

LB01A、LB02A、LB06 使用说明书

User Manual



使用注意事项

1、本仪表内部使用自恢复保险和一次性保险丝结合，但任何保护措施都无法保证 100%的完全可靠，只是尽最大可能保护仪表及使用者的安全。本仪表的任何档位，均可以在错误操作时耐受直流 30V 或交流 20V 以下电压 5 秒。任何档位均不可以接入 220V 市电。若违反以上安全要求，可能会造成人身伤害、仪表损坏。

2、仪表工作时，内部会产生一定的热量，这就在一定程度上影响内部测温元件的测量准确性，这种误差的大小与环境温度的高低，有源电流输出的电流大小、负载电阻的大小、操作者手部的温度都有关系，这种误差是任何内部集成的温度测量都有的问题。如要克服这个误差，建议采用外部 Pt100 温度探头。

3、电阻输出时，电阻输出的准确性和外部激励源的电流大小有一定的关系，若电流太小，会使输出电阻有一定的误差，因此，用普通万用表检测输出电阻可能会有少许误差。

产品特点：

1、内置一次性保险丝，可以避免绝大多数误插入 220V 市电造成的仪表损坏。

2、AD、DA、基准电压、运放等重要芯片均采用高精度高温稳定性芯片，提高仪表的温度稳定性以及长时间老化性能指标。

3、在电路结构上降低热电阻、电阻输出对外部激励电流的敏感度。提高输出精度。适用于恒流及非恒流电阻测量方式，扩大了仪表的使用范围。

LB01A、LB02A、LB06 的区别：

输出功能：OUTPUT				
功能 function	输出类型	LB01A	LB02A	LB06
	OUT UNIT			
直流电压 DC. V	V	√	√	√
直流毫伏 DC. mV	mV	√	√	√
欧姆 Ω	Ω	×	√	√
直流电流 DC. mA	mA	√	√	√
热电偶 TC	R	√	√	√
	S	√	√	√
	B	√	√	√
	K	√	√	√
	E	√	√	√
	J	√	√	√
	T	√	√	√
热电阻 RTD	Pt100	×	√	√
	Cu50	×	√	√
	Pt1000	×	√	√
24V	V	√	√	√
频率 Hz	Hz	×	√	√
modbus 主站		×	×	√
modbus 从站		×	×	√
hart 手操器		×	×	√
固件可升级		√	√	√


测量功能: MEASURE				
功能 function	测量类型	LB01A	LB02A	LB06
直流电压 DC. V	V	√	√	√
直流毫伏 DC. mV	mV	√	√	√
欧姆 Ω	Ω	√	√	√
直流电流 DC. mA	mA	√	√	√
热电偶 TC	R	√	√	√
	S	√	√	√
	B	√	√	√
	K	√	√	√
	E	√	√	√
	J	√	√	√
	T	√	√	√
	N	√	√	√
热电阻 RTD	Pt100	√	√	√
	Cu50	√	√	√
	Pt1000	√	√	√
频率 Hz	Hz	√	√	√
量程换算 Range switch	V	√	√	√
	mV	√	√	√
	Ω	√	√	√
	mA	√	√	√
	Hz	√	√	√

使用方法说明：

：测量标识

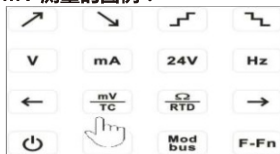
：输出标识

当处于某个档位时，循环按动该档位对应的功能按键，即可在该功能的测量模式和输出模式间切换（比如第一次按下

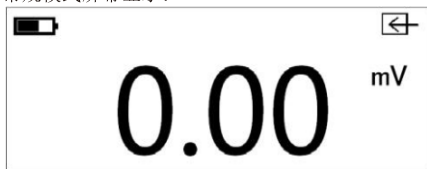
 按键，对应功能是电压输入，再一次按下  按键，就会切换为电压输出）（输入输出功能都有的情况下）。

基础功能指的是电压电流毫伏电阻频率等基础电学单位，子功能指的是使用这些基础电学单位作为输出或测量的工程信号类型。举例说明：各型热电偶（TC）就是 mV 的子功能。各型热电阻（RTD）就是电阻的子功能。

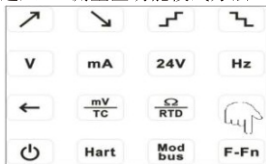
mV 测量的图例：



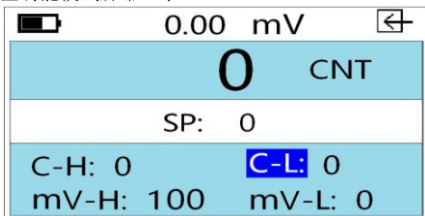
常规模式屏幕显示：



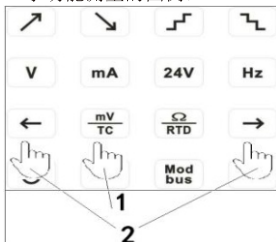
进入 mV 测量全功能模式方法:



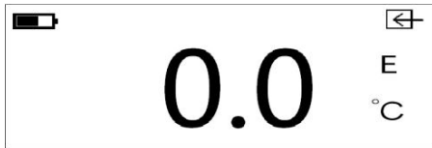
全功能模式屏幕显示:



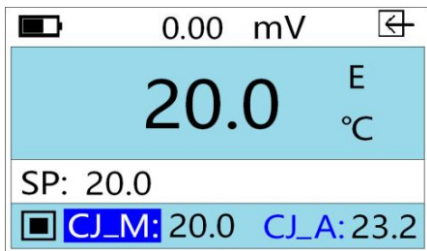
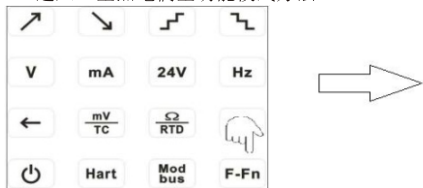
mV 子功能测量的图例:



常规模式屏幕显示：



1.1 进入 E 型热电偶全功能模式方法：



其他所有功能的操作都和这个类似，不再累述。

各功能的全功能模式下简写字符含义：

SP: 设定值

Sqrt: 信号是否开方, 1 为开方, 0 为不开方

CNT: Count 的简写, 可以理解为量程换算的计数单位

C-H: Count-H 的简写, 量程换算的上限

C-L: Count-L 的简写, 量程换算的下限

V-H: 量程换算上限对应的电压值

V-L: 量程换算下限对应的电压值

mA-H: 量程换算上限对应的电流值

mA-L: 量程换算下限对应的电流值

C-T: 电流编程输出时一个完整循环周期的时间

W-T: 电流编程输出时到达上下限后的等待时间

mV-H: 量程换算上限对应的 mV 值

mV-L: 量程换算下限对应的 mV 值

CJ_M: 热电偶测量或者输出时的冷端温度手动设定值

CJ_A: 热电偶测量或者输出时的冷端温度自动设定值

R-H: 量程换算上限对应的电阻值

R-L: 量程换算下限对应的电阻值

WR-M: 热电阻测量时的线阻手动设定值

WR-A: 热电阻测量时的线阻自动设定值

Hz-H: 量程换算上限对应的频率值

Hz-L: 量程换算下限对应的频率值

Hz-V: 频率测量或输出时电平阈值, 对于输入状态时, 只有输入信号大于此设定值时, 才会计数。对于输出状态, 此电平是输出波形峰值。

Hz-DC: 频率输出时的占空比设定值

量程换算以电流 为例，其他信号类型公式相同。

$$CNT = \frac{mA_{in} * (C_H - C_L)}{mA_H - mA_L}$$

热电阻测量时线阻补偿的说明：

当 WR-M 被选中的情况可以手动设定线阻补偿，补偿范围在 0-50 欧姆范围内。当 WR-A 被选中的情况可以自动设定线阻补偿，过程为：当测量的电阻值在 0-10 欧姆范围内时会自动将该值设定为线阻补偿值，不在需要手动设定。

不管在任何功能下，全功能模式被激活后，屏幕上一定会有部分区域是浅蓝绿背景色，常规模式一定是白色背景色。

常规模式下：增减按键的增减幅度固定，且按动按键输出即时生效，不需确认，这样有利于快捷设定输出值。如需更精细调节输出幅度，进入全功能模式使用数字键盘输入。



：小幅增减按键



：大幅增减按键

全功能模式下，数字键盘及特殊功能键盘被激活，数字键盘不介绍，特殊功能键盘介绍如下：



：参数选择按键，按动该按键会在可选参数间循环。

Del



：数字删除按键，按下这个按键会对已经输入的数字从后往前逐位删除。

Enter



：确认按键，按下这个按键会对已经输入的参数进

行确认。

F-Fn

： 全功能进入、退出按键。

Modbus 功能介绍：

LB06 支持 Modbus 主站、从站功能。

<input type="checkbox"/> Master	Slave
SlaveAdd: 1	BaudRate: 9600
DataBit: 8	StopBits: 1
Parity: 0	0: NO; 1: Even; 2: Odd
ReadCoil	ReadInput
ReadHoldReg	ReadInputReg
WriteCoil	WriteHoldReg

注意：当选择框位于白色背景区域时可以切换至其他功能，比如电压测量、电流输出等。当选择框位于浅蓝绿色背景区域时无法切换至其他功能，只能修改、确认或者切换到其他选项。

主站、从站设定。



Master


Slave

通讯参数设定，必须正确设置才可能通讯正常。

SlaveAdd: 1	BaudRate:9600
DataBit:8	StopBits:1
Parity:0	0:NO; 1:Even; 2:Odd

Modbus 功能选择

ReadCoil	ReadInput
ReadHoldReg	ReadInputReg
WriteCoil	WriteHoldReg

根据所需功能使用  按键进行选择。注意：不管主、从模式，对方设备使用什么命令，本仪表使用什么命令。比如对方是读输入寄存器，本仪表不用刻意转换为写输入寄存器命令，仍然使用读输入寄存器即可，避免人为转换时用错命令。

Hart 手操器功能介绍：

Hart 手操器支持三种连接方式：1、常规模式，在这种模式下，Hart 手操器是高阻状态，可以直接并联于回路中不干扰回路正常工作。此模式不能进行电流校准。2、24V 模式，这种模式下可以应用本仪表直接驱动两线制变送器，在这个模式下，支持本仪表有的全部功能。3、250 Ω 模式，此模式串联于回路中，应用于回路电阻小于 250 Ω 的回路中。具体连接方式，参考仪表模式选项下的图例。

Primary_Variable:主变量测量值

Loop_Current:回路电流，这个电流是 LB06 Hart 模块从变

送器读取回来的数字信号，不是 LB06 测量出来的

Percent_of_Range:主变量测量值占量程范围的百分比

top_of_range:用户量程上限

bottom_of_range:用户量程下限

top_of_sensor:传感器量程上限

bottom_of_sensor:传感器量程下限

damping_time:阻尼时间，也就是常说的滤波时间

External_Current:外部电流，这个电流是 LB06 在 Hart 手操器模式选择 24V 状态下，由 LB06 提供的驱动变送器的电流值，请注意这个和 Loop_Current 的区别。

4mA_calibrate:变送器 0 点校准，按 Start 后，LB06 会发送校准 0 点命令，变送器会强制输出 4 mA，这时

External_Current 下显示的电流值是变送器强制输出的 4 mA，如果不是 4 mA，将这个数值输入 4mA_calibrate 校准后面数字框，按回车等待，直到 External_Current 后电流值等于或非常接近 4 mA。

20mA_calibrate:变送器满点校准，按 Start 后，LB06 会发送校准满点命令，变送器会强制输出 20 mA，这时

External_Current 下显示的电流值是变送器强制输出的 20 mA，如果不是 20 mA，将这个数值输入 20mA_calibrate 校准后面数字框，按回车等待，直到 External_Current 后电流值等于或非常接近 20 mA，校准完毕。

Set_to_Pv_L_Range:将当前测量值设置为用户量程下限

Set_to_Pv_H_Range:将当前测量值设置为用户量程上限

Set_to_Pv_Zero:将当前测量值设置为用户量程 0 点。这

个操作在变送器正在使用过程中勿用，因为一旦设置成功，需要将变送器从装置中切除后恢复初始状态再次应用该命令才能恢复回来。这个操作一般用于新变送器安装好以后投用前使用。

Set_Square_Root:信号是否开方。

其他功能介绍

1、自动关机。本仪表在没有任何按键操作的情况下，半小时左右会自动关机以节省电量消耗，如需长时间保持在开机状态，请插上充电器。

2、充电及状态指示。开机关机均可充电，在开机状态下，如果插入充电器，电量边框会闪烁，提示正在进行充电。在关机状态下插入充电器，不会有提示，但充电仍会继续，电池充满后会自动停止。不要等电池耗尽后再充电。长时间放置前需将电池充饱。

3、一次性速熔断保险丝的更换。本仪表使用的是力特 5*20mm 500mA 规格（216 系列）的速熔断保险丝，如需更换，尽量使用力特品牌，必须更换速熔断类型 500mA 规格的保险丝。

Cautions :

1. This instrument uses multiple internal self-recovery fuse and a quick one-time fuse blows, but no protective measures can not guarantee 100% complete and reliable instrument and just do our best to protect the safety of users possible .Any position of the instrument, can withstand 30V DC or AC voltage is below 20V 5 seconds when an error operation. Any stalls can not access to 220V mains. If the violation of security requirements above may result in personal injury, damage to the instrument

2. When the meter is working, internally generated some heat, which to some extent affect the measurement accuracy of the temperature measurement devices inside. The size of this error and the level of ambient temperature, The current size of the active output, the size of the load resistance, temperature of the operator' s hand have a relationship .Any internal integrated temperature measurement instruments can not avoid such errors .To overcome this error, we recommend using an external Pt100 temperature mouldle.

3. Resistance output, which has a certain relationship with the external resistor output excitation source, if the current is too small, the output resistance will have a certain degree of error, therefore, ordinary

multimeter to check the output resistance may be a little error.

Features:

LB01A、LB02A、LB06 multifunction process calibrator covers the PLC, DCS, ESD, field instrumentation, valves and other maintenance required functions, performance greatly improved. Security fully in place and shell with a new ABS material, copper connector contact resistance is minimal. Compact and portable, Panel layout, simple operation. V, mV, mA, resistance, Hz signal input and output has a corresponding button directly transferred out, the operation is extremely simple. LB06 have modbus master, slave mode and Hart function.



Operation Instruction:



Measure mode



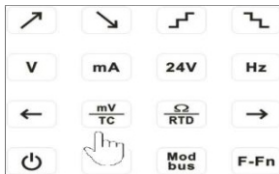
Output mode

When at a certain function, press function key of the corresponding function repeatedly to alternate between the measure mode and output mode (for example, press key , and the corresponding function is voltage input, press key  again, and it will alternate into voltage output) (under the condition both of input and output).

The basic function means voltage, current, millivolt, resistance, frequency and the other basic electrical units, subfunction means use these basic electrical

units as engineering signals of measure or output. For instance: various types of thermoelement (TC) is the subfunction of mV. Various types of thermal resistance (RTD) is the subfunction of resistance.

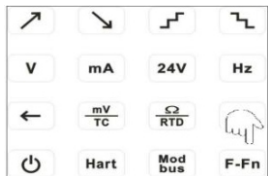
mV measurement figure :



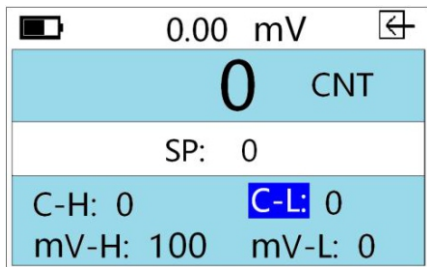
Conventional mode display :



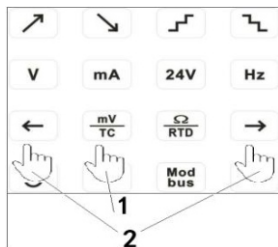
mV Method of measure full-function mode:



Full-function mode display:



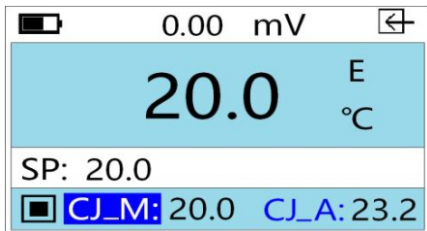
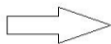
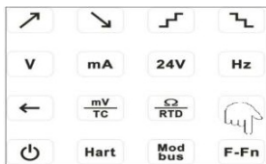
mV Subfunction measurement:



Conventional mode display:



Method of starting full-function mode of E type TC :



Operation of all the other functions is similar to it, and no more details.

Meanings on various of subfunction shorthand characters in full-function mode:

SP: set value.

Sqrt: whether the signal is Square root or not, on is Square root, off is not Square root.

CNT: short for Count, can be interpreted as the counting unit of range conversion.

C-H: short for Count-H, upper limit of range conversion.

C-L: short for Count-L, lower limit of range conversion.

V-H: voltage to upper limit of range conversion.

V-L: voltage to lower limit of range conversion.

mA-H: current to upper limit of range conversion.

mA-L: current to lower limit of range conversion.

C-T: time of a complete cycle when current program output.

W-T: waiting time of up to upper limit and lower limit when current program output.

mV-H: mV value to upper limit of range conversion.

mV-L: mV value to lower limit of range conversion.

CJ_M: manual set value to cold junction temperature when Thermocouple measure or output

CJ_A: automatic set value to cold junction temperature when Thermocouple measure or output.

R-H: resistance value to upper limit of range conversion

R-L: resistance value to lower limit of range conversion

WR-M: manual set value to wire resistance when thermal resistance measure.

WR-A: automatic set value to wire resistance when thermal resistance measure .

Hz-H: frequency value to upper limit of range conversion

Hz-L: frequency value to lower limit of range conversion

Hz-V: threshold value when frequency measure or output, for input state, it will not start counting until the signal of input greater than the set value. For

output state, the frequency is the peak of output waveform.

Hz-DC: PWM Duty cycle set when frequency output

Range conversion, take current for an example, formula of the other signal types is the same.

$$\text{CNT} = \frac{\text{mA}_{\text{in}} * (\text{C}_{\text{H}} - \text{C}_{\text{L}})}{\text{mA}_{\text{H}} - \text{mA}_{\text{L}}}$$

Instruction of compensation for wire resistance when thermal resistance measure:

When WR-M is selected, it's available to execute manual set of wire resistance compensation, range of compensation is 0~50Ω. When WR-A is selected, it's available to execute automatic set of wire resistance compensation, and the process: it will not set the value as wire resistance compensation automatically until the resistance measure value is 0~10Ω, and no needs to set manually.

Regardless of whatever function it is, once the full-function mode stimulated, some parts of the screen will be light teal background.


Conventional mode: the range of add-subtract key is fixed and stable, and it will be effective at once when pressing the key to output, no needs to confirm, and it's good to Convenient setting output value. If it's


necessary to adjust range of output in accuracy, start full-function mode and use digital keyboard to input.


  : small range of add-subtract key

  : big range of add-subtract key

When full-function mode , digital keyboard and special function keyboard simulated, no details of digital keyboard instruction of special function keyboard as follows:

 : Chosen parameter key, press the key and it will cycle in chosen parameters.

Del
 : Digital delete key, press the key and it will delete the digits from back to front one by one.

Enter
 : Confirm key, press the key and it will confirm to the parameters input.

 : Full-function enter、exit key.

Modbus mode :

LB06 support Modbus master、slave function.

<input type="checkbox"/> Master	Slave
SlaveAdd: 1	BaudRate:9600
DataBit:8	StopBits:1
Parity:0	0:NO; 1:Even;2:Odd
ReadCoil	ReadInput
ReadHoldReg	ReadInputReg
WriteCoil	WriteHoldReg

Note: When the select box is in the white background area ,it' s available to alternate to other function , such as voltage measure、 current output and so on. When the select box is in the light teal background area, it' s not available to alternate to other function, it' s available to alter、 confirm or alternate to other selects.

Master、 slave setting


<input type="checkbox"/> Master	Slave
--	--------------

Communication parameter setting, correct setting to guarantee normal communication.

SlaveAdd: 1	BaudRate:9600
DataBit:8	StopBits:1
Parity:0	0:NO; 1:Even;2:Odd

Modbus function select

ReadCoil	ReadInput
ReadHoldReg	ReadInputReg
WriteCoil	WriteHoldReg

according to the function required, press key  to select. Whatever mode it is, master or slave, the order of the meter will be in accordance with the order of other equipment. For instance, the other is order of read input register, and no needs to alternate to order of write input register for the meter, but still use order of read input register to avoid mistaking when artificial transforming.

Hart mode :

Hart mode supports 3 connecting method:

- 1、 In the conventional mode, Hart is in the high resistance state, can be connected directly to the circuit in parallel without disturbing. But it's not available to execute current calibration.
- 2、 24V mode, in 24V mode, it's available to use the meter to drive two-wire transmitter directly and support all the functions of meter.
- 3、 250 Ω mode, the mode is connected in the circuit, and applies to the circuit the resistance of circuit is lower than 250 Ω .

The connecting method in detail, refer to the figure in the mode select of meter.

Primary_Variable: master variable measurement value.

Loop_Current: circuit current, the current is the digital signal read by LB06 Hart module from the transmitter, not measured by LB06 Hart module.

Percent_of_Range: percentage of master variable value to range.

top_of_range: upper limit of user range.

bottom_of_range: lower limit of user range.

top_of_sensor: upper limit of sensor range.

bottom_of_sensor: lower limit of sensor range.

damping_time: damping time, means filtering time .

External_Current: external current, the current value is the value of driving transmitter by LB06 in the state of 24V basic to Hart hand operator mode, please note the distinction between this and loop_current.

4mA_calibrate: 0 point calibration of transmitter, press Start, then LB06 will send calibration order relatively, and the transmitter will output 4 mA compulsorily, then the displayed current value of external current is 4 mA output by transmitter compulsorily. If it's not 4mA, input the value into 4mA_calibrate calibration digit box, press key Enter and wait until External Current equals to or close to 4 mA.

20mA_calibrate: Full calibration of transmitter, press Start, LB06 send order of full calibration , and the transmitter will output 20 mA , the displayed current value of External_Current is 20mA output compulsorily , if it' s not 20 mA, input the value into the 20mA calibrate digit box, press key Enter and wait until External_Current equals to or close to 20 mA , the calibration is completed.

Set_to_Pv_L_Range: set the measurement value as lower limit to user range.

Set_to_Pv_H_Range: set the measurement value as upper limit to user range.

Set_to_Pv_Zero: set the measurement value as 0 point of user range, and do not operate during the using process of transmitter, due to once set successfully , it will not recover until cut and remove the transmitter from the device and take the order again. The operation is used after the new transmitter equipped well and before putting in service.

Set_Square_Root: whether the signal is prescribed or not.

Other functions introduction:

1. Cancel toggle switch, through the key switch, do not operate for a long time (about 30 minutes), automatic shutdown. In the state of charge, auto-off function

is disabled. While charging the instrument will not automatically shut down, the production line for continuous use.

2. Charging and status indication. battery can be charged in with calibrator on or off state. the charging process will takes 5-6 hours. This machine uses the lithium polymer battery. Do not try to run out of power. Place a long time needs to be fully charged battery.

3. Replace fuse. This instrument uses 5 * 20mm 500mA (216 series) littelfuse quick fuse, for replacement, try to use the littelfuse brands, it must be replaced as 250V/500mA fuse.

4、function and parameter please refer to Chinese Manual.

