



Handbook

ABDT-LD Electromagnetic BTU meter

Weifang AOBO Instrument Technology Development Co.,Ltd

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I. Introduction

The Intelligent electromagnetic BTU meter is a type of measuring instruments, which measure the heat-carrying fluid heat exchange. Using Faraday electromagnetic induction principle of electromagnetic flow measurement technology with high precision high reliability to measure flow, using platinum thermal resistance with high precision high stability to measure temperature, and using the powerful embedded processor for flow and temperature collection and calculation. It is based on above means, according to the thermodynamics formula to calculate the heat transfer fluid release quantity of heat.

Intelligent electromagnetic BTU meter is composed of three parts: pairing temperature sensor, electromagnetic flow sensor and intelligent electromagnetic BTU converter.

The temperature sensor: using Pt100/Pt1000 paired platinum resistance with high precision, adopting precision temperature measurement electric circuit, guarantee the supply and return water temperature measurement with high precision.

The flow sensor: using electromagnetic flow sensor, choose industry performance excellent electromagnetic flow sensor products.

The intelligent electromagnetic flow converter: using advanced multi-function, low power and high performance of embedded processor, analog and digital integrated circuit chip, optimizing measures through improved design of the hardware and software to ensure long life and low power consumption, and has strong capability of anti electromagnetic interference.

The Intelligent electromagnetic BTU meter has multifunction: temperature sensor detection, empty pipe alarm and excitation alarm function. It has self-diagnosis, fault display, wide temperature and large LCD screen, which can display the parameters such as temperature, flow, flow rate, working time and heat.

II. Function Features

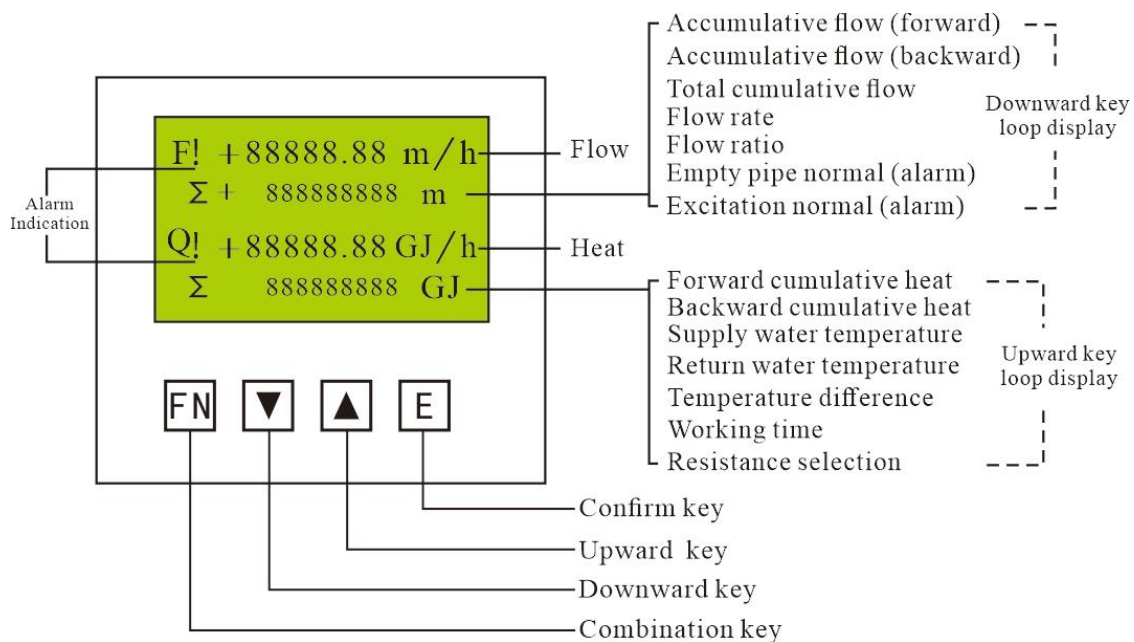
The intelligent electromagnetic BTU meter is using some unique techniques such as programmable constant current excitation, signal-noise separation, intelligent fuzzy

technology for empty pipe detection, and damping wavelet transform and so on.

- Empty pipe detection: using intelligent fuzzy technology for empty pipe detection with High safety and reliability, and calibration can be used unnecessary.
- Measurement the damping using wavelet transform algorithm, it can guarantee the stability of flow measurement, but also ensures that the real-time response to flow changes.
- Adopting strictly matched constant current source and isobaric measurement technique to effectively eliminate the influence of circuit noise on temperature measurement.
- The Intelligent temperature measurement circuit and algorithm is designed to solve the impact of ambient temperature for the device and ensure the meter operation on Long-term stability. Power on automatically detects the connection of the temperature sensor to prevent mismeasurement in the absence of a temperature sensor.
- The analog signals, digital signals, and output signals are fully isolated. The Input interface, output interface and power port are using anti overvoltage, lightning and surge protection design, to ensure the anti-interference ability.
- The excitation current and excitation frequency can be set through the menu to meet the measurement of a variety of measured media.
- It can measure the forward flow and backward flow. There are three internal totalizers, it can display including forward cumulative flow, backward cumulative flow rate and the difference cumulative flow. It can be switch control the output of backward measurement. It also can output flow direction indicator signal.
- Heat measuring and displaying, supply water and return water temperature and temperature difference measuring and displaying.
- The LCD with high-definition large-screen, Chinese and English operation menu can be selected, and convenient to operate.
- Using LCD module with wide temperature range, the LCD backlight with auto-off function to extend the service life of the LCD, the LCD state is monitoring by real-time to ensure that the LCD reliable operation.
- With self-diagnosis, fault display, power failure data protection function.

- The pressure at 0.6MPa and 1.6MPa can be selected by customers.
- A variety of lining materials, electrode materials and forms and protection level, can meet the user on the temperature, corrosion, harsh installation environment of the demanding requirements..
- With the Modbus protocol communication interface (RS485),it is easy to quick connect with the PLC or control devices.

III. Keyboard and Display



The electromagnetic BTU enter to the automatic measurement status when it power on.All of measurement functions are ready and measurement data is displayed.The parameters can be set and displayed by operating four keys.

IV. Key Function

The BTU meter has four function keys:Upward key,Downward key,Combination key,Confirm key.

Upward key:Figures with the cursor plus 1,or cycle display heat flow previous content.

Downward key:Figures with the cursor minus 1,or cycle display flow afterward content.

Combination key+Upward key:Cursor shift right,or cycle display heat flow afterward

content.

Combination key+Downward key:Cursor shift left,or cycle display flow previous content.

Combination key+Confirm key:Into the password entry screen,Confirm password input,into the lower sub-menu,save the parameters.

Confirm key:Return to superior sub-menu.Press more than two seconds and then release the key at level one menu,return automatic measurement state.Press more than two seconds and then release the key at any state,return automatic measurement state.

V. Password

The instrument has 3 levels of passwords. Level 1 password can modify the password value of this level; Level 2 password can modify the password of this level and view the password value of level 1; Level 3 password can modify the password of this level and view the password values of level 1 and level 2. The factory values of level 1, level 2 and level 3 passwords are "10000", "40000" and "99999" respectively.

After entering the menu with the password, operations of the corresponding password level can be performed. Combination key+Confirm key can return to the main screen. You can directly enter the menu without a password within 5 minutes (operating the Combination key+Confirm key on the password input screen can directly enter the menu).

VI. Menu

The menu of this BTU meter is using structured design.It has reasonable classification,and has very clear hierarchy,also convenient to operate.

The menu list is shown below.

Abbreviation	Description	Abbreviation	Description
BKLT	Back Light	HO	Hot
NEGF	Negative Flow	INIT	Initialization
CAL	Calibration	CO	COLD
COEF	Coefficient	MAINT	Maintenance
COD	Code of Production	TEMP	Temperature
DIR	Direction	THD	Threshold

DOD	Date of Production	TI	Temperature In
EPD	Empty Pipe Detection	TO	Temperature Out
EXCT	Excitation	PARAM	Parameter
POSF	Positive Flow	Pt	Temperature Sensor
FREQ	Frequency		

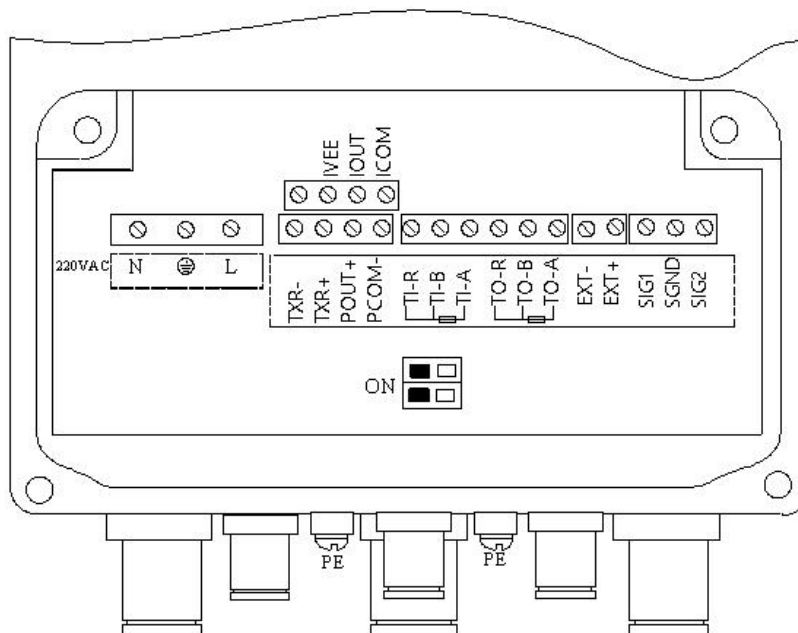
First Level Menu	Second Level Menu	Third Level Menu
Flow setting	DIAMETER	3mm~3000mm,±0~±99mm micro tuning
	DAMPING TIME	0~99 Sec.
	FLOW UNIT	L/h,L/m,L/s,m ³ /h,m ³ /m,m ³ /s,t/h,t/m,t/s,kg/h,kg/m,kg/s,GPM,LPM
	FLOW DEC SET	AUTO or MANU
	VOLUME UNIT	0.001m ³ ,0.01m ³ ,0.1m ³ ,1m ³ ,0.001L,0.01L,0.1L,1L,1t,1kg,GAL
	MEASURE RANGE	Setting,0-99999;m ³ /h,m ³ /m,m ³ /s,kg/h,kg/m,kg/s,t/h,t/m,t/s,L/h,L/m,L/s
	EXCT FREQ	1/8 PF
Heat setting	HEAT UNIT	MJ/h,GJ/h,KW,MW,BTU/s,MCAL/h,KCAL/s
	Temp Damp	Setting 1-30s
	Temp Filter	ON/OFF
	TEMP STD SER	Setting
	Refrig Medium	H2O,CACL2
	HEAT TPYE	HOT,COLD,DUAL
	Pt SENSOR WIRE	Two-Wire,Three-Wire
	Pt SENSOR TYPE	Pt100,Pt1000
	Pt MEASURE TIME	Setting
	TO COEF	Setting
	TO ZERO COEF	Setting
	TI COEF	Setting
	TI ZERO COEF	Setting
	LIQUID DENSITY	Setting
	PRESSURE MODE	0.6MPa/1.6MPa
	TEMP UINT	°F,°C
	HEAT SUM UNIT	MJ,GJ,KWh,MWh,BTU,MCAL,KCAL,10 ¹ KWh,10 ² KWh,10 ³ KWh,10 ¹ MCAL,10 ² MCAL,10 ³ MCAL
Function setting	MEASURE DIR	FORWARD/BACKWARD
	NEGF MEASURE	ON/OFF

	NEGF OUTPUT	ON/OFF
	LOW FLOW CUTOFF	ON/OFF
	LOW FLOW VALUE	Setting 00.00%
	METER ALARM	ON/OFF;When disabled, all alarm displays are turned off
	EXCT ALARM	ON/OFF
	INNER LINING	RUBBER or OTHERS
	EPD ALARM	ON/OFF
	EPD ALARM THD	Setting
Communicati on setting	MODBUS	BUS ADDRESS 001-255
		BAUDRATE 300,600,1200,2400,4800,9600,19200,38400
		CHECK BIT
Output setting	OUTPUT MODE	FREQ/PULSE
	20MA TUNING	Setting
	CURRENT TUNE	Setting
	FREQ RANGE	0~10000Hz
	PULSE WIDTH	Setting
	PULSE UNIT	The unit is L, which can be set between 0.001L~10000.000L
	PULSE POLAR	PO,NE
	PASSWORD SET	Including three level password
	RESTORE DEFAULT	Setting
	SAVE AS DEFAULT	Setting
	LCD CONTRAST	Setting
	WORK TIME RESET	Working time to be cleared
	COLD SUM RESET	Total cumulative cold to be cleared
	HEAT SUM RESET	Total cumulative heat to be cleared
	COLD SUM PRESET	Setting
	HEAT SUM PRESET	Setting
	POSF SUM PRESET	Setting
	NEGF SUM PRESET	Setting
	FLOW SUM RESET	Total cumulative flow to be cleared
	SHOW PASSWORD	Show low level password
Calibration settings	ZERO CORRECT	Setting
	SENSOR COEF	Setting
	SENSOR COEF CALC	Setting,Input standard flow, automatically calculate and save
	NORMALIZED	Setting

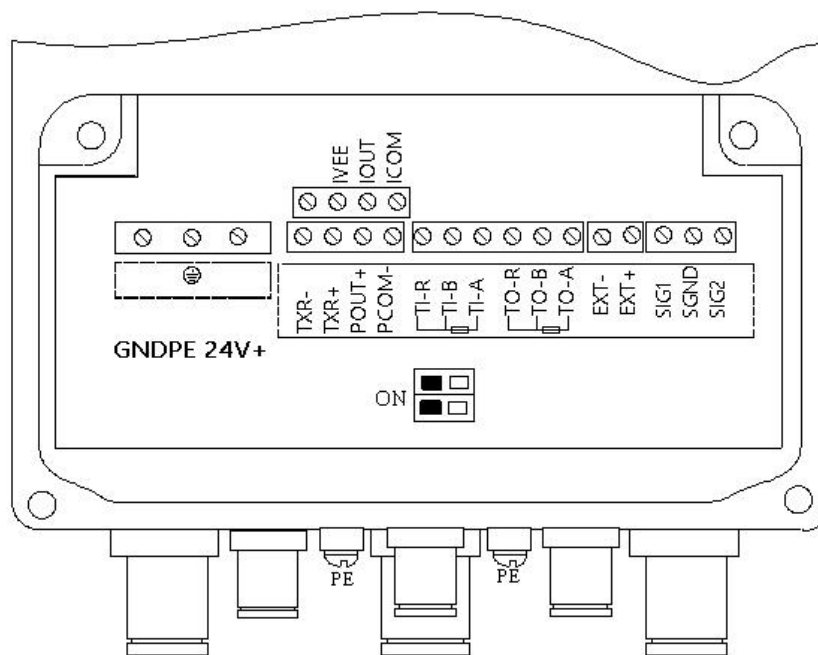
	COEF		
	CORRECT SET	CORRECT UNIT	m/s,L/h,L/m,L/s,m ³ /h,m ³ /m,m ³ /s,kg/h,kg/m,kg/s,t/h,t/m,t/s,GPM
		CORRECT POINT 1	Setting
		CORRECT COEF 1	Setting
		CORRECT POINT 2	Setting
		CORRECT COEF 2	Setting
		CORRECT POINT 3	Setting
		CORRECT COEF 3	Setting
		CORRECT POINT 4	Setting
		CORRECT COEF 4	Setting
		CORRECT POINT 5	Setting
		CORRECT COEF 5	Setting
	FLOW CORRECT	ON/OFF;The submenus in FLOW CORRECT will only take effect when allowed	

VII. Wiring Diagram and Signal Definitions

Remote type wiring diagram



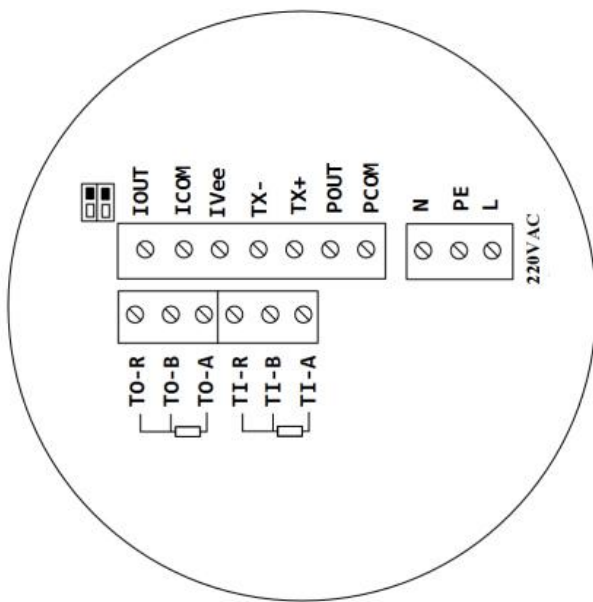
AC220V



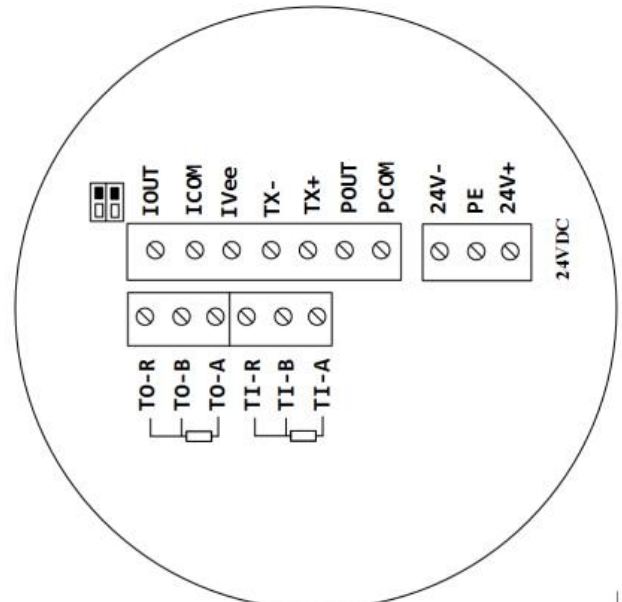
DC24V

SIG 1	Signal 1	}	Connect to sensor
SGND	Signal GND		
SIG 2	Signal 2		
EXT +	Excitation current +	}	
EXT -	Excitation current -		
IVEE	Current output power supply	}	Current output
IOUT	Current output(+)		
ICOM	Current output GND(-)		
POUT+	Frequency/pluse output (+)	}	Frequency/Pulse output
PCOM-	Frequency/pluse output GND (-)		
TI-A	Pt voltage A	}	Supply water temperature wiring
TI-B	Pt voltage B		
TI-R	Pt reference R		
TO-A	Pt voltage A	}	Rutern water temperature wiring
TO-B	Pt voltage B		
TO-R	Pt reference R		
TXR +	COMM+(RS485+)	}	Communication wiring
TXR -	COMM-(RS485-)		

Integrated display type wiring diagram



AC220V



DC24V

SIG 1	Signal 1	] ————	Connect to sensor
AGND	Signal GND		
SIG 2	Signal 2		
EXT +	Excitation current +		
EXT -	Excitation current -		
IVEE	Current output power supply	] ————	Current output
IOUT	Current output(+)		
ICOM	Current output GND(-)		
POUT+	Frequency/pluse output (+)	] ————	Frequency/Pulse output
PCOM-	Frequency/pluse output GND (-)		
TI-A	Pt voltage A	] ————	Supply water temperature wiring
TI-B	Pt voltage B		
TI-R	Pt reference R		
TO-A	Pt voltage A	] ————	Rutern water temperature wiring
TO-B	Pt voltage B		
TO-R	Pt reference R		
TXR +	COMM+(RS485+)	] ————	Communication wiring
TXR -	COMM-(RS485-)		

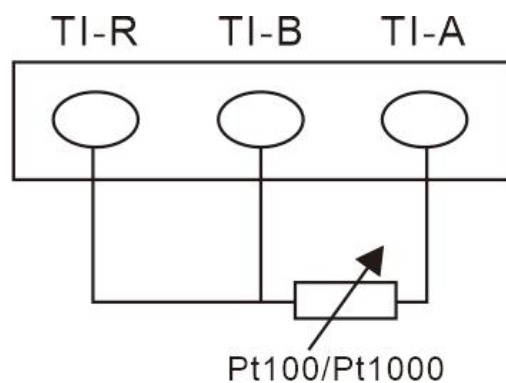
VIII. Pt100/Pt1000 Connection

The BTU meter uses the Pt100/Pt1000 for temperature detection, with 2-wire connection or 3-wire connection. The sensor type and connection type can be selected by LCD and Key on the menu. Please refer to the following connection:

2-Wire Type:

1) Connect the TI_B and TI_R together using any short wire.

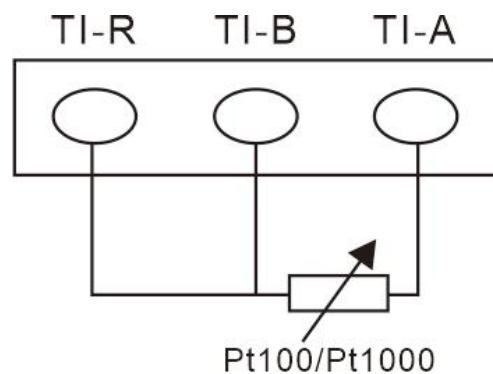
2) Connect the Sensor with TI_B and TIN_A



3-Wire Type:

1) Connect the TI_B and TI_A with sensor's same lead.

2) Connect the TI-R with sensor's compensation lead.



Heat calculation method::

When water flows through an integral BTU meter or a combined BTU meter installed in a heat exchange system, the heat energy released or absorbed by the system is calculated and displayed by a calculator based on the flow rate given by the flow sensor, the supply and return temperature signals given by the paired temperature sensor, and the time the water

flows. The basic formula is:

$$Q = \int_{t_0}^{t_1} q_m \times \Delta h \times dt = \int_{t_0}^{t_1} \rho \times q_v \times \Delta h \times dt$$

In the formula:

Q—Heat released or absorbed by the system, in J;

q_m —Mass flow rate of water flowing through the heat meter, in kg/h;

q_v —Volume flow rate of water flowing through the heat meter, in m³/h;

ρ —Density of water flowing through the heat meter, in kg/m³;

Δh —Difference in enthalpy of water at the inlet and outlet temperatures of the heat exchange system, in J/kg;

τ —Time, in hour.

The density and enthalpy in the formula shall conform to the provisions in Appendix A of the CJ128-2007 standard. When the temperature is non-integer, interpolation correction should be made.

Note: The measurement of heat is calculated by multiplying the inlet and outlet heat fusion values by the flow rate, so the calculated value is related to the second increment of the cumulative flow rate. In other words, the heat flow is calculated for each increment of cumulative flow.

Contact

AOBO Instrument Technology Development Co.,Ltd

No. 8009 Minzhu St.-Weifang,Shandong Province

261100,China

Mob.: +86 19953631088/+8619953631096

Email: aobometer@gmail.com

All of the catalogue and company information can be found at:

WWW.AOBOINSTRUMENT.COM