GE-104P Portable Current Meter

User Manual

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Part 1

Operation & Maintenance for PROPELLER

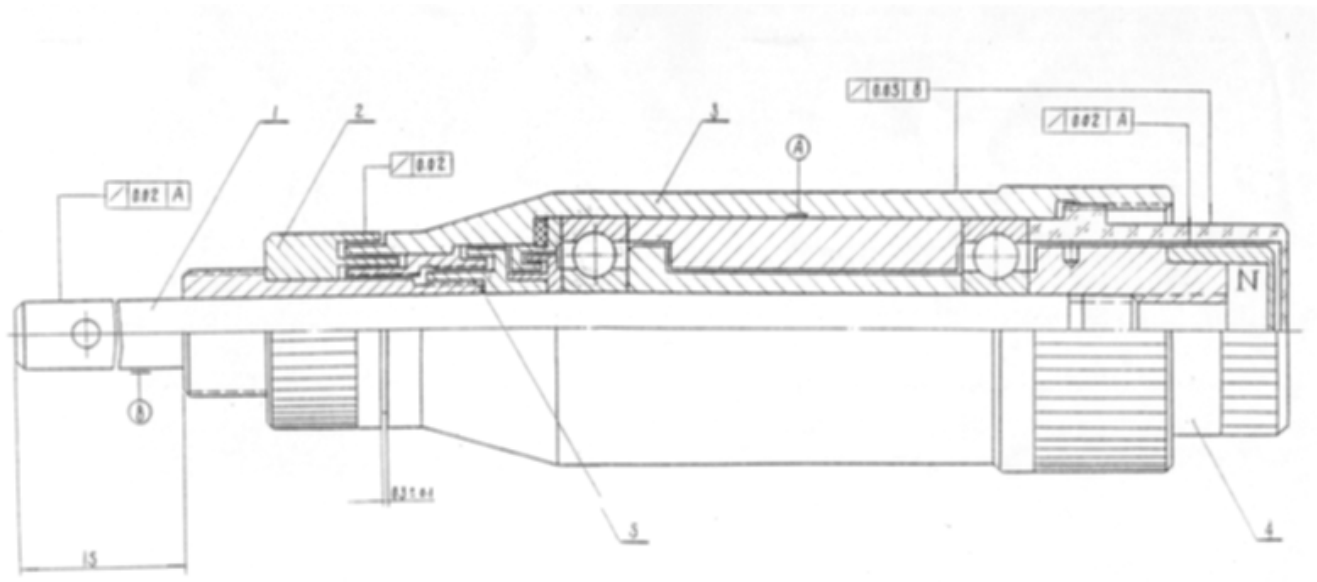
GE-104P Propeller Type Current Meter is used to measure hourly average flow velocity on given points. Being light, impact and portable, this instrument applies to rivers, pipelines, irrigation and drainage channels, hydrological investigation, and runoff experiments.

Specification:

1. The Rotary Diameter for Propeller: Φ60mm
2. The Hydraulic Thread Pitch for Propeller: H=120mm
3. Minimum Velocity： Vo≤0.06m/s(Normal)
   Vo≤0.05m/s(Premium)
4. Measuring Range: 0.07～7m/s(Normal)
   0.05～7m/s(Premium)
   0.05~15m/s (customized)
5. Operational Depth： 0.1～1.2m(Wading rod)
6. Accuracy： unbiased variance: m≤±1.2%(Normal)m≤±1.0%(Premium)
   V<0.2m/s: Relative Error: σ ≤±5%
7. Signal: two signals on every rotary
8. Operational Condition：0～35℃
9. Continuous Running Time：24h
10. Wading Rod (additional):

GE-104P wading rod for open channel: 1600 mm in four sections; Inner supporting type special wading rod for pipeline

Configuration



GE-104P Propeller Type Current Meter is composed of a sensing part, signal transition mechanism, a tail fin, and a wading rod. Instruction of counter is in last page of the text.

Sensing Part

Installed on the rotary axis at the front part of the instrument, the sensing part is a three-leaf screw propeller used to sense the flow velocity. Rotate speed of the propeller is proportional to flow rate. The proportional constants are measured in flume testing.

Signal Transition Mechanism

Signal transition mechanism is to transform rotating number of propeller into electrical pulse signals for counting by magnet—reed switch. Magnet is vertically installed at the tail of the rotary axis, synchronous rotating with propeller. Reed switch is encapsulated in a water-proof component fixed on the main body close to magnet. When propeller is driven by current, magnet and propeller are rotating synchronously. Every propeller's rotation induces two times of magnetization between magnet and reed switch. The rotating number is transformed into signals and transmitted to the counter.

Tail Fin(Additional)

Tail fin is used to level instrument in open channel during flow measurement. If in shallow, and slow-rate flow, or pipelines, instruments can be leveled by eyeballing, tail fins are not necessary.

GE-104P Type Wading Rod(Additional)

Wading Rod is used to measure water depth, and fixed instrument at the given measuring points. There is a signal transition socket on top of the wading.

Operational Principles and Calculation

The functional relationship between flow rate and rotary speed of propeller is determined by flume testing.

Calibration formula:

V = Kn + C

V—flow rate， m/s；

K—hydraulic thread pitch of propeller， m；

n—rotary rate of propeller， n= N /T， 1/s

(N—rotating number of propeller; T—measuring duration)；

C—instrument constant， m/s。

Flow rate actually is average rotary rate of propeller in given measuring duration.

Maintenance

Propeller: The material of the GE-104P propeller is excellent engineering plastic. After more than ten years of various experiments, this material is proved to be characteristic of impact-resistance, corrosion-resistance, atmosphere-caused deterioration-resistance and good thermal stability, up to technical standards.

Quality of Propeller dominates the capability of the instrument. In order to guarantee accurate value of K in above formula, maintenance of propeller should be emphasized.

(1) Prevent it from fierce impact during measurement.

(2) Clean out oil and sediment from propeller by water or gas, keeping it clean and dry.

(3) In ice seasons, boiled water can be poured on propeller to thaw the ice.

Never use fire to roast it.

(4) Propeller is fixed on rotary axis by screw threads. If under fast flow rate, hook spanner should be used to screw it down. Especially for measurement in pipelines of pumping stations, when measurement instantly finishes, reverse current will make the propeller rotate rightabout. Screw thread is easy to loose. Never use wire cutter to screw it down for fear of laceration.

Ball Bearing: As a crucial component of the supporting system of the current meter, the ball bearing, especially the low-rate section influences the capacity of the instrument. Technical schedule should be conformed to cleanse the ball bearing. Material of ball bearing is 9Cr18 stainless steel. Although it is rust-resistant, careful maintenance for GCr15 stainless steel should be conducted on it. If damaged, the ball bearing can be purchased according to code: GE-104P-D25MX.

Cleansing the ball bearing：

(1) Gas Number 120(SY1207—67) or Number 200(GB444—64) is good cleanser.

(2) Cleansing should be conducted in a covered porcelain box or aluminum mess tin. Set a copper screen (65 eyes/3.3cm) at 10mm from box bottom to filter the sediment. Prepare three boxes for rough cleansing and finish cleansing.

(3) Operators should wash hands with warm water and soap. Other people must not touch the ball bearing by hand.

(4)The ball bearing chamber should be cleansed carefully to prevent dust, the archenemy for ball bearing.

(5) GB487-84 Instrument oil is 6.3-8.5 centistroke at 50℃. It has excellent viscosity-temperature characteristics and lean harmful substances such as acid, moisture, dust and mechanical impurity, up to strict standards. If other types of instrument oil are used, new calibration on it should be made.

(6) Cleanser and instrument oil should accord with international standards, properly deposited, and strictly prevented from water and impurity.

(7) Cleansing Procedure

Rotate and clean the ball bearing in first box with gas 10 times, half in one direction. Then turn to the second and third boxes to repeat the same process. Shake off gas, and install the ball bearing instantly, avoiding long-time exposure in air.

If there is any water entering into the ball bearing chamber (judged by sensitivity of propeller's rotation) after measurement, clean it in time. Hold the circular circumference of ball bearing, shaking the water or sediment out of the ball bearing in axial direction. Then repeat the cleansing procedure in (7).

(8) Keep the instrument in airy, dry and noncorrosive room. After 3-6 months, ball bearing should be checked, cleaned, and oiled.

Dismantling, Washing, Assembling and Oil Filling

Although the bearing chamber and the rotary axis have excellent sealing performance, sordid condition and ignorance of technical principles will induce moisture entering into the chamber. Special attention must be paid during dismantling, washing, assembling and oiling the instrument.

(1) Dismantling and Washing

After measurement, dismantle the current meter body from the bracket. Check the quality of oil in bearing chamber from transparent cap. If the oil is clear without water in it, and sensibility of propeller is normal, the instrument is not requisite to be washed. However, in order to guarantee the accuracy of the instrument, open the transparent cap, add oil into the bearing chamber and squeeze out the water drops from the front part. If the oil in bearing chamber is a little feculent, the instrument should be dismantled completely.

(2)Assembling

According to reverse sequence of dismantling, assemble the components washed. Tighten the screw caps by hand or hook spanner. Assembling should be checked as followed.

1) The assemblage gap between propeller's rotary set and main body of the instrument is 0.3—0.4mm which can be measured by thickness gauge. If the gap is too narrow, a gasket can be added to the tread of rotary set to avoid the friction possible to influence sensibility of the instrument. If the gap is too wide, water is easy to enter into the bearing chamber. The two abnormal situations are mainly caused by nonstandard assembling procedure.

2) The bounce gap of rotary set should not surpass 0.03mm checked by dial gauge. Dial the propeller by hand. If rotation of propeller is not so smooth but a little shaky, it is not accordant with standards. Check the bounce gap of propeller axis and rotary set by dial gauge to determine repair methods. Special notice: extrusion of eccentric driven pump is most possible to cause water intake.

3) Sensibility of the instrument is checked by mouth's blowing. If a slight blowing drives the propeller rotate smoothly without sense of blocking, the sensibility is considered to be eligible. We recommend JGM-1 type flywheel sensibility checking-gauge developed by our institute. The flywheel is working with a suspended cable and a weight. Average moment of friction is determined by rotation duration of the flywheel. Thus, sensibility of the instrument can be judged. It is more reliable to use the gauge to measure sensibility.

4) The instrument assembled should be placed on table. Lay wood block under the body, keeping the propeller suspending. Otherwise, put it into housing immediately.

(3) Oil Filling

Bearing and distance sleeves are washed, then assembled together. If the rotary set is proved to be accordant with technical demands, fill oil in the chamber assembled with rotary set, and the cap. Couple them together instantly and tighten the cap. If the instrument oil throws from the rotary set and there is no air bubble in the cap, the chamber must be filled up. In order to prevent chamber from air bubbles, keep the head of instrument on the top when you tighten the

cap. Fill oil in holes of bracket, then assemble it with the main body. Thus, the instrument is full of oil inside.

Signal Transition Mechanism

Signal transition mechanism is composed of magnet and reed switch. The magnet is hold in the magnet box. Remanence is 700-1000Gauss. The reed switch is sealed with epoxy. The minimum ampere-turns is 12-18AT. The magnet and reed switch on one instrument are not exclusively coupled, but exchangeable with other instruments. They are also disposable an purchasable.

Life span of reed switch is greatly influenced by power system load. At 3V and 30mA, it can work 5×105times. After that it should be replaced. 1minute is only needed for replacement, even in field. It's not necessary to lift the instrument up from water, because reed switch is completely sealed.

Notice the value of power and current of the counter connected. **Never choose inductance type counter**.

In water with high salinity or industrial polluted wastewater, such as electroplating effluent, Adhesive plaster can be used to wrap the binding posts (positive) of reed switch, avoiding short circuit with main body of the instrument (negative) in water.

Incasement

After measurement, lift the instrument up from water. Dry it with towels. Put it into housing according to original position. Other accessories should be well placed. Check the placement of components if the housing can't be well-covered. Never forcedly press the cover of housing.

VII. Life Span

1. 5years under correct operation and maintenance.
2. Under correct operation, calibration formula should be checked after 1—2years.

Part 2.

GE-104P portable current meter

This portable current flowmeter is working for point-by-point measuring for accessing the current speeds in running waters. The measure values are displayed on a hand terminal, and the stored values are transferred to a PC by means of the Software. It produce by the standard ISO2548-73, C class accuracy.

This current meter is smart, aesthetic appearance, compact design, simple operation, convenient when measuring. It is widely used to measure the flow velocity in river, irrigation canal, surface runoff, hydrological experiment, and measuring pipeline flow to test the efficiency of the pump station, wastewater monitoring and seepage flow measuring in the Environmental protection.

The device is simple and convenient, energy saving, stable and reliable. It possesses com plete functions and a high automaticity in accordance with the national measurement sta ndard of open channel. Equipped with a rotating propeller which can endure 100 ℃.

Figure 1 Installation diagram of the portable current meter

I: technical requirement of the device.

* Velocity measurement formula：$V = \frac{KN}{T} + C$(m/s)(automatic calculation)
* Range of the velocity measurement：0.06-5.00 m/s (7.00m/s is also attainable)
* Error in current measurement：≤1.5%
* Display screen：4×16 liquid crystal display
* Temperature range：－20℃- 60℃
* Power supply: DC8.4V Li-ion rechargeable battery, continuous operation of above 40 hours after complete charge.

II: measurement principal

The device was developed with the flow velocity-area method in the open channel measurement. After obtaining the flow velocity, the flow quantity can be obtained through the formula Q=V • S(S is the section area)

1. The measurement of the flow velocity

   In the measurement, the Propeller current meter was rotated by the water power, the signal device generates the revolution signal, and the flow velocity can be calculated by the following formula:

$$V = \frac{KN}{T} + C(m/s)$$

In it ： V：The mean flow velocity during the measurement(m/s)

K：Screw pitch C：Constant of the current meter

T：the amount of time of the measurement(unit: s)

N：The number of signals during T

During the use of the device, K and C both are constants. The flow velocity can be calculated once the value of T and N are obtained.

2. The calculation of volume of flow

   By the flow velocity-area method, the volume of flow can be obtained by multiplying the flow velocity and section area which were obtained in the measurement.

Three: operation of the device

Normally, **plug in to start up and unplug to shut down.** The moment the device is plugged in, the screen will display the current meter parameter used last time. The parameter setting is

illustrated as follows: Measurement can be conducted once the parameter coincides with the certificate.

ZMLSY-1.0 7.2V
K=.0288 1V=0.000
T=100 0N0000.0
Q=000000.000m3\h

Table 1 the display of measurement parameter used last time

There are 3 buttons on the device:

3.1 The operation of the setting of parameter

3.1.1 **The setting of parameter 1**: Check whether the parameter displayed on the screen is the same with the current meter parameter. If not, press Menu to setting of parameter 1. Make modifications on the screen by the right shift button and shift up button. For instance, If c is 0.0010, press the right shift button to move the cursor to the position of "5" where C=0. 01**0**0. Then press the shift up button, one press will add 1 to this digit, and press the button for several times until the digit which cursor stays turns into the required value that is C= 0.0150.

Modification of the K and T is the same. First press right shift button and then press shift up button until it turns into the right value. Correction can also be made with the procedure above.

Please input K and C by the parameters given on the certificate. T represents the amount of time during the measurement.

3.1.2 Press Menu to enter setting of parameter 2

Setting 1
Thread pitch - K=.9710
Constant - C=.0170
Time - T=100.00

Setting 2
Automatic - 0
Time delayed - 3
Section - 01.005 m^2

On the screen, the "Automatic – 0" means automatic operation, if manual operation is needed, change the "0" into "1".

On the screen, the delayed time is "3"which means the device will conduct the automatic operation in 3 seconds after finishing the setting and back to the measurement interface. If the setting is automatic, the device will automatically repeat the measurement.

If it is manual, press start/stop button and start or stop the measurement. After the value on the screen is obtained, press the button again so that you can proceed with your next measurement.

Volume of flow on the sectional area: Unit: Square meter. The volume of flow on the sectional area can be obtained by the formula Q=V • S (S is the sectional area)

3.1.3 Version number communication displays the communication mode. (No communication in default mode)

Setting 3	
LAP	01
PULSE	01
LANGUAG-	ENG

Setting 4	
Baud rate	9600
Stop bit	1
Parity bit	N

3.2 Data of the measurement

After setting the right parameter, press “right shift” and “shift up”, the parameter can be kept down and the device will be back to the measuring status.

Back to the measuring status:

Enter the measuring status. The screen will come as portrayed: If it is automatic operation, the device will automatically calculate the flow velocity by the formula and display 1V=0.000M/S at the end of the measurement. After keeping the display for 3-5 seconds, the automatic measurement will be repeated but the value of flow velocity will be preserved until the end of next measurement. If it is manual operation, the value will be recorded at the end of measurement. After recording the values, press start/stop button and you can proceed with your next measurement. During the measurement, it can be perceived that T and N start to count on the screen when the first signal comes. When T reaches the set time, the device will automatically turn off the T and N when another signal comes and automatically calculate the velocity of the flow. After displaying for 3-5 seconds, the device will automatically conduct the next measurement and repeat the procedure above. In this measurement, the value of V displayed in this measurement is actually the value of last time, which is made for the convenience of reference and record.

3.4 Shutdown

The device will be shut down automatically after unplugging. Save the model and parameters you used this time. Next time you can conduct the measurement of current again by just plugging in and connecting the device with the target.

IV. Online Operation with Computer (no such function if not specified when ordering)

First, connect the device with computer with a communication cable for exclusive use. Turn on the computer and get into the WINDOWS- Program- Attachment- Communication- Hyperterminal, set the Baud rate at 2400, communication bit at 8, stop bit at 1, no parity check, and flow control at software. Then choose the right communication entrance, connect the signal power cord of the device and start the measurement. At the end of every measurement, a set of

data will be sent onto the computer screen.

K=7800 C=0.050 T=0106.5 N=0015 V=0.160

K=7800 C=0.050 T=0108.4 N=0016 V=0.165

V: Maintenance of the Device

Unplug the device if not to be in use for a short time. Charge the device every 3 months if the time is too long.

Rinse the current meter and the measuring stick with clean water at the end of measurement every time. Dry them with a towel and keep them in the right place.

VI: The whole set of the device

GE-104P current meter 1

GE-104P propeller 1

Signal line 1

***Communication cable (selective) 1**

Charger 1

Attachments:

GE-104P portable current meter user manual 1

Special warning:

Charge the device for above 3 hours at the first time. Set the test time above 20 seconds. Run out the battery before recharging. (The device contains a protector for over-charging and over-discharging)