MT-Lmag-W800 Electromagnetic Converter

Operating Manual

（Battery Powered）

Metery Technology Co.,Ltd

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1 Summery

Developed by Shenyang Lanshen Company, MT800 series electromagnetic water meter converters are battery powered, capable of being used together with common electromagnetic flow meters, with the flow rate measurement accuracy up to 0.5 level and 0.2 level. That is to say, a new type of products — electromagnetic water meter series will be developed simply by connecting a MT800 convertor to a common electromagnetic flow meter.

The MT800 electromagnetic water meter converter is equipped with a lithium battery as its standard configuration, which can work over three consecutive years. If a high-capacity battery is equipped, the continuous working time will be much longer.

The MT800 electromagnetic water meter converter may use a base-station type radio communication network system, with the communication base station built in the central area, and coverage radius designed as 1000M. Electromagnetic water meters communicate with the base station within a closer distance (SRD mode), by use of an opened frequency range — 928MHZ （American standard）. The base station, via GPRS or CDMA mobile communication network, realizes data communication with the supervisory computer. In addition, the MT800 electromagnetic water meter converter may, via GPRS or CDMA mobile communication network, directly realize data communication with the supervisory computer. (Please see communication instructions for further information about GPRS communication)

Designed with IP68-level seal protection for its die-cast aluminum

case, the MT800 electromagnetic water meter converter is particularly applicable for damp environment, for example, underground mine.

2 Performance indexes

- Ambient temperature－２０℃—５０℃
- Ambient humidity≦９５％
- Level of protection for case: ＩＰ６８
- Measuring range of flow rate: 0 --- １５m/s
- Medium conductivity: clean water > ２０ μs/cm
- Range of nominal diameters measurable ＤＮ３—ＤＮ６００
- Accuracy grade of sensors: Grade 0.5, grade 0.2
- Measurable parameters: instantaneous flow rate, instantaneous flow velocity
- Recordable parameters: accumulative total of flow, record of 32 events

  Test alarm parameters: Fluid empty-tube test alarm

  Exciting current test alarm

  Battery capacity test alarm
- Calibrated output signal: Flow and impulse per unit volume
- Radio communication mode: ＳＲＤ、ＧＰＲＳ、ＣＤＭＡ

Working hours of battery

Table of working hours of battery---sensor calibers (1/15HZ） excitation

frequency

Range of calibers	DN3-150	DN200-350	DN400-600	DN700-1000
Working hours of battery	40 months	32 months	30 months	26 months*

Table of working hours of battery--- sensor calibers (1/30HZ) excitation frequency

Range of calibers	DN3-150	DN200-350	DN400-600	DN700-1000
Working hours of battery	66 months	60 months	50 months	46 months*

*** Electromagnetic water meter convertors with such a caliber need to be particularly customized.**

3 Requirements for sensors matched

▲ Resistance of excitation coil of sensor: 100~120 ohm (two in series) (it is suggested)

▲ Resistance of excitation coil of sensor: 30~50 ohm (two in series)

▲ Signal intensity of flow of sensor: 150~200μv (1m/s flow rate)

Note: it must be particularly stated for the parameters of excitation coil resistance when placing an order!

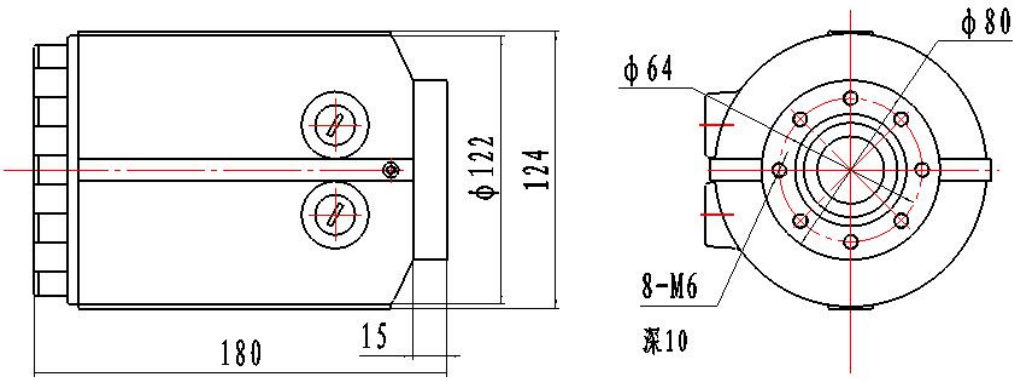
Instructions: When calibrating flow, if the sensor coefficient calibrated is close to 1.0000, which means the signal intensity of flow of sensor measures up to the requirement. A sensor coefficient greater than 1.0000 means low flow sensitivity, while a sensor coefficient smaller than 1.0000 means high flow sensitivity. Higher flow sensitivity is conducive to improving measurement stability and

accuracy of flow meters.

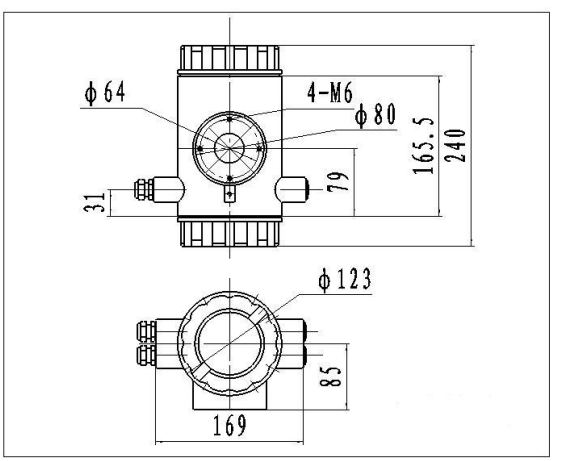
In principle, the MT800 250mA excitation convertor can matches well with any common sensors of which the coefficient is calibrated below 1.0000.

4 Mounting drawing

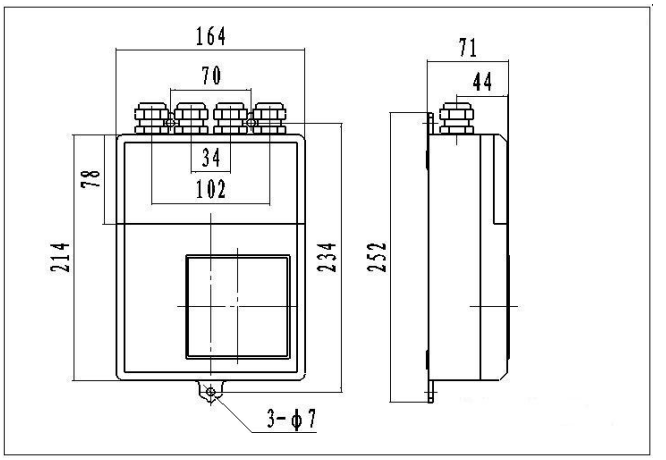
4.1 The Round and vertical type, integral structure



4.2 The round and horizontal type, integral structure



4.3 The square type, separate structure



5 Pictures of Convertors

Figure （A） Figure （B） Figure （C）

Figure（A）：The round and horizontal type, integral structure (with GPRS communication function)

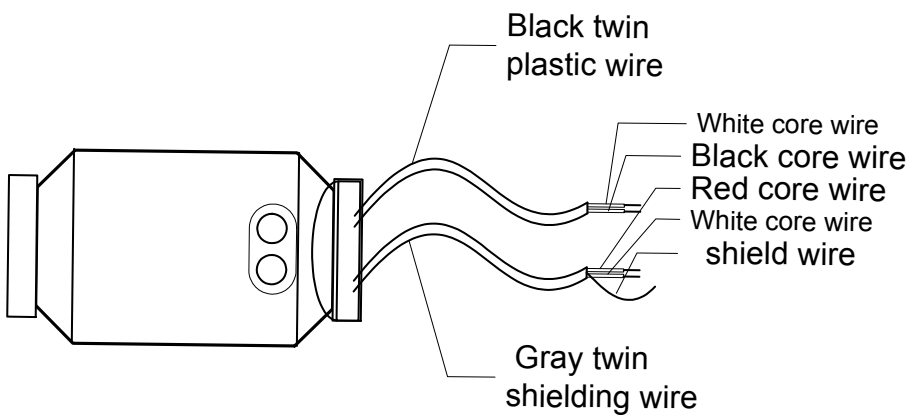
Figure（B）： The square type, separate structure

Figure（C）：The Round and vertical type, integral structure(equipped with GPRS communication function)

6 Definition of signal line for converter

6.1 Terminal wiring and signs for round integral meters

The MT800 electronic integral water meter convertor connects with sensor via two group of wiring terminals respectively, signal line group and excitation line group. When connection work is doing, make sure every connection is correct and check them carefully, to avoid any possible damage to meters for reason of incorrect connection.



Schematic diagram of MT800 signal lines

Signal lines are signed as follows

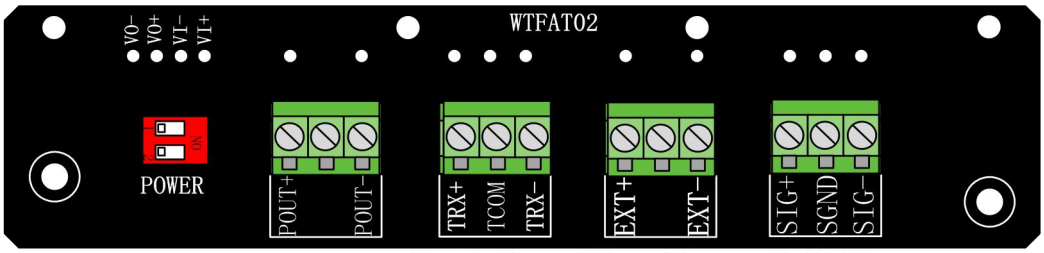
Black twin plastic wire: White core wire
Black core wire
} For exciting current use

Gray twin shielding wire：Connect the red core wire to “signal 1”

Connect the white core wire to “signal 2”

Connect the shield wire to “signal ground”

6.2 Terminal wiring and signs for square separate meters



SIG1	Signal 1	
SGND	Signal ground	
SIG2	Signal 2	For separate sensor use
EXT+	Exciting current+	
EXT-	Exciting current-	
POUT+	Impulse current	Impulse output
POUT-	Impulse output ground	

The separate electromagnetic water meter convertor is applicable for submersible electromagnetic water meters. In practical use, the electromagnetic water meter sensor is extended down to the underground, while the electromagnetic water meter convertor is mounted on the ground surface. The special design allows the cable connection between the sensor and the convertor as long as 10M, but no effect is exerted on the measurement accuracy of flow. The meter is first developed in China as a kind of battery-powered separate electromagnetic water meter.

7 Flow verification

7.1 Impulse output signal line

For meeting the need of flow verification, MT800 is designed with impulse output signal and impulse output per unit volume. The impulse interface is of a collector open-circuit output (OC gate). Note: a non-electrical isolation is applied between the impulse output circuit and meter measurement circuit, with the maximum voltage bearable of 30V and the maximum current bearable of 20mA.

Working only under the flow verification mode, the impulse output signal is in the closing state under the measurement mode. Wiring connection of the impulse interfaces for meter verification is as shown in following figures:

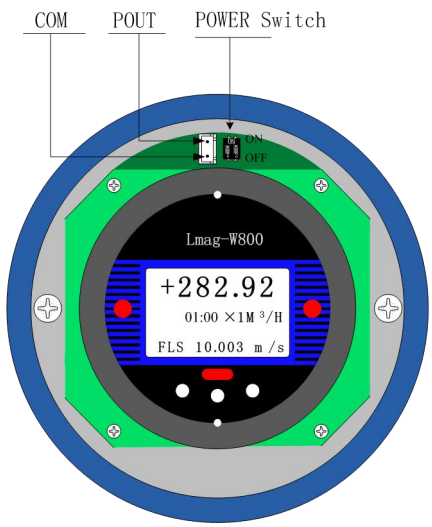


Figure Connection diagram for round convertors

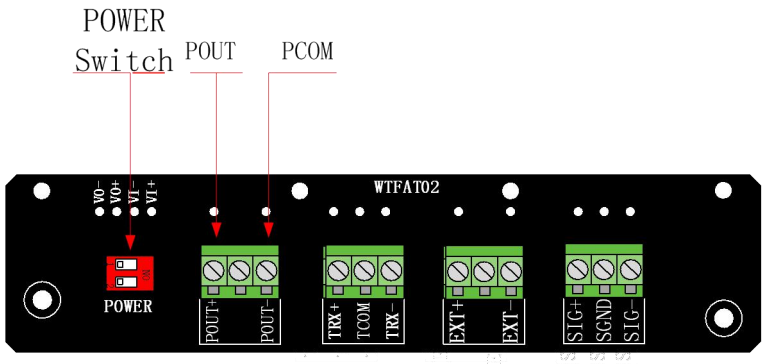


Figure Connection diagram for square convertors

POUT ——— Output COM ——— Ground wire

7.2 Connection between impulse output and calibration system

7.2.1Connection of digital quantity level output

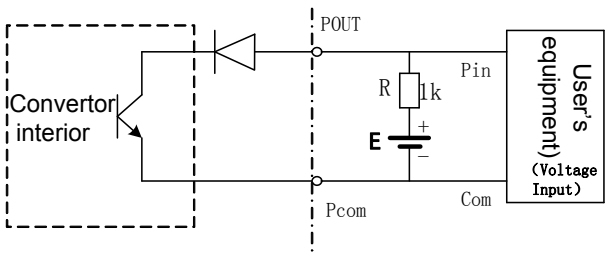


Diagram: Connection of digital quantity level output

7.2.2 Connection between digital quantity output and optoelectronic coupler(forexample,PLC,etc.)

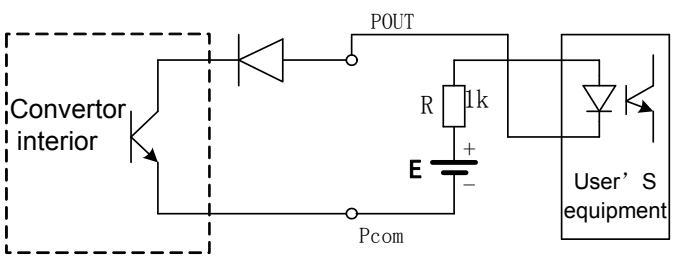


Figure: Connection between digital quantity output and optoelectronic coupler (for example, PLC, etc.)

7.3 Setting of impulse output parameters

▲ Through verification, the maximum impulse output speed is 400HZ, the impulse width is adjustable. When verifying a meter, the impulse output speed is worked out by setting the impulse output equivalent (refer to annex 4 to set impulse equivalent)

▲ For example, for a DN200 flow meter, when the flow rate is 10m/s and the flow is 314.16L/S, we can set the impulse equivalent as 1L, thus there are 314.16 impulses output per second.

▲ The impulse output speed must not be set too high, to guard against being close to the upper limit of output speed, which may cause a loss of output impulses, thus affecting the calibration accuracy of a meter.

▲ To avoid the counting error between the calibration system and the meter verified, the MT800 electromagnetic water meter convertor requires the counting time must be **more than 4 minutes** in each calibration.

7.4 Enter into the meter calibration mode

Referring to the meter display panel diagram, keep pressing the enter key on the left, then press the resetting key, thus the meter enters the verification mode, and the impulse output of the meter starts operation. If required to enter the measurement mode from the verification mode, just press the system resetting key.

After entering the meter calibration mode status, which can maintain for 3 hours, then the meter will exit from the calibration mode and turn to the measurement mode.

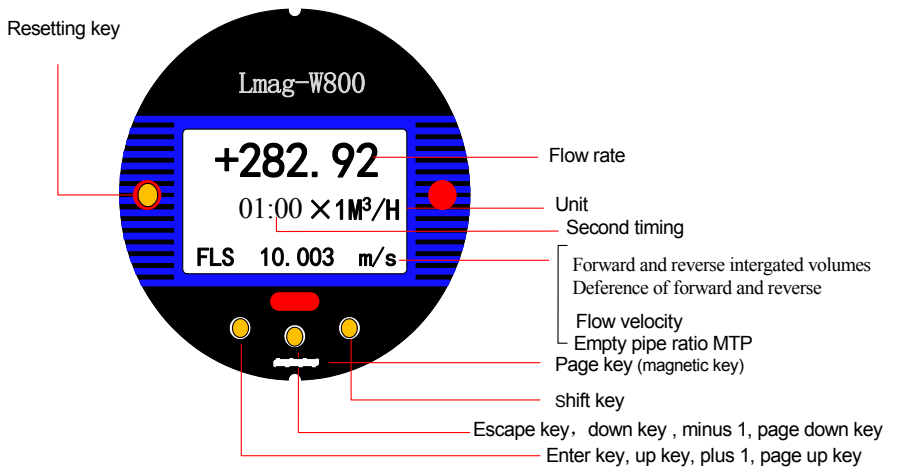


Figure Keyboard definition and LCD

Instructions: press the shift key on the right, the meter enters the “version number” menu. Press the shift key again, the meter enters the function selection menu “parameter setting”. Then press the shift key to move the cursor to the below of the “enter key”, press the “enter key” to enter the state of” password 00000”, then enter the password. Then press the shift key to move the cursor to the below of the “enter key”, press the “enter key” to enter the operation selection menu to set parameters. If intended to return to the running state, move the cursor to the below of the “escape key” and press the “escape key”.

Note: upon normally powered, the meter will enter the measurement mode, in this case, accumulation is made by the second timer on a 15-second basis,The width of pluse out put is 1S.(More information at 8.2.9)Under the measurement mode, detection is made on a 15-second basis, without impulse output. If required to enter the calibration mode, keep pressing the enter key on the left, then press the resetting key, thus the meter will enter the calibration mode, with the impulse output function of the meter started up.

8 Setting of meter parameters

The MT800 electromagnetic water meter convertor is designed with 31 parameters in 6 classifications, including flow measurement, flow correction, state alarm, total accumulation, network communication, meter calibration and verification. The parameters of the convertor are defined as follows:

8.1 Parameter menu

Parameter-setting menu schedule

No.	Parameter description	Setting mode	Parameter range	Code grade
1	Language	Optional	Chinese, English	1
2	CommAddres	Optional	0～99	1
3	Snsr Size	Optional	3～600	1
4	Flow Unit	Optional	L/h、L/m、L/s、m^3/h、m^3/m、m^3/s	1
5	Flow Direct	Optional	FORWARD/REVERSE	1
6	Flow Zero	Preset	0～±9999	1
7	Flow Cutoff	Preset	Set according to flow cut-off	1
8	Total Unit	Optional	0.001～1 m^3、0.001～1 L	1
9	Pulse Fact	Optional	0.001～1 m^3、0.001～1 L	1
10	Pulse Width	Optional	1～99ms	1
11	MtsnsrTrip	Preset	599.99 %	1
12	ClrSum Key	Preset	0～59999	1
13	Sensor Fact	Preset	0.0000～2.9999	1
14	Sensor Code	Set by users	0～59999	1
15	Line Crc Ena	Optional	ENABLE/DISABLE	1
16	Lineary CRC1	Preset	Setting according to flow velocity	1
17	Lineary Fact1	Preset	0.0000～1.9999	1
18	Lineary CRC2	Preset	Setting according to flow velocity	1
19	Lineary Fact2	Preset	0.0000～1.9999	1
20	Lineary CRC3	Preset	Setting according to flow velocity	1

21	Lineary Fact3	Preset	0.0000～1.9999	1
22	Lineary CRC4	Preset	Setting according to flow velocity	1
23	Lineary Fact4	Preset	0.0000～1.9999	1
24	Fwd Total Lo	Preset	00000～99999	1
25	Fwd Total Hi	Preset	0000～9999	1
26	Rev Total Lo	Preset	00000～99999	1
27	Rev Total Hi	Preset	0000～9999	1
28	PassWord1	Preset	0～59999	2
29	Meter Fact	Preset	0.0000～1.9999	2
30	Meter Code	Set by manufacturer	0～59999	2
31	Factors Rec	Preset	Preserved	2

8.2 Detailed instructions for meter parameters

8.2.1 Language

The MT800 electromagnetic convertor can be operated by using either Chinese or English language, which is optional for users.

8.2.2 CommAddres（Communication address of the meter）

It means the communication address of the meter under the condition of multi-computer communication. Range of selection: 01~99#, 0# address is reserved.

8.2.3 Snsr Size（Calibers of pipes measured）

Range of nominal diameters of sensors designed for battery-powered electromagnetic flow meter convertors: 3 ～ 600 mm.

8. 2.4 Flow Unit（Flow rate units）

Such units as L/h, L/m, L/s, m^3/h, m^3/m, m^3/s are used to display the flow rate of the meter. In practical use, users may make their own selection in accordance with different technological requirements and practice.

8. 2.5 Flow Direct（Adjustment of flow direction）

In case of a discrepancy between the fluid direction indication and the

practical situation, users may adjust it by setting parameter using flow rate direction, but needless to change the means of connections of excitation lines or signal lines.

8. 2.6 Flow Cutoff（Small signal cut-off points）

Small signal cut-off points are set by using flow rate. When small signals are being cut off, flow rate, accumulative amount and impulse output are simultaneously cut off.

8. 2.7 Total Unit（Flow rate totalization units）

MT800 uses a 9-digit inventory counter, with a maximum permissible count value of 999999999.

Flow rate totalization units:

0.001L、 0.010L、 0.100L、 1.000L

0.001m^3、 0.010m^3、 0.100m^3、 1.000m^3

8. 2.8 Pulse Fact（Impulse unit equivalent ）

Output impulse units:

0.001L、 0.010L、 0.100L、 1.000L

0.001m^3、 0.010m^3、 0.100m^3、 1.000m^3

Under the condition of the same flow rate, the smaller the impulse equivalent, the higher the impulse output frequency will be, and the smaller the accumulative flow rate error will be.

8.2.9 Pulse Width（Impulse width）

The impulse output is of the low level effective, with a impulse width of 1～99mS

Table of comparison between impulse width and maximum impulse output number

No.	Impulse width（ms）	Maximum impulse output number/hour（p/h）
1	99	14400
2	80	18000
3	40	36000
4	20	72000
5	10	144000
6	8	180000
7	4	360000
8	2	720000
9	1	1440000

Remark: In the measurement mode,The pulse fact is the same with Total Unit ,the width of pulse is 1 second, the pulse output rate should be controlled below1440P/S .

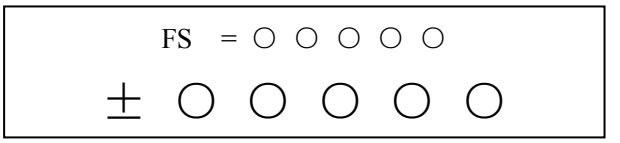
8.2.10 MtsnsrTrip（Empty pipe alarm threshold）

MT800 measures resistance between the two poles of the sensor to determine whether it is in the empty-pipe state. At the state of the pipe being filled up with fluid, observe the measured resistance value（MTP）of the fluid, then take the 1.5～2 times of the measured value as the empty pipe alarm threshold. An emptied pipe will cause an increase in the value of resistance between the two poles, and trigger the empty pipe alarm upon exceeding the threshold.

8.2.11 Flow Zero（Zero correction of flow rate）

When conducting a zero correction, make sure that the sensor is filled with fluid, which is in a stationary state. The zero point of flow rate is expressed by flow velocity, measured in ｍｍ／ｓ.

Zero correction of convertor flow rate is shown as follows:



The small words above display: FS represents the measured value

of meter zero;

The big words below display: Zero correction of flow rate;

When the value of FS is not “0”, adjust the correction value to keep FS=0. Note: if changing the down-going correction value, the value of FS increases, in this case, the positive and negative signs need to be changed to enable FS to be corrected to zero.

As a constant of sensor, the zero correction value of flow rate should be entered in the record sheet and the sensor nameplate. The zero value of sensor is entered as the flow rate value, measured in mm/s, with its sign opposite to the sign of correction value.

8.2.12 Sensor Code（Code for inventory zeroing ）

By using the high-grade code, users may set an inventory zeroing code, then enter the function selection menu, where, through pressing the page key, users may enter the inventory zeroing menu for a code setting, so as to realize an inventory zeroing.

8.2.13 Sensor Fact（Sensor coefficient value）

Sensor coefficient: it means the calibrated coefficient of the electromagnetic flow meter unit. This coefficient is obtained through practical calibration, and steel-marked on the sensor nameplate. Uses must list the coefficient in the table of parameters of the battery-powered convertors.

8. 2.14 Fwd Total Lo / Fwd Total Hi（High and low positions of positive-going inventory）

This parameter is used for setting accumulative inventory, mostly when electromagnetic convertors are being maintained and replaced.

8. 2.15 Meter Fact（Manufacturer’s calibration coefficient）

Used for convertor manufacturers only, this coefficient is designed to

normalize the measurement circuit system of electromagnetic convertors, to ensure the interchangeability between all MT800 convertors up to 0.1%.

9 Meter alarm display

Each meter is designed with three alarm displays: SYS for system alarm, MTP for empty pipe alarm, CUT for small signal cut-off alarm.

SYS alarm is issued possibly due to broken convertor' excitation winding or a lack of battery power. After the battery power insufficiency alarm is issued, the battery can continue to work for about 100 hours, but the measurement accuracy declines. In this case, users must replace battery.

Annex 1 Instructions for non-linear correction function

The non-linear correction function is basically used for linear adjustment of low flow rate below 0.5m/s. The function is designed with 4 sections of correction, including 4 flow rate points and 4 correction coefficients. The flow velocity corresponding to these correction points must meet: correction point 1 〉 correction point 2 〉 correction point 3〉 correction point 4 〉 0.

Correction computation is to conduct correction on the original sensor flow rate coefficient curve, therefore, the non-linear correction function must be firstly closed, and the sensor coefficient marked, then the non-linear correction function will be allowed, based on the marked non-linear of sensor, to set the correction coefficient and conduct correction section by section. It is not necessary to recalibrate if the coefficient is appropriately set.

In the formula, the original flow velocity means the calibrated flow rate, while the flow velocity corrected is known as corrected flow velocity, the formula for correction computation is as follows:

At the interval of “correction point 1 ＞ original flow velocity ≥correction point 2”;

Corrected flow velocity= Correction coefficient 1×Original flow velocity

At the interval of “correction point 2 ＞ original flow velocity ≥correction point 3”;

Corrected flow velocity= Correction coefficient 2×Original flow velocity

At the interval of “correction point 3＞ original flow velocity ≥correction point 4;

Corrected flow velocity= Correction coefficient 3×Original flow velocity

At the interval of “correction point 4＞ original flow velocity ≥ 0”;

Corrected flow velocity= Correction coefficient 4×Original flow velocity

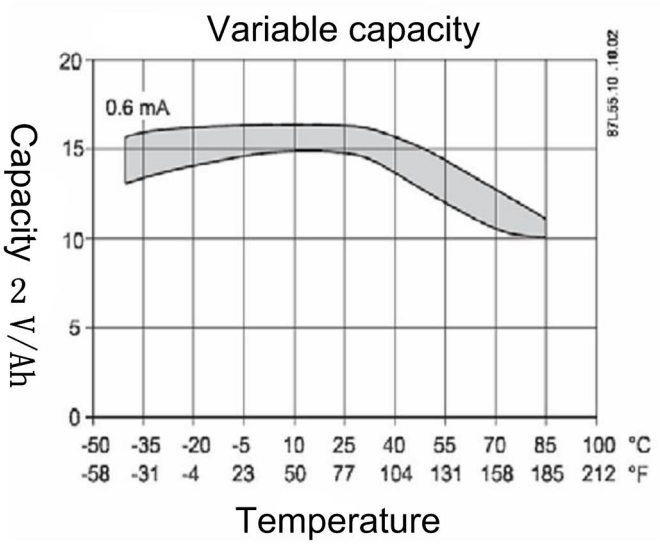
Note: when setting correction points, such a relation must be maintained:

Correction point 1 ＞Correction point 2 ＞Correction point 3 ＞ Correction point 4＞ **0**

The intermediate value of correction coefficient is 1.0000. Correct the flow velocity up when the coefficient is above 1, likewise, correct the flow velocity down when the coefficient is below 1.

Annex 2 Further instructions for battery

According to the characteristic of battery, the effective work time of a battery is associated with temperature. As shown in the figure below, a change in temperature from 15 ℃ ~ 55 ℃will lead to a decrease in electric quantity by 17%.



Annex 3 Instructions for battery replacement

1 Battery replacement method for the round and vertical type integral-structure convertor

First step: Power off the meter, unscrew the two screws out of the meter core, as shown in figure 1.

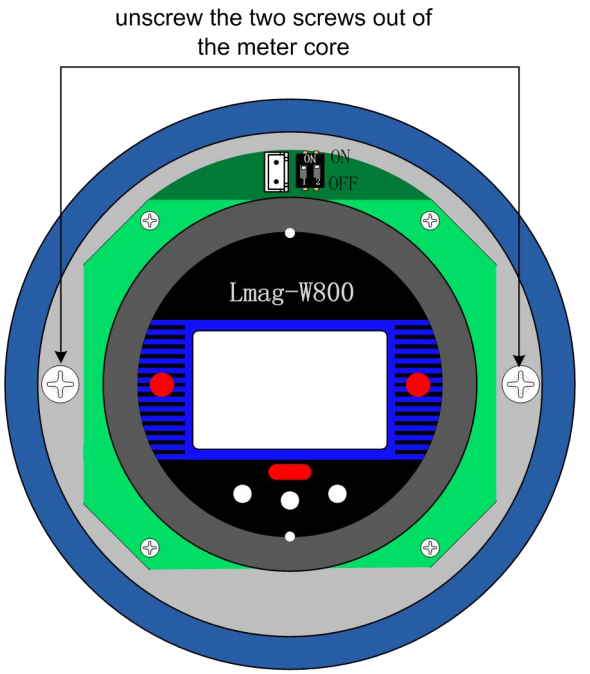


Figure 1

Second step: Pull out the core, as shown in figure 2.

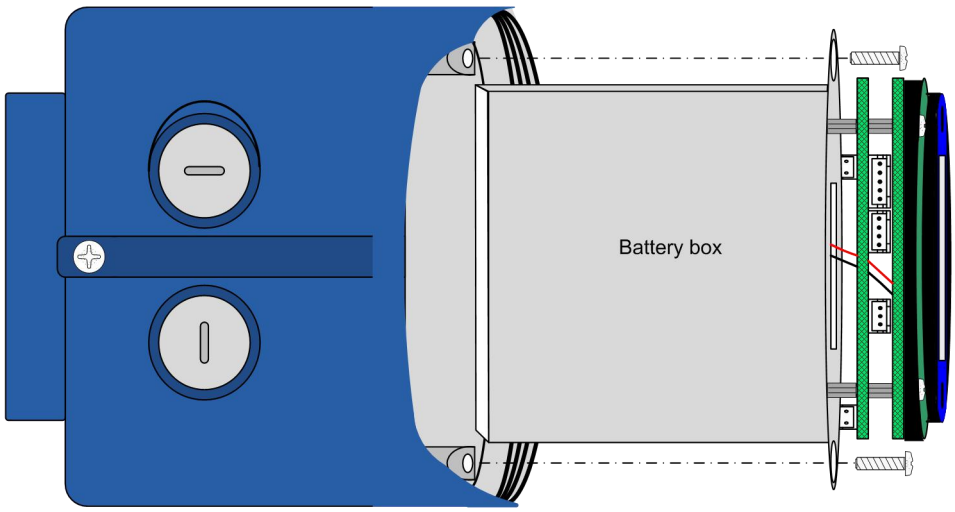


Figure2

Third step: Open the back cover of the battery box, as shown in figure 3

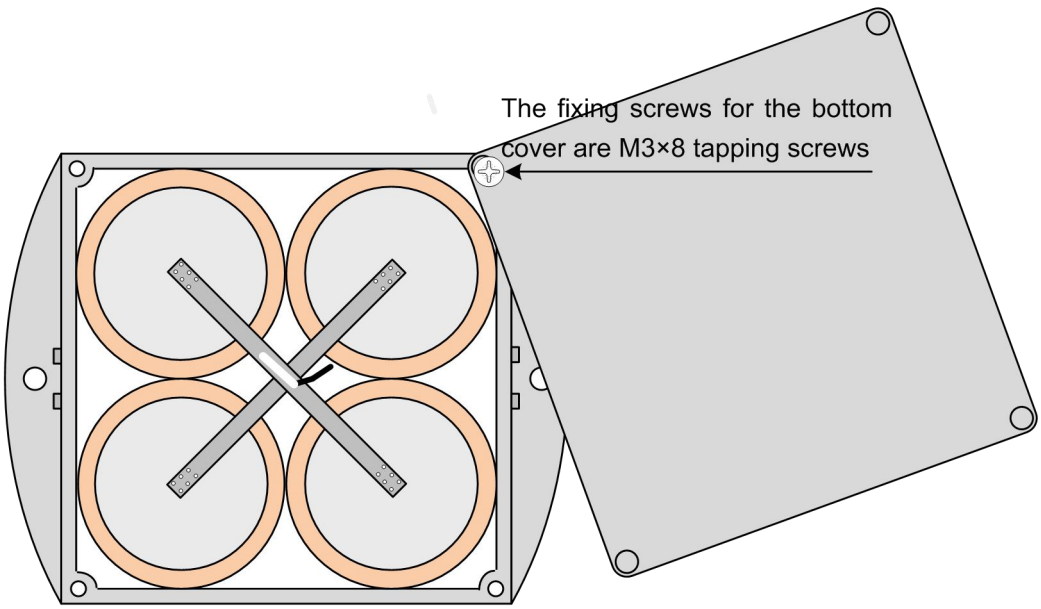


Figure 3

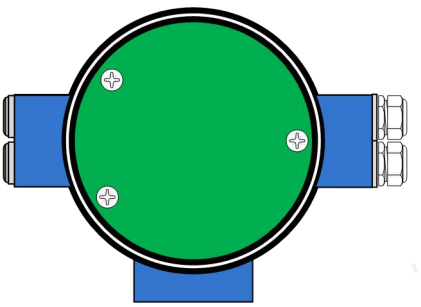
Fourth step: with battery connectors unconnected, take the battery out of the box; install a new one (obtainable at our company), making sure the positive terminal of the battery is upward.

Fifth step: reassemble the meter following the above disassembly steps.

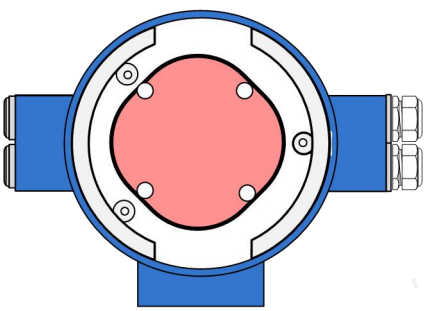
2 Battery replacement method for the round and horizontal type integral-structure convertor

First step: uncover the terminal board of the converter by screwing the back cover out of the converter counterclockwise.

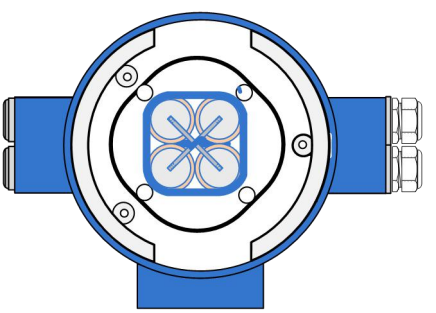
Second step: uncover the battery box by screwing the three screws out of the terminal board.



Third step：Screw the four screws out of the battery box



Fourth step: with the battery connectors unconnected, take the battery out of the battery box; install a new one (obtainable at our company),



Fifth step: Reassemble the meter following the above disassembly steps.

3 Battery replacement method for the square and separate convertor

First step: unscrew the four fixing screws out of the small cover as shown in figure 1.

Figure 1 Removal of screws from small cover

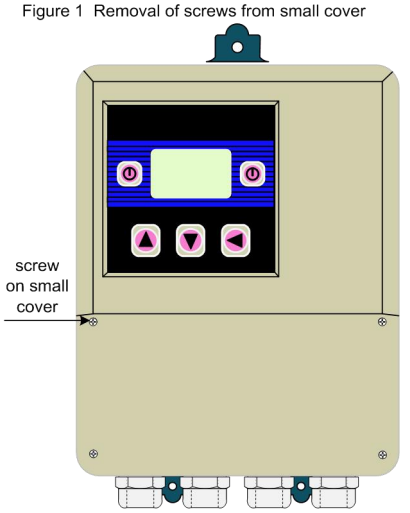
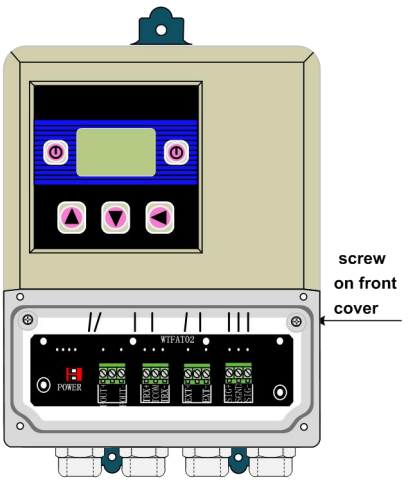


Figure 2 Removal of screws from front cover



Second step：unscrew the two fixing screws out of the front cover as shown figure 2.

Third step: unscrew the four screws out of the case as shown figure 3.

Figure 3 Removal of screws from case

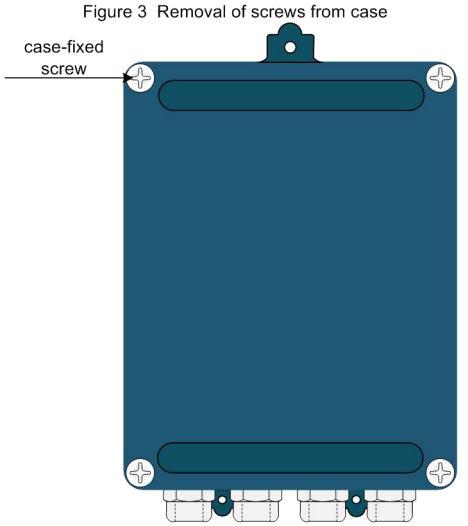
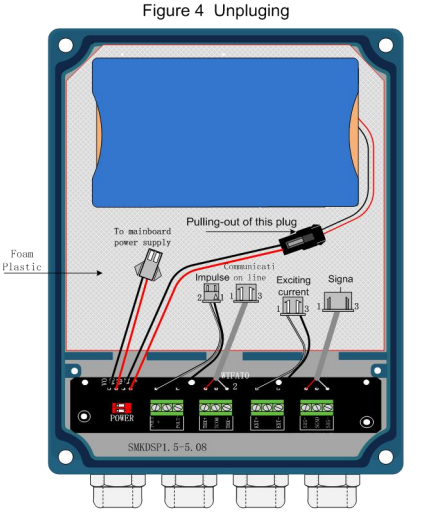


Figure 4 Unpluging



Fourth step:Removal of the front cover

Fifth step:Pulling-out of this plug, as shown in figure 4.

Sixth step: with the battery connectors unconnected, take the battery out of the battery box; install a new one (obtainable at our company);

Seventh step: reassemble the meter following the above disassembly steps.

Annex 4 Reference table for the setting of impulse equivalent at impulse width 1MS

Reference table for the setting of impulse equivalent of the electromagnetic flow convertor					
D-caliber (mm)	Impulse equivalent (Upper limit of flow velocity V =5m/s)	Impulse equivalent (Upper limit of flow velocity V =4m/s)	Impulse equivalent (Upper limit of flow velocity V =3m/s)	Impulse equivalent (Upper limit of flow velocity V =2m/s)	Impulse equivalent (Upper limit of flow velocity V =1m/s)
3	0. 001L	0. 001L	0. 001L	0. 001L	0. 001L
6	0. 001L	0. 001L	0. 001L	0. 001L	0. 001L
8	0. 001L	0. 001L	0. 001L	0. 001L	0. 001L
10	0. 001L	0. 001L	0. 001L	0. 001L	0. 001L
15	0. 01L	0. 01L	0. 01L	0. 001L	0. 001L
20	0. 01L	0. 01L	0. 01L	0. 01L	0. 001L
25	0. 01L	0. 01L	0. 01L	0. 01L	0. 01L
32	0. 1L	0. 01L	0. 01L	0. 01L	0. 01L
40	0. 1L	0. 1L	0. 01L	0. 01L	0. 01L
50	0. 1L	0. 1L	0. 1L	0. 01L	0. 01L
65	0. 1L	0. 1L	0. 1L	0. 1L	0. 01L
80	0. 1L	0. 1L	0. 1L	0. 1L	0. 1L
100	0. 1L	0. 1L	0. 1L	0. 1L	0. 1L
125	1L/0. 001m^3	1L/0. 001m^3	0. 1L	0. 1L	0. 1L
150	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3	0. 1L	0. 1L
200	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3	0. 1L
250	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3
300	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3
350	0. 01m^3	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3
400	0. 01m^3	0. 01m^3	1L/0. 001m^3	1L/0. 001m^3	1L/0. 001m^3
450	0. 01m^3	0. 01m^3	0. 01m^3	1L/0. 001m^3	1L/0. 001m^3
500	0. 01m^3	0. 01m^3	0. 01m^3	1L/0. 001m^3	1L/0. 001m^3
600	0. 01m^3	0. 01m^3	0. 01m^3	0. 01m^3	1L/0. 001m^3

Remarks: Flow computing formula: (Q=D2×0. 0007854×V, unit (L/S)

Impulse equivalent can be set by reference to the table above; the maximum speed of impulse equivalent is 400p/s.