



Recorder



Flow



Pressure



Temp



Analyzer



Level

Datasheet

Electromagnetic BTU Meter

TPSSUP-FBC240



TOTAL
PRESSURE
SOLUTIONS



Datasheet

Electromagnetic BTU Meter

SUP-FBC240

The electromagnetic BTU meter combines the functions of an electromagnetic flowmeter and a heat (or cold) energy calculator. It is mainly used to measure both the flow rate of fluids (such as water, coolant, etc.) through pipelines and the corresponding thermal energy.

Applications

- Heating and cooling systems
- Industrial process control
- Thermal energy metering

Features

- Integrates both flow measurement and energy calculation functions into a single device; no need for additional integrator, reducing procurement and installation costs.
- Utilises advanced low-frequency square wave excitation, ensuring zero-point stability, strong anti-interference performance, and reliable operation.
- Provides reliable measurement with high accuracy and excellent stability.
- One-piece structure with no moving parts, easy to install and maintenance-free.
- RS485 communication interface with standard Modbus RTU protocol.
- Adjustable display meter head and interface orientation for easy reading.
- Bilingual interface (Chinese and English) allowing for flexible switching.



Electromagnetic BTU Meter



- Durable 316 SS construction for reliable, long life in harsh environments
- 1/2 inch NPT threaded connection, allows the unit to be installed in a pipe/conduit

Principle

The electromagnetic BTU meter works by combining electromagnetic measurement with heat (or cold) energy calculation. The electromagnetic BTU meter combines the functions of an electromagnetic flowmeter and a heat (or cold) energy calculator. It is mainly used to measure both the flow rate of fluids (such as water, coolant, etc.) through pipelines and the corresponding thermal energy.

1) The electromagnetic flowmeter adopts an advanced low-frequency square-wave excitation design and operates based on Faraday's law of electromagnetic induction.

As shown in Figure 1, the upper and lower electromagnetic coils generate a constant or alternating magnetic field. When a conductive fluid flows through the measuring tube of the meter, an induced electromotive force (EMF) is detected between the two electrodes located on the inner wall of the tube (typically on the left and right sides).

This induced EMF is directly proportional to:

- The velocity of the conductive fluid;
- The magnetic flux density of the magnetic field;
- The effective inner diameter (width) of the measuring tube.

By computing the induced voltage signal, the volumetric flow rate of the fluid can be accurately determined. The fundamental equation for the induced EMF is:

$$E=K \times B \times V \times D$$

Where:

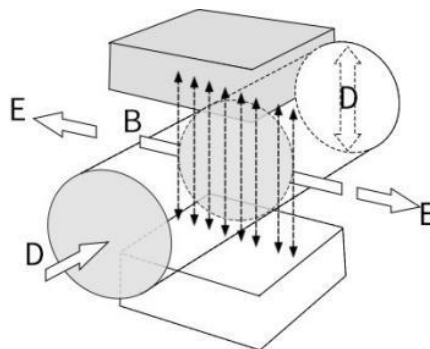
E is the induced voltage (EMF),

K is a constant,

B is the magnetic flux density,

D is the diameter of the measuring pipe,

V is the flow velocity of the fluid.



When measuring flow, the conductive fluid passes through a magnetic field perpendicular to the flow direction, generating a voltage proportional to its velocity. This voltage is captured by electrodes and sent to the converter, where it undergoes signal processing. The converter then displays real-time and



total flow values. The fluid's conductivity must exceed the instrument's minimum requirement.

2) The working principle of the electromagnetic BTU meter is as follows: hot (or cold) water supplied by a heat source flows into the heat exchange system (such as radiators, heat exchangers, or a complex system composed of these components) at a higher (or lower) temperature and flow out at a lower (or higher) temperature. During this process, thermal energy is released to or absorbed through heat exchange within the system. (Note: this process includes both heating and cooling energy exchanges in the system).

When the fluid flows through the BTU meter installed in the heat exchange system, the total energy exchanged is calculated and displayed by the calculator based on:

The flow rate measured by the flow sensor;

The inlet and outlet temperatures measured by the paired temperature sensors;

The duration of the fluid flow.

The amount of energy released or absorbed by the system is calculated using the following formula:

Where:

Q — thermal energy released or absorbed by the system, in joules (J); q_m — mass flow rate of the medium passing through the thermal energy meter, in kilograms per hour (kg/h);

q_v — volumetric flow rate of the medium, in cubic meters per hour (m³/h);

ρ — density of the medium, in kilograms per cubic meter (kg/m³);

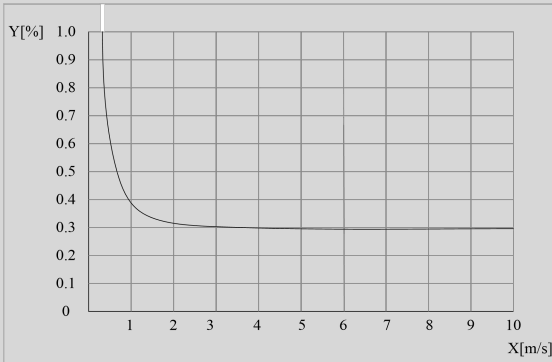
Δh — specific enthalpy difference of the medium between inlet and outlet, in joules per kilogram (J/kg);

t — time duration, in hours (h).



Technical Parameters			
Input			
Measured variable	Direct measured variables: Flow, velocity Calculated measured variables: Volume flow, mass flow.		
Velocity range	Typically range: 0.5m/s~5m/s		
Flow range	See Table 2		
Temperature sensor	Pt1000		
Nominal diameter	DN10~DN1000		
Range ratio	1:10		
Output			
Current output	Function	Flow velocity, volume flow (under constant fluid density)	
	Range	Range	(4~20)mA
		Max.	20mA
		Min.	4mA
	Internal voltage	24VDC	
Load	≤750Ω		
Pulse output	Function	Can be configured as pulse output	
	Pulse output	Basic	Output pulse width: 0.1ms ~2000ms (within max duty cycle, max 1:1) Fmax ≤ 5000 cp/s
		Pulse coefficient	0.001~100000/unit
		Passive	U Outer≤ 30VDC
	Active	U Internal ≤ 24VDC	
		I≤ 4.52mA	
Communications	RS485, MODBUS-RTU communication protocol		
Power supply			
Supply voltage	100VAC~240VAC, 50/60Hz; 20VDC~28VDC		
Power consumption	≤15W		
Terminals	Screw terminal block		
Cable entries	M20*1.5		
Signal cable	For remote version only; standard length 10 m, customisable		
Performance specifications			
Reference operating conditions	Medium: water		
	Temperature: 20℃		
	Pressure: 0.1MPa		
	Installation requirements: Inlet run≥10DN; Outlet run≥5DN		
Accuracy	Measurement value ±0.5% (Flow velocity 0.5m/s~5m/s)		
	Energy: Class 2.0 Temperature: 0.1K		



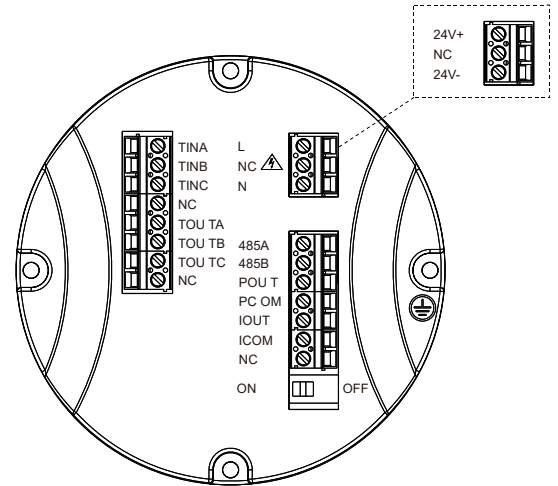
Repetitiveness	0.16%	
Maximum measured error	<div></div> <div>①X[m/s]: flow velocity ②Y[%]: actual measured value deviation (mV)</div>	
Process		
Medium temperature range	Chloroprene rubber (CR) liner: -10℃~70℃ Polyurethane rubber (UR) liner: -10℃~60℃ PTFE/FEP liner: -10℃~120℃ PFA(F46) liner: -10℃~120℃	
Nominal pressure (customised high-pressure versions available))	DN10~DN250: PN<1.6MPa DN300~DN1000: PN<1.0MPa Note: (For specific model differences, refer to nameplate. High-pressure versions can be customised)	
Conductivity	≥20μS/cm	
Buried depth	< 5m (only for remote type sensors with IP68 protection)	
Immersion depth	< 3m (only for remote type sensors with IP68 protection)	
Environment		
Ambient temperature	Integrated type Remote type	-10℃~55℃ Converter: -20℃~55℃ Sensor: -10℃~55℃
Storage temperature	-20℃~55℃	
Protection level	Integrated type Remote type	IP65 Sensor: IP68 Converter: IP65



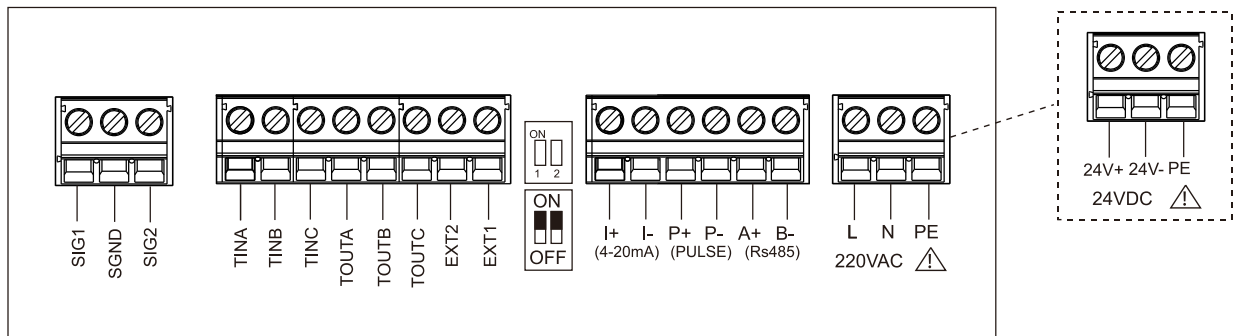
Wiring

Integrated Version

Terminal	Description
L, N	220V AC
24V+; 24V-	24V DC
485A; 485B	RS485 interface
IOUT; ICOM	(4~20)mA output interface
POUT; PCOM	Pulse output interface
ON/OFF	DIP switch for selecting pulse output type: ON = active output; OFF = passive output
TINA; TINB; TINC	Inlet temperature (Pt1000)
TOUTA; TOUTB; TOUTC	Outlet temperature (Pt1000)
	Protective grounding for transmitter



Remote Type

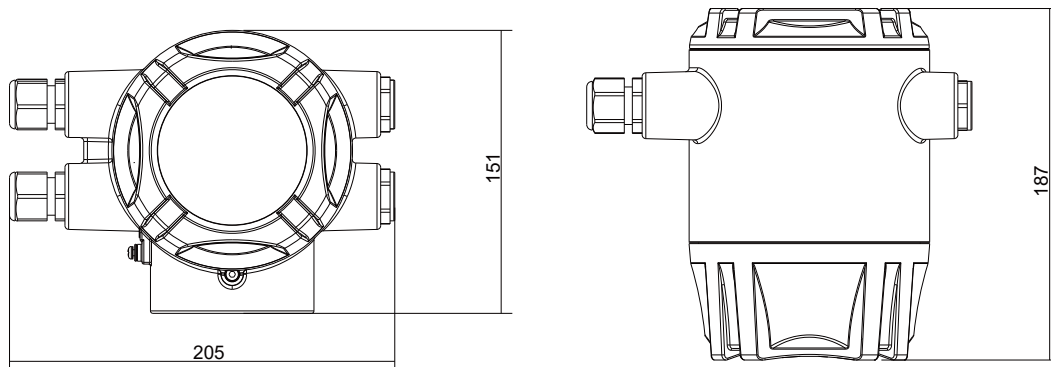


Terminal	Description
SIG1; SIG2; SGND	Sensor signal
TINA; TINB; TINC	Inlet temperature (Pt1000)
TOUTA; TOUTB; TOUTC	Outlet temperature (Pt1000)
EXT1; EXT2	Excitation signal
ON/OFF	DIP switch for selecting pulse output type: ON = active output; OFF = passive output
I+; I-	(4~20)mA current output interface
P+; P-	Pulse output
A+; B-	RS485 interface
L; N	220V AC
24V+; 24V-	24V DC
PE	Power grounding

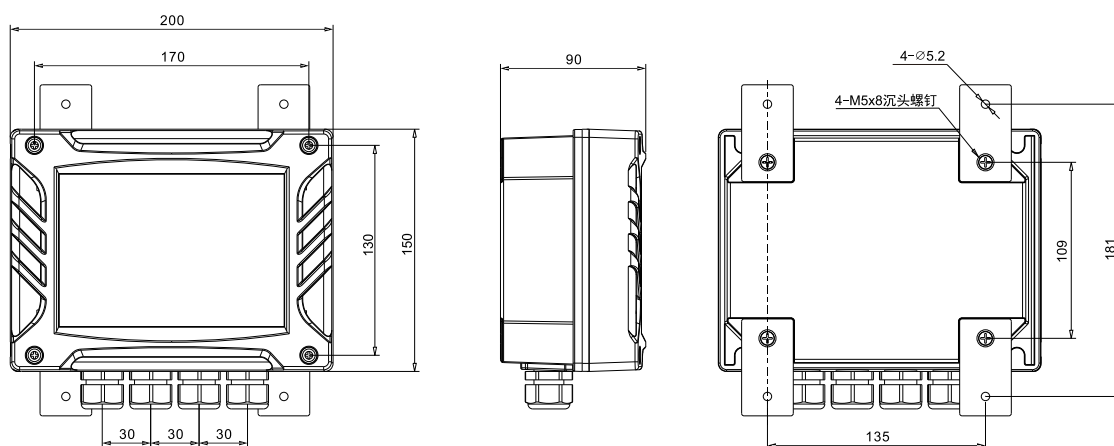


Dimension

Converter Dimensions of Integrated Version



Converter Dimensions of Remote Version



Sensor Dimensions

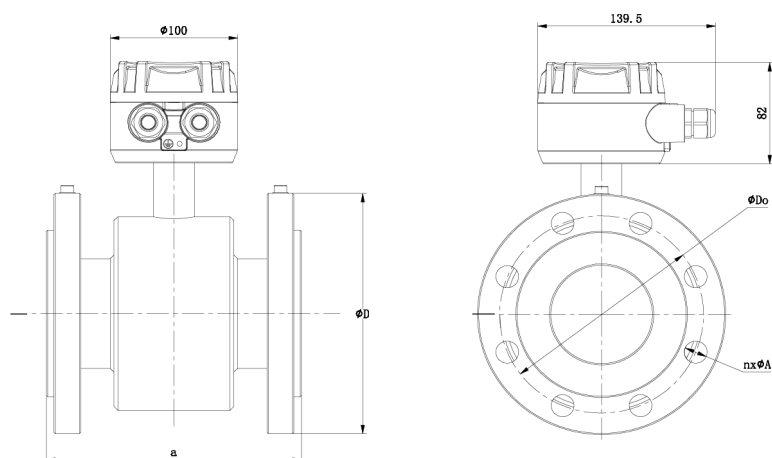




Table 1 Sensor dimensions (JB/T 81 flange connection)

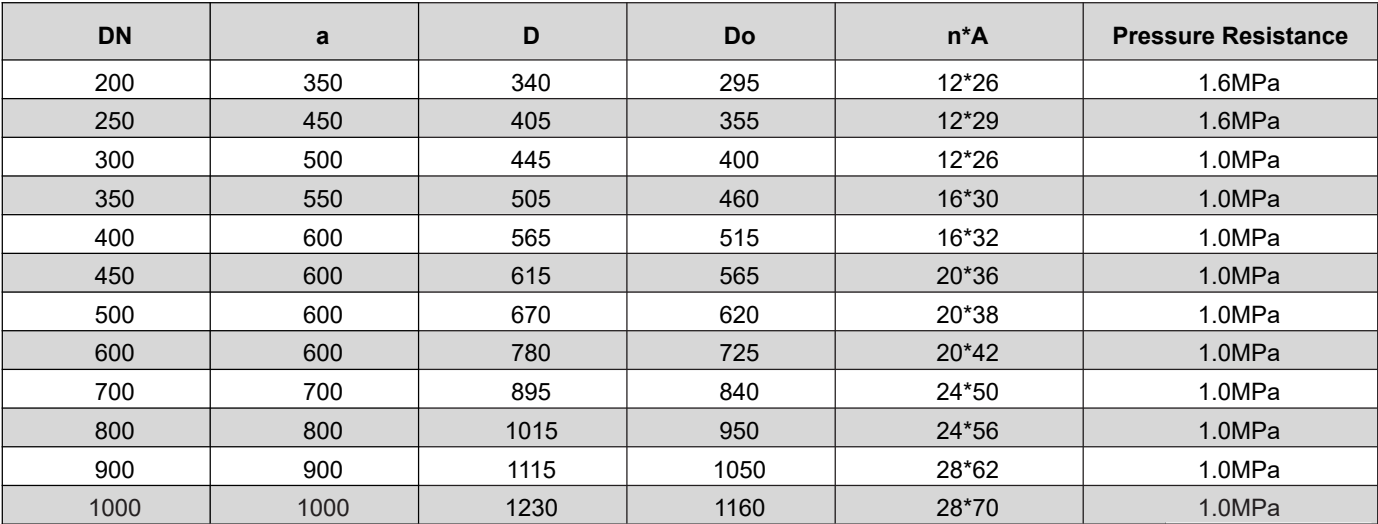
Unit in mm

DN	a	D	Do	n*A	Pressure Resistance
10	200	90	60	4*14	1.6MPa
15	200	95	65	4*14	1.6MPa
20	200	105	75	4*14	1.6MPa
25	200	115	85	4*14	1.6MPa
32	200	135	100	4*18	1.6MPa
40	200	145	110	4*18	1.6MPa
50	200	160	125	4*18	1.6MPa
65	200	180	145	4*18	1.6MPa
80	200	195	160	8*18	1.6MPa
100	250	215	180	8*18	1.6MPa
125	250	245	210	8*18	1.6MPa
150	300	280	240	8*23	1.6MPa
200	350	335	295	12*23	1.6MPa
250	450	405	355	12*25	1.6MPa
300	500	440	400	12*23	1.0MPa
350	550	500	460	16*23	1.0MPa
400	600	565	515	16*25	1.0MPa
450	600	615	565	20*25	1.0MPa
500	600	670	620	20*25	1.0MPa
600	600	780	725	20*30	1.0MPa
700	700	895	840	24*30	1.0MPa
800	800	1015	950	24*33	1.0MPa
900	900	1115	1050	28*33	1.0MPa
1000	1000	1230	1160	28*36	1.0MPa

Table 2 Sensor dimensions(GB/T 9124 Flange connection)

Unit in mm

DN	a	D	Do	n*A	Pressure Resistance
10	200	90	60	4*14	1.6MPa
15	200	95	65	4*14	1.6MPa
20	200	105	75	4*16	1.6MPa
25	200	115	85	4*16	1.6MPa
32	200	140	100	4*18	1.6MPa
40	200	150	110	4*18	1.6MPa
50	200	165	125	4*20	1.6MPa
65	200	185	145	8*20	1.6MPa
80	200	200	160	8*20	1.6MPa
100	250	220	180	8*22	1.6MPa
125	250	250	210	8*22	1.6MPa
150	300	285	240	8*24	1.6MPa

[illegible]



Nominal pressure	A										PN6
	B										PN10
	C										PN16
	D										PN25
	E										PN40
	F										PN63
	G										Class 150
	J										JIS 10K
	X										Others
Process connection material and body material		MC									Carbon Steel CS
		M1									304SS
		XX									Others
Accuracy			N								Level 2.0
Output and power supply				AA							4-20mA+pulse+RS485, 220VAC
				AB							4-20mA+HART+Pulse, 220VAC
				AM							4-20mA+pulse+RS485, 24VDC
				AK							4-20mA+HART+pulse, 24VDC
Electrode Materials				M3							316LSS
				MF							Hastelloy B
				MG							Hastelloy C
				T1							Ti
				T2							Ta
				MH							Pt-Ir
				MJ							Tungsten Carbide WC
Lining material				N6							PTFE
				N1							CR
				N2							PU
				N7							FEP (F46)
Electrical interface, housing material and protection level					WA						Integrated version, M20×1.5 cable gland, aluminum alloy, IP65
					WC						Remote Type, M20×1.5 cable gland, aluminum alloy, IP68
Cable length for the remote type						00					0m
						10					10m
						15					15m
						20					20m
						25					25m
						30					30m
						40					40m



	50				50m
	XX				Others
Additional options					
Accessories	PA				Paired PT1000 temperature sensor
	PB				Paired flange (carbon steel CS)
	PC				Paired flange (304SS)
	PE				Paired grounding ring (316LSS)
	PF				Paired grounding ring (titanium)



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