material：SS304，SS316L, Ti (***PEEK)***

3.8 Maximum Liquid Temperature: PEEK 120℃

3.9 Enclosure IP: IP65、IP67，IP68 for remote type only

3.10 Maximum Cable Length: 100m (***10m cable supplied if not specifically ordered)***

3.11 Output Signal:4~20mA, load: 0~500Ω;

Pulse: 1~5KHz, load: 250~1.2kΩ;

Communications: RS232C、RS485、MODBUS etc.

3.12 Other specifications refer to RBMAG converter manual.

4.Principle of Operation

Faraday's law of electromagnetic induction states that an inductive voltage is generated when a conductor moves through a magnetic field. This principle is used as the basis of flow measurement in the RBEF-I electromagnetic flow meter. In the electromagnetic flow meter, the flowing fluid corresponds to the moving conductor as described in Faraday's law.

$$U_E \infty B * D * v$$

The induced voltage UE is directly proportional to magnetic field intensity (B), electrode spacing (D) and average fluid velocity (v). Since magnetic field intensity (B) and the electrode spacing (D) are constant values, induced voltage U_E is therefore directly proportional to the average flow velocity (v).

$$Q = (\prod * D2) / 4 * v \quad \text{therefore} \quad U_E \infty Q$$

The equation for calculating volumetric flow rate (Q) shows that the induced voltage (UE) is linear and directly proportional to the average velocity (v). In the flow meter transmitter, the induced voltage (UE) from the electrodes is used to calculate volumetric flow rate (Q) based upon the pipe's internal diameter.

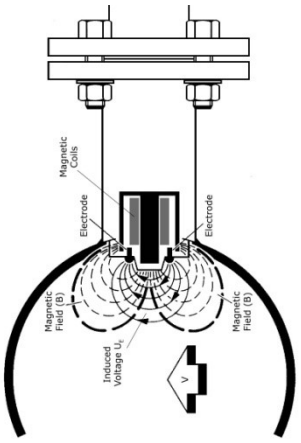

Fig. 1 The Principle of Insertion Flowmeter

U_E = Induced voltage
B = Magnetic field strength
D = Electrode spacing
V = Fluid velocity
Q = Instantaneous volumetric flow rate

5.Production Models

The RBEF consists of insertion probe and converter. The RBEF has two models:

Fixed-length model and Pluggable model.

5.1 Fixed-length model

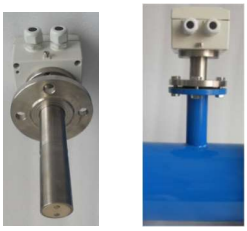

Fig.2A Fixed-length Model

Fig.2B Compact-type

Fig.3C Remote-type

Pipe Size	Insertion Depth（D=pipe inner diameter)
DN50~DN150	(1/8)*D
DN200~DN600	(1/8)*D or (1/2)*D
DN700~DN8000	(1/8)*D

5.2 Pluggable Model

Model	Probe Length (mm)	DN Size
		Insertion Depth （1/8）*D
RBEF-B-500	500	DN50 ~ DN1600
RBEF-B-900	900	DN450 ~ DN4800
RBEF-B-1200	1200	DN1400 ~ DN7200
BEF-B-1500	1500	DN2000 ~ DN8000

Fig.3A Pluggable Model

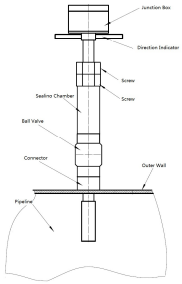

Fig.3B NPT G1.5” Connection

The RBEF tube is made from stainless steel or titanium and its outer diameter is Φ27mm. The probe is made from stainless steel or titanium and PEEK and its outer diameter is Φ34mm. For the pluggable model, the connection between the probe and the pipeline is made through G$1\frac{1}{2}$ screw or DN40 flange.

6. Model Selection

RBEF-I Insertion Type Converter Model Selection

RBEF-I	□□□	□□	□	□	□	□	□	□	□	□	□	□	□	□	□
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]

[1] Pipe Size(mm)

050	350	102	262
065	400	122	282
080	450	142	302
100	500	162	402
125	600	182	502
150	700	202	602
200	800	222	702
300	900	242	802

Sample：150 = DN150；122 = DN1200

[2] Flange Rating

06	0.6 MPa (DN700 --- DN8000)
10	1.0 MPa (DN200 --- DN1400)
16	1.6 MPa (DN50 --- DN600)
20	ANSI 150 (DN15 --- DN600)
40	4.0 MPa (DN 50 --- DN150)
50	ANSI 300 (DN50 --- DN600)
J1	JIS 10K (DN50 --- DN300)
J2	JIS 20K (DN50 --- DN300)
AA	Special
BB	Pluggable with Remote Converter

[3] Installation Type

1	Fixed Size RBEF-I-A
2	On line Pluggable RBEF-I-B-500
3	On line Pluggable RBEF-I-B-900
4	On line Pluggable RBEF-I-B-1200
5	On line Pluggable RBEF-I-B-1500

[7] Protection Class

1	IP65
2	IP67 (Only Compact)
3	IP68 (Only remote type, specify the cable length)

[8] Explosion Proofing

1	No

[9] Configuration-Sensor/Transmitter

C	Compact (only DN50 --- DN1000)
R	Remote (Standard cable: 10m, other length, pls clarify.)

[10] Power Supply

A	85---265 VAC /45---63Hz
D	16---36 VDC
B	Battery Powered

[11] Output and Input

0	Basic Configuration(current+pulse+alarm)
2	Basic Configuration + RS232
4	Basic Configuration + RS485
M	Basic Configuration + MODBUS
H	Basic Configuration + HART
P	Basic Configuration + Profibus-DP
S	Special

[12] Special Function

0	No	R	IR Remote
T	Power off timer	H	Cumulative hours
Q	Quantitative control	J	Relay Output

[4]	**Electrode material**		[13]	**Factory Calibration**	
	1	316L Stainless Steel [316L]		1	3-point calibration，1.5%
	2	Hastelloy C [Alloy-C22]		2	5-point calibration，1.5%
	3	Hastelloy B [Alloy-B10]		T	Other
	4	titanium			
	5	tantalum			
[5]	**Grounding and Lining Protection**		[14]	**Additional No.**	
	0	The Probe Grounding		0	No
[6]	**Fluid Temperature**		[15]	Probe Material	
	A	≤80 ℃		0	PEEK
	B	≤120 ℃		1	SS304
				2	SS316
				3	Ti

Sample : DN150、4.0MPa、Fixed size type、316L electrode、The Probe Grounding、fluid type≤120℃、IP67、No-exproof 、Compact、220VAC、Basic Configuration +RS485、no special function、3-point calibration、1.5%、no additional demand; probe material: SS304; Model：RBEF-I-15040110B21CA40101

7. Application Cases

The Insertion type electromagnetic flow meter is a cost-saving and space-saving solution for most cases in which the velocity of liquid is needed, such as water piping, flow switch, leakage detection, network analysis, open channel measurement, etc. Below is an example of open channel measurement.