Inline Ultrasonic Pipe Flow meter Manual

MT100W series

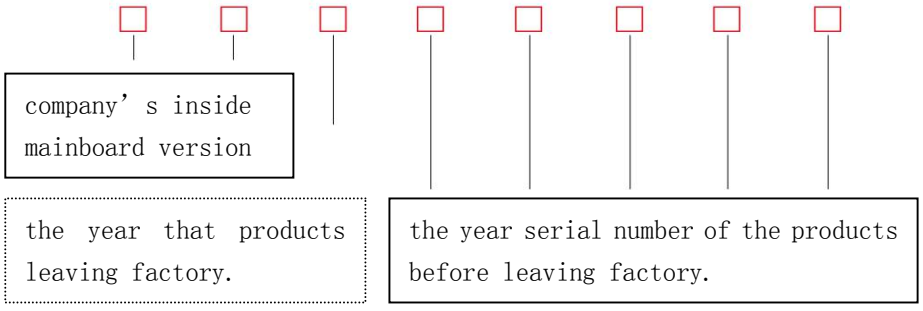
1.Outline

§1.1 Preface:

Welcome to use the MT100W series ultrasonic flow meter/heat meter/24VDC/110VAC /battery power supply ultrasonic water meter invented by us.

MT100W, .it explains how to install,operate,communicate in details.

Each instrument has its own 8 ESN,before using it,please check whether the series number before leaving factory and ESN(in menu window 61) are the same,and read carefully related contents according to the serial number and product style.the principle of serial number is as follows:



§1.2 standard function parameter:

Item		Function,parameter
measuring mainframe	Accuracy	2.0 % (time difference resolution 40 picosecond)
	Repeatability	0.2%
	Max velocity	64m/s
	Measuring cycle	500mS (two times per second,each cycle collecting 128 unite data,details about MT100PU16 water meter main board to read specific introduction.
	Measurement principle	Ultrasonic transit-time principle,4 byte IEEE754 floating-point calculation
	interface to connect monitor	Connect 2*10 backlit Chinese letter or 2*20 character LCD monitor.
	operating	connected with 4 keys
	input	three channel 4-20mA input optional,accuracy 0.1%,input signals of pressure,liquid level,temperature,etc.also use as digit interface.
		two channel three wires PT1000(MT100PU16 version) platinum resistance input loop,realize the function of heat meter(enthalpy potential method)
	output	Current signal(optional module):4-20mA,resistance:600Ω,accuracy:0.1% Frequency signal(optional module):1-9999Hz,OCT output. Pulse signal:positive,negative,net flow rate and heat quantity totaliser pulse,two channel OCT output(including one channel,programmable between the pulse width:6-1000ms,default :200ms) Alarm signal:two channel OCT output,nearly 20 original signals optional Data interface:isolation RS485 serial port. Print at scheduled time,data output function.
	communication protocol	MODBUS protocol,M-BUS protocol,FUJI extending protocol,the recommended is MODBUS-RTU protocol or MODBUS-ASCII protocol.
	other function	Day total,month total,year total flow rate automatic memory function,power on/off time and flow management function and realize automatic and manual replenishing.read the day total,month total,year total data by MODBUS protocol.programmable fixed quantity controller(start by outside input signal or MODBUS command).one bidirectional serial port can connect many outer equipment just like 4-20mA,data logging. Work parameter can be solidified to the FLASH memory inside the instrument,automatically callout when power on. Error self diagnosis function,error timer.
	work current	50mA(without connecting keyboard display and no alarm of deeper)
	spare battery	When power off,MT100PU16 version main board use electric capacity discharge to solidify the data to flash.
	environment temperature	-10℃～70℃ （If Out of the temperature range,pls contact manufacturer.）
	work time	continually
	version	MT100PU16
	power supply	8-36VDC or 3.6V platinum battery.
	Main board size	Φ84mm
transducers	clamp-on type	Standard S1 type,suitable to pipe diameter:DN15-100mm Standard M2type,suitable to pipe diameter:DN50-700mm Standard L2 type,suitable to pipe diameter:DN300-6000mm
	insertion type	No limitation to pipe material(install without stopping production),suitable to

		pipe diameter above DN 80mm.
	in-line type	Π.in-line type:suitable to pipe diameter DN15-DN40,instrument measuring accuracy is +/-0.5% Standard in-line type:suitable to pipe diameter DN50-DN1000,instrument measuring accuracy is +/-0.5%
	signal cable	shielded twisted-pair cable,single cable can be lengthened to 500m in special spot.(not recommended)
	protection level	IP68 (it can work under water)
measurable pipe	pipe material	Carbon Steel,stainless steel,
	inner diameter	15mm～6000mm(to 2mm for the π in-line type)
	length of straight pipe	Upstream≥10D，downstream≥5D，distance to pump≥30D
measuring medium	kinds of fluid	Water (hot water, chilled water, city water, sea water, waste water, etc.); Sewage with small particle content; Oil (crude oil, lubricating oil, diesel oil, fuel oil, etc.); Chemicals (alcohol, acids, etc.); Plant effluent; Beverage, liquid food; Ultra-pure liquids; Solvents and other liquids that ultrasonic beam can travel and well-distributed.
	turbidity	≤20000 ppm，Better stable measurement results for dirty water
	temperature	-40℃～160℃
	flow direction	Measure the positive and negative flow respectively,can measure the net flow.

§1.3 Application field:

Applied to on-line measure and system monitor for nearly all liquids from petrol chemical,metallurgy,electric power plant,irrigation,city water company,energy monitor fields,realize the functions of measuring and checking of flow velocity,flow rate,accumulation and heat quantity of different liquids,and flow rate on/off,liquids distinguish.

2. Starting Measurement

The new instruments are comprised of measuring main board,function extending module,and display operation terminal etc.users can choose the right configuration according to own requirements.the easiest configuration only needs a measuring main board and a pair of transducers to complete the function of flow measurement.

§2.1 DC or AC powered In-line ultrasonic flow meter

MT100W-AC OR DC ultrasonic flow meter/heat meter:it make the main board of MT100PU16 ,then encapsulate them in a sealed enclosure,realize on-line display and operation on spot.it solved the problem that owing to the reason of people that make the measured pipe parameters inaccuracy ,caused errors that lowered the measurement accuracy during the period of installing the clamp-on type and insertion type transducers .it has the advantages of high accuracy,wide measurement range,no pressure lost,easy installation,no need to set parameter,etc.it is the future for the flow meter and heat meter.

Л style in line type(DC OR AC POWERED)

standard in line type(DC OR AC POWERED)

Technology features:

1: operating power :AC 85—264V or isolation DC 24V

2: current: 50mA(under the condition of connection without keyboard display and sound of buzzer)

3:output optional: one channel standard isolation RS485 output

One channel isolation 4-20mA or 0-20mA passive output.

Two channel OCT output(programmed between the pulse width(6-1000ms),default before leaving factory (200ms))

4:input optional: two channel three wire system PT100 platinum resistor input loop,to make heat meter has the function of displaying heat quantity.

5:display:2*10 back-lit LCD(Chinese and English optional)

6: operating:magnetic 4 keypads to operate

7:other functions: automatic memory the positive,negative,net totaliser or flow rate and heat quantity of the last 512 days,128 months,10years

Automatic memory the time of power on/off and flow rate of the last 30 times, realize to replenish by hand or automatically,read the data through Mod-bus communication protocol.

8:protection level:IP68

Detailed information of Menu

flow rate/flow totalizer display	00	display instant flow rate/net totaliser,adjust the units in M30-M32
	01	display instant flow rate/instant flow velocity, adjust the units in M30-M32
	02	display instant flow rate/positive totaliser, adjust the units in M30-M32
	03	display instant flow rate/negative totaliser, adjust the units in M30-M32
	04	display instant flow rate/date time
	05	display heat flow rate/total heat quantity,adjust the units in M84 ,M88.
	06	display temperature input T1,T2
	07	display present battery voltage.(suitable to MT100PU16)
	07	display analogue input AI3,AI4
	08	display system error code
	09	display today net totaliser
initial setup	10	input outside perimeter of pipe
	*11	input pipe outer diameter,data range:0-18000mm
	*12	input pipe wall thickness
	*13	input pipe inner diameter
	*14	choose the kinds of pipe materials
	15	input sound velocity of pipe material
	16	choose kinds of liner
	17	input the sound velocity of liner
	18	input the thickness of liner
	19	input inner pipe wall absolute degree of roughness
	*20	choose kinds of fluids
	21	input fluid velocity
	22	input fluid viscosity
	*23	choose the types of transducers,including more than 20 types to use
	*24	choose transducer installation method
	*25	display transducer installation space
	*26	parameter solidifying and setup
	27	store and read installation parameters on installation point
	28	When signal set turning poor,keep last data,choosing”yes”means when the signal turning poor,the flow meter display last correct measured data.
	29	Input signal strength when the pipe flow is set to be empty.for example: inputting 65 means when the signal strength is lower than 65,the flow meter will think that there is no liquid in the pipe and display the flow value as zero.
flow unit setup	30	choose metric or imperial unit
	31	choose instant flow rate unit
	32	choose totaliser unit
	33	choosing the totaliser multiplying factor which function is to multiply totaliser data rang,normally set it as x1
	34	net totaliser switch
	35	positive totaliser switch

	36	negative totaliser switch
	37	restore parameters setup before leaving factory and reset totaliser
	38	manual totaliser (the key to control on/off)
	39	choose operating language, including 8 kinds of different languages for international users to use
	3•	setup the LCD display method,inputting 0 or 1 means regular displaying content.inputting 2-39 means automatically cycle displaying method,displaying the previous menu of 2-39,time interval is 8 seconds.when inputting accuracy ,displaying according to the inputting operation.when there is no inputting operation,it will automatically enter cycle displaying status.(detailed information in §3.1)
Choosing setup	*40	damper coefficient
	*41	Input low flow velocity cutoff value
	42	Setup static zero point
	43	clear zero point setup and manually setup zero point,restore default before leaving factory.
	44	Set up zero point deviant by hand
	45	meter coefficient,rectification coefficient
	46	input Network address identification number (IDN)
	47	password protecting operation,after the meter was setup with password,only browse menus without any modification.
	48	Input degree of linearity broken line rectification data.at most there is 12 segments broken line,used for users to rectify meter no linear.
	49	Network communication tester,on this window to visit the data transferred from upper computer to judge the problems arised during communication.
scheduled time output	50	Optional setup of data output at scheduled time,choose output content at scheduled time to print,more than 20 to select
	51	Setup output time at scheduled time
	52	Printing data flow direction control.by default printing data will flow directly to the thermal printer hanged inside bus.setup printing data output to outside serial port(RS485 port)
AI5 setup	53	display analogue input AI5(reserved for the MT100PU16 main board)
input and output setup	54	Setup of OCT totaliser pulse output,pulse width,range:6 Ms-1000Ms.
	55	choose current loop mode
	56	corresponding data to output of current loop 4mA or 0mA
	57	corresponding data to output of current loop 20mA
	58	Verification of current loop output.applied to check whether current loop is normal or not.
	59	present output of current loop
	60	Date time and setup.the date time of the new flow meter is realized by CPU,when upgrading software,time will be slow,so after upgrading,recommend to adjust the date and time to display correctly
	61	Software version information and Electronic Serial Number (ESN)
	62	setup serial port parameter
	63	Communication protocol choosing(including compatible protocol choosing),two

		options,choosing MODBUS-RTU means using binary system MODUS-RTU protocol.choosing MODBUS-ASCII+previous protocol means using ASCII protocol,at this time can support several protocols simultaneously,including MOSBUS-ASCII, previous 7 version protocol,FUJI protocol,Meter-BUSx protocol etc.	
	64	analogue input AI3	By inputting measuring range ,the flow meter will turn current signal into data range users need,so display related analogue input that corresponding to physical parameter data.
	65	Analogue input AI4	
	66	Analogue input AI5	
	67	Setup frequency range of frequency output signal.frequency signal output represent instant flow rate value by signal frequency value.default:0-1000Hz ， max-range:0-999Hz.output frequency signal by special frequency output unit.	
	68	setup lower limit flow of frequency signal output	
	69	setup upper limit flow of frequency signal output	
	70	LCD backlit control	
	71	LCD contrast ratio control	
	72	Work timer,logging work time of the meter by unit of second.it can reset.	
	73	setup lower limit flow of frequency signal output	by setuping the lower and upper limit of alarm,confirm a range,when actual flow is over the range set in this window,then create a alarm signal output.alarm signal can be transferred to outside by setuping OCT or relay.
	74	setup upper limit flow of frequency signal output	
	75	LCD backlit control	
	76	LCD contrast ratio control	
	77	beeper setup options	
	78	setup Open Collector Transistor output(OCT) output options	
	79	setup relay(OCT2) output options	
	80	choose input signal of batch controller	
	81	batch controller	
heat quantity measuring	82	day/month/year totaliser,check the flow rate and heat quantity of the totalisers	
	83	Automatically replenish flow switch during the period of power off,default status:off.this function is not available under special conditions.	
	84	Choosing heat quantity unit, 0.Gj(default) 2.Kcal 3.Kw 4.BTU (imperial unit)	
	85	Choose temperature signal origin,if choosing inputting temperature signal by AI3,AI4,then need temperature transmitter that can output 4-20mA current signal.	
	86	heat capacity,default: GB-CJ128 enthalpy potential method. Temperature difference method is available also.	
	87	heat quantity totaliser switch	
	88	Heat quantity multiplier factor.	
	89	display present temperature difference and setup temperature difference sensitivity.	
	8•	Options of installation of heat meter on supply water pipe or return water pipe	
diagnosis	*90	Display the signal strength and signal quality	
	*91	Display the transit time ratio	

	92	Display the calculated fluid sound velocity .
	93	Display the total transit time and the delta time
	94	Display the Reynolds number and the pipe coefficient
	95	Display positive,negative heat quantity totaliser,start cycle display function.
added menu windows	+0	Display the time of power on/off and flow rate
	+1	Display the total working time of the flow meter
	+2	Display the last time of power off.
	+3	Display the flow rate of last power off
	+4	Display total times of power on
	+5	Scientific calculator
	+6	Setup threshold value of fluid sound velocity
	+7	Net totaliser of this month
	+8	Net totaliser of this year
	+9	Operating time with trouble(including power off time)
hardware adjustment menu windows	.2	store static zero point
	.5	setup threshold value of Q value
	.8	max instant flow rate of this day and this month
	.9	serial port testing window with CMM direct output
	-0	circuitry hardware parameter adjusting entrance(only inputting password to enter following windows)
	-1	4-20mA current loop calibration
	-2	AI3 inputting calibration of analogue input 4mA
	-3	AI3 inputting calibration of analogue input 20mA
	-4	AI4 inputting calibration of analogue input 4mA
	-5	AI4 inputting calibration of analogue input 20mA
	-6	AI5 inputting calibration of analogue input 4mA
	-	AI5 inputting calibration of analogue input 20mA

	7	
	-8	zero point setup of PT100 at lower temperature(<40℃)
	-9	PT100 setup zero point at higher temperature（>55℃）
	-A	PT100 standard calibration at 50℃
	-B	PT100 standard calibration at 84.5℃

:* means common used menus,red color means new added or changed functions,blue color means the menus related with heat quantity measurement

§2.2 Battery powered inline style ultrasonic water meter

New version MT100W-BATTERY battery powered style ultrasonic water meter/calorimeter achieved to display online on spot,MT100PU16 main board is encapsulated in the sealed body(the size is the same as in-line style meter),solved the problem of drifting with little flow rate.the measuring mainframe can be welded on the measured pipe or hang up on the wall.it features with lower starting flow,wide measuring range ratio,higher accuracy,long lifetime.

Used preposition receiving amplifier that has 50 decibel dynamic range in MT100PU16 main board,the meter can measure the pipe diameter from 3mm to 10m through clamp-on type and other transducers.it can connect any types transducers.

Technology features:

1:operating power:3.6V/19AH Lithium battery, 24VDC/110VAC/220VAC optional

2:measuring cycle:500ms—49 seconds(default before leaving factory:10 seconds)

3:sampling times:optional sampling times for one cycle(32---128)(default before leaving factory:64)

4:battery consumption:the battery can work continually up to 5 years under the condition of default

5:optional output:one channel USART(TTL)output

One channel non-isolation RS485 output(the built-in 3.6V battery supply power,at the state of accepting,there is no power consumption.only at the state of sending datas,there is power consumption.but the interface is not electrical isolation,it is easy to be disturbed to make the flow meter work abnormally.so that is suggestion for users to use TTL to output when networking,RS485 is used to setup parameters)

Two channel isolation OCT output(programmed between the pulse width(6-1000ms),default before leaving factory (200ms))

One channel bidirectional serial port for general peripherals,directly through series connection to connect peripherals just like 4-20mA analogue output board,frequency signal output board,thermal printer,data

logging meter,etc.

6:input optional: two channel two wire system PT1000 platinum resistor input loop,to make heat meter has the function of displaying heat quantity.

7:display:96 segments LCD ,display 44 different windows.

8:operation:magnetic two keypad,browse prior 40 windows data,but can not setup parameters,in order to setup parameters,you have to connect with another meter or PC setup parameter software(download from our website) through RS485

9: other functions:automatic memory the positive,negative,net totaliser or flow rate and heat quantity of the last 512 days,128 months,10years

Automatic memory the time of power turning on and off and flow rate of the last 30 times, realize to replenish by hand or automatically,read the data through Modbus communication protocol.

10:protection level:IP68

11:replacing directly.

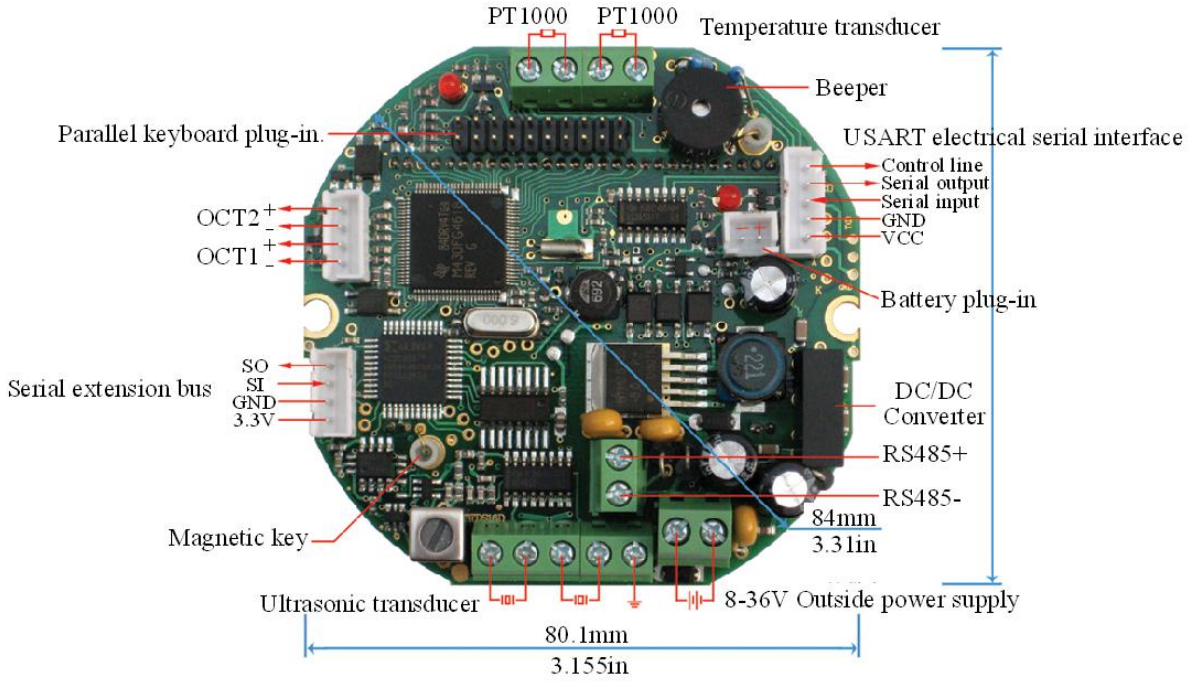
12:transducer:clamp-on type,insertion type,in-line type

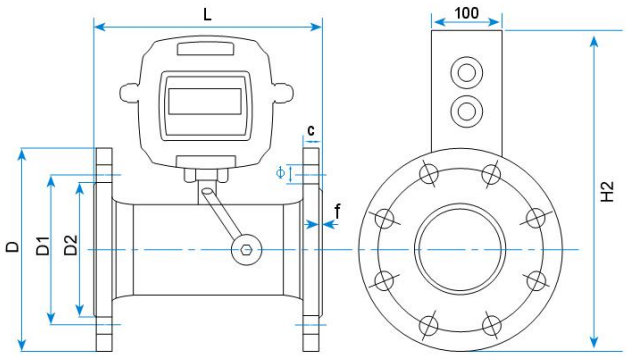
ultrasonic water meter flow range

Meter Size DN (mm)	Max Flow rate Q max	Nominal flow rate Q n	Transitional flow rate Qt	Min flow rate Q min	Max. reading	Min. reading	Remark
	m^3/h				m^3		1.set Min reading data according to requirements of user.2,use manual totaliser when calibration,Min reading data based on previous base automatically increase to enhance total flow resolution
15	3	1.5	0.12	0.03	99999.999	0.001	
20	5	2.5	0.20	0.05			
25	7	3.5	0.28	0.07			
32	12	6	0.48	0.12			
40	20	10	0.80	0.20			
50	56	28	1.76	0.50	99999999	1	
65	100	50	3.00	0.84			
80	145	72	4.52	1.27			
100	230	110	7.07	1.69			
125	360	180	11.04	2.65			
150	500	250	15.90	3.82			
200	900	450	28.26	5.65			
250	1400	700	44.16	8.83			
300	2000	1000	50.87	12.72			
350	2800	1400	70	17.31			
400	3600.	1800	90	22.61			
450	4500	2250	110	28.61			

500	5600	2800	140	35.33			
600	8100	4050	200	50.87			
700	11000	5500	275	69.24			
800	14400	7200	360	90.43			
900	18300	9150	457	114.45			
1000	22600	11300	565	141.3			

■Main board wiring





Flange mechanism size * stainless steel/carton steel(optional)

DN(mm)	Rated pressure（Mpa）	Π in-line style outer size		Standard in line outer size		Flange size（mm）			
		L1	H1	L2	H2	D	D1	D2	Φ-N
15	1.6	320	136			95	65	46	14×4
20		360	142			105	75	56	14×4
25		390	151			115	85	65	14×4
32		450	157			140	100	76	18×4
40		500	169			150	110	84	18×4
50				200	260	165	125	100	18×4
65				210	280	180	145	120	18×4
80				225	295	195	160	135	18×8
100				250	314	215	180	155	18×8
125				270	347	245	210	185	18×8
150				300	372	280	240	210	23×8
200				370	430	335	295	265	23×12
250				450	489	405	355	320	25×12
300				500	543	460	410	375	25×12
350				550	599	520	470	435	25×16
400				600	653	580	525	485	30×16
400	1.0			600	653	565	515	482	25×16
450				700	708	615	565	532	25×20
500				800	771	670	620	585	25×20
600				1000	884	780	725	685	30×20
700				1100	964	860	810	775	24×25
800				1200	1072	975	920	880	24×30
900				1300	1172	1075	1020	980	24×30
1000				1400	1287	1175	1120	1080	28×30

3 display and operation

§3.1 96 segments LCD display and operation(suitable to MT100PU16)

There is a 96 segments LCD monitor in MT100W ultrasonic water meter(MT100PU16 main board), totally 44 menu windows,commonly used 8 menu windows is listed in forefront,triangle indicator indicate explaining characters on the menu,displaying automatic cycle ,the interval time is fixed at 8 seconds,also using keys to visit and page turning,but could not setup parameters,if need to setup parameters, you have to connect another device through RS485 serial port or computer software to set.

§3.1.1 display

samples displaying as follows:

* Display data
* Represent ultrasonic signal strength
* Represent ultrasonic signal quality
* Rolling means the flow rate is not zero
* Fault existing,need to repair
* Represent flow direction
* Represent the flow is zero or not reach rated sensitivity
* m³/h Represent instant flow rate(m3/hour)
* GJ/h Represent instant heat quantity(Gj/hour)
* KWh Represent totaliser heat quantity(kwh)
* Δ℃ Temperature difference of supply and return water.

The LCD can display 44 menu windows,respectively from M00 to M43,it can be set to two displaying way,one is regular display method,the other is automatic cycle method.inputting the digits from 2-43 on M3•(M3A) to setup automatic cycle method,inputting 0,1 to setup regular display method.

When power on,default is to enter M00.using keys to move to other menu windows.

At the state of automatic cycle method,stopping operation for over 60 seconds,LCD will display automatically cycle from M00 to the Menu windows defined in M3• at the time interval of 8 seconds.when users can not operate the keys ,such design make users read the value on the windows if to wait for enough time.users press keys firstly,the LCD will display the Menu window that users visited last time,press the key again,enter upper window or down to the above window.

§3.1.2 displaying contents of LCD for battery powered meter

sequence	Displaying model	Displaying contents	discription
00	006789.45 m³	represent positive totaliser value	position of arithmetic point is set in M33
01	8.3215 m³/h	represent present instant flow rate	if "U"appeared,that means flow rate can not reach the set sensitivity,low flow cutoff ,it is set in M41
02	007658.34 GJ	display positive totaliser heat quantity	
03	2.3214 KW	display instant heat flow rate	
04	91.4	display the temperature of supply and return water	
05	34.2345	display present temperature difference	
06	000012.14	display fault running time	unit: hour
07	F- 80 9	display present working status	Respectively is error code,signal strength,signal quality etc.
08	23.15.49	display time	
09	07-12-31	display date	
10	E0 0.1234	display present flow velocity	Unit: m/s
11	E1 99.876	display present ultrasonic signal transit-time ratio	%
12	E2 1480.3	**display estimated sound velocity of fluid**	Unit: m/s

13	E3 4.0000	**display present 4-20mA output value**	Unit: mA
14	E4 130.24	**display equal resistor value of T1**	Unit:Ohm
15	E5 130.56	**display equal resistor value of T2**	Unit:Ohm
16	E6 3.5673	battery voltage	Unit: V（MT100PU16）
	E6 15	display outside pipe diameter	Unit:mm(MT100PU13)
17	E7 12.05	display used software version	
18	12800001	display ESN	
19	E9 1	display communication address code(meter address)	set in M46
20	002345.23 h	display total work time	Unit:hour
21	071219.08	display the date of leaving factory	Respectively year,month,date,hour
22	88888888	display all fields to check LCD	
23	23 A5 F7 89	display the value input through serial port	used to check serial port communication
24	L4	display used communication protocol	
25	L5	display the meter's coefficient	
26	23658933 m^3	display this year's totall flow	
27	23658933 m^3	display this month's total flow	
28	L8	display present ultrasonic total transmitting time	unit:microsecond
29	L9	display present time difference of the wave	unit:nanosecond
30	C0	display time difference voltage 1	Range 3500～5000
31	C1	display time difference voltage 2	Range:7000～9600
32	C2	display frequency coefficient	Lower than 0.1
33	C3	display current value of analogue input AI3	unit:mA(reserved in MT100PU16 mainboard)
34	C4	display current value of analogue input AI4	unit:mA(reserved in MT100PU16 mainboard)
35	C5	display current value of analogue input AI5	unit:mA(reserve in MT100PU16 mainboard)
36	0000234.5	display negative totaliser heat quantity	
37	000045.67	display net totaliser flow	Unit :m3 ,set arithmetic point in M33
38	000012.34	display negative totaliser flow	Unit :m3 ,set arithmetic point in M33
39	000012.34	display today's totaliser flow	Unit :m3 ,set arithmetic point in M33
40	H0 1.2345	Start manual totaliser	Stop operating when exit this Menu
41	H1 2.3456	Stop and display manual totaliser flow rate	Unit is present chosen totaliser unit(determined in M32)
42	H2 34.567	Display manual totaliser timer	Unit:second
43	H3 9600	Display present used baud rate	

Attention:M40-M42 are used to calibration display.

§3.1.3 display status code and fault judging

To judge the work status of flow meter on M07 of LCD

The sample showing on M07:FxG SS Q

SS means data from 00-99,represent present signal strength.normal range:50-99,more higher,more better.

Data range of Q :0-9,represent present signal quality,normal range:5-9,more higher,more better.

G means signal adjusting process.normally working,it is blank,display 3,2,1 during adjustment.

X means present system work status code,meaning is as follow:

"-"represent work normally,corresponding to "R"status

"1" represent lower signal error

"2" poor signal error

"3" pipe empty error

"4" circuitry hardware error

"5" adjusting circuitry gain

"6" frequency output over measurement range error

"7" the current of current loop output over measurement range error

"8" inner data register checking error

"9" main quake frequency or timer frequency existing error

"A" parameter area existing checking error

"b" program memorizer data checking error

"C" temperature measurement circuitry probably existing error

"d" reserve for use

"E" inner timer overflow error

"F" analogue input circuitry existing error.

If a few work status codes exist at same time,it will automatically cycle display one by one in order for one second each.

§3.1.4 keys

ultrasonic water meter (main board) use two magnetic keys(up arrow key and down arrow key) located in the left upper and right down side of LCD monitor to operate page turning,no need to open enclosure,use special magnetical bar to browse windows.

§3.1.5 serial port operation setup parameter:

MT100PUPU ultrasonic water meter(MT100PU16 main board), has ability to visit Menu window,can not set parameter,if to set,users need to use the another device that we supplied to setup parameter by RS485 serial port,and also to set parameter by RS485 connecting computer serial port software.

The another device that we supplied is in fact a serial port keyboard operator,the operating method is the same with parallel port keyboard monitor,also can supply 24VDC power for main board in environment of the one meter,not applied to use for data collecting network of more than two MT100PU-100.when users need to connect MT100PU-100 with network of RS485 ,and at same time need RS485 serial keyboard monitor to display measurement results,thus you have to use network style keyboard monitor(in research process)

Software serial port keyboard monitor connect the setup parameter software in computer by RS485,its function and operating method is the same with parallel keyboard monitor,but can not supply power for main board.

§3.1.6 about special introduction of the calibration of water meter

Water meter's min-readings is fixed when leaving factory,when calibrating,it could possibly create results deviation owing to resolution insufficient.so when calibrating,,using manual totaliser menu H0,H1,H2,H3(40,41,42,43) to ensure accuracy.

Attention:when leaving factory,the set min-reading is 0.001 cubic meter,the menu unit of the manual totaliser is

Litre;when the set min-reading is 1 cubic meter,the menu unit of the manual totaliser is cubic meter.

§3.2.1 key function

4 key keyboard has 2 up/down arrow key,1 menu key(M),1 enter key(ENT),inputting digits,characters,and arithmetic point is by using up arrow key to input many times,the use of down arrow key is to move to next digit position.

4.Troubleshooting

MT100PU-100 designed perfect self-diagnosis function.The errors are displayed on the upper right corner of the menu window via identification code in a timely order. Display orderly all the existing errors on M08 Hardware self-diagnosis is conducted every time when power is on. Some errors can even be detected during normal operation. For those errors undetectable due to incorrect settings or improper testing conditions, the flow meter will also display useful information to help the user to quickly debug the error and solve the problems according to following listed methods.

Table. Working status errors code causes and solutions

code	M08 displaying	causes	solutions
*R	system work normally	* normal system	
*J	Circuit Hardware Error	* Hardware problem	* Contact the manufacturer
*I	No Signal	* Unable to receive signal * Loosen contact or not enough couplant between transducer and pipe surface. * Transducers installed improperly * scaling on inner pipe wall is too thick. * new changed liner	* Make sure the transducer is in tight contact with pipe surface, the couplant is enough . * Polish the pipe surface and clean the pipe surface. Clear paint,rust. * Check original installation parameter settings * Clear the scaling or change the pipe with thick scaling,normally change to another measurement point that has little scaling,the meter can work normally. * Wait until the liner has been solidified and then test.
*H	lower signal strength received	* lower signal * causes are the same with code "I"	* solutions are the same with code "I"。
*H	poor signal quality received	* poor signal quality * include above all caused	* include above all solutions
*E	The current of Current Loop is Over 20mA (not influence the measurement if not using current output)	* 4-20mA current loop output overflow 100% * Improper settings for current loop output 。	* Check current loop settings on M56. or Confirm if the actual flow rate is too high.
*Q	Frequency Output is Over the set value(not influence the measurement if not using frequency output)	* 4-20mA current loop output overflow 120% * Improper settings for current loop output 。	* Check frequency output settings(refer to M66-M69). or Confirm if the actual flow rate is too high.

*F		* find problems when power on and self-diagnosis * permanent hardware errors	* power on again,check the information showed on screen, if not solved ,contact manufacturer. * contact manufacturer.
*G	Adjusting Gain >S1 Adjusting Gain >S2 Adjusting Gain >S3 Adjusting Gain >S4 （ displayed on M00,M01,M02,M03）	Instrument is in the progress of adjusting the gain to prepare the measurement. If stopped at S1or S2 or switched between S1 and S2,that means the too lower receiving signal or not good wave.	
*K	Empty pipe ,setup in M29	no liquid in pipe or wrong setup.	if there is liquid actually,input 0 value in M29

Attention:

the codes of *Q,*E displayed do not affect measurement,only means current loop and frequency output have problems.