Smart pipeline Solution

1. Application

Smart pipeline Solution， It can mark the dense urban underground pipelines and important facilities, thereby accurately, safely and quickly locating them. When used in conjunction with GPS (Global Positioning System) and intelligent mobile terminals, it can conveniently help engineering personnel find the target location and obtain relevant information about the equipment on site.

The electronic identification system originated in the United States and strictly follows the standards set by APQA (American Public Works Association) for underground facility identification. It is used to mark the routes of underground pipelines and to locate important underground facilities.

2. Smart pipeline Solution can solve the detection problems of non-metallic pipelines.

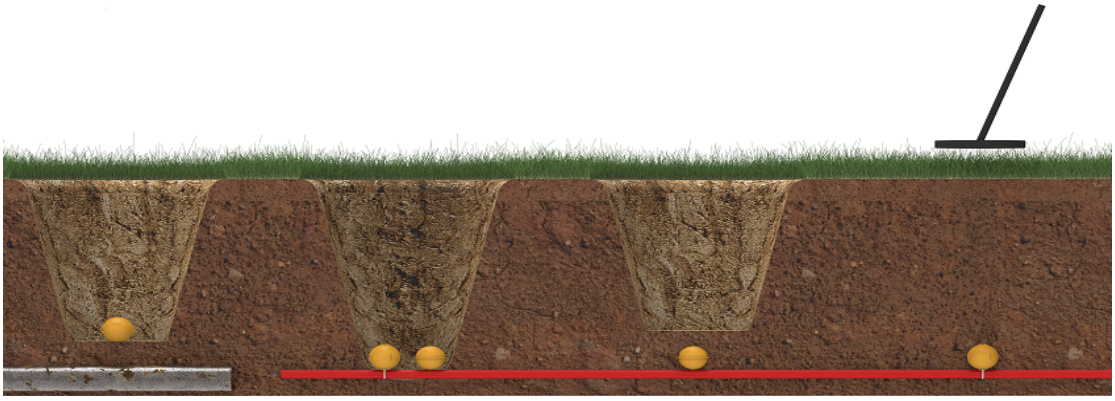
Buried non-metallic pipelines cannot be detected by traditional underground pipeline detectors. Moreover, the lifespan of commonly used metal tracer lines is very limited and is much shorter than the service life of non-metallic pipelines. The application of underground pipeline electronic identification systems can effectively solve the problems of detection, location and management of non-metallic pipelines.。

Comparison of Electronic Identifier and Traditional Tracing Line Solutions			
		Traditional Tracing Line Solutions	Electronic Identifier
Identification function	Routing indication	×	√
	turning	×	√
	Reserved interface	×	√
	Three-way/ Four-way connection	×	√
	Pipeline crossing	×	√
	Repair Record	×	√
	Pipeline characteristics	×	√
Identify uniqueness		×	√
Service life (years)		5	50
Maintenance Requirements		Highly	Maintenance-free
Degree of corrosion		Easy	Non
Difficulty of construction		Highly	Easy
Detection difficulty		Highly	Easy

3. Smart pipeline solution detection principle

The detection of underground pipeline electronic markers adopts low-frequency passive RFID technology. The signal can penetrate non-metallic media such as soil, asphalt and concrete. The positioning accuracy can reach 10 cm, which is much higher than that of traditional pipeline detectors. Different types of electronic markers can be selected according to the burial depth, and the maximum burial depth can reach 2.4 meters.。

1. The detector sends signals of a certain frequency intermittently.
2. Underground identifiers with the same resonant frequency absorb and store signal energy.
3. After the detector sends signals for a short period of time, it stops sending and enters the signal reception mode.
4. The detector measures the strength of the returned signal to determine the exact location of the identifier.
5. When the detector is closest to the identifier, the signal is the strongest, which is precisely above the identifier.



4. Composition and Structure of smart pipeline Solution

It is mainly composed of four parts.

1. Electronic Identifier
2. Detector
3. Mobile terminal APP and applications
4. Data service software

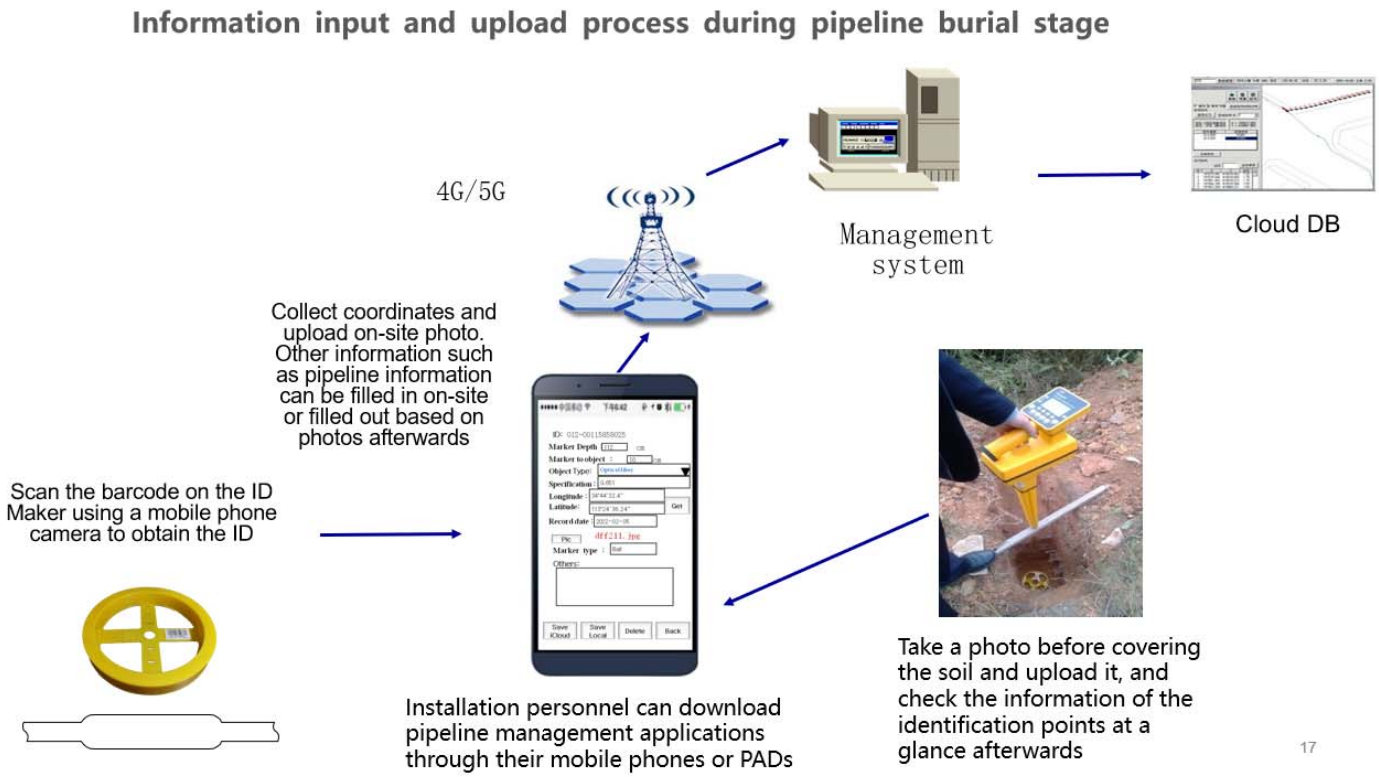
Structure

1. The electronic identifier serves as the basic information point and achieves the unique correspondence between data information and physical devices through the ID code.

2. At the engineering site, information points can be created through intelligent terminals and displayed in real time on the electronic map.

3. Through intelligent terminals, one can directly collect information such as latitude and longitude coordinates, on-site pictures, etc., and upload it to the server.

4. The data is stored in the cloud and can be viewed at any time and from any location via smart terminals or web browsers.



5. Advantage OF smart pipeline Solution

The underground pipeline electronic identification system can help operators achieve precise positioning and management of underground assets under non-digging conditions.

1. Real-time access to the precise routing system of underground Pipelines.
2. Quickly locate the target facilities on-site, such as valves, T-shaped branches, and joints.
3. Quickly identify different underground pipelines and facilities.
4. Quickly grasp the various complex situations such as the turning or crossing of underground pipelines.
5. Effectively prevent accidental excavation and increase the speed of emergency repairs.
6. Implement dynamic management of underground pipeline information.

6. Underground Pipeline Electronic Identifier

The electronic identifier is one of the core components of the pipeline electronic identification system. It can be buried near major underground facilities during construction, or used to mark existing underground facilities during pipeline maintenance. By applying the underground pipeline identification system, operators no longer need ground reference points, and no longer need to spend a lot of time and money searching for various underground facilities buried underground. This can greatly improve work efficiency and ensure safe production.

The internal circuit of the electronic identifier is passive. The shell is waterproof, corrosion-resistant and shockproof. It can fully withstand drastic changes in the external environment. The normal service life of the electronic identifier can reach over 50 years, far exceeding the operational lifespan of the corresponding underground pipelines. It can achieve lifelong maintenance-free operation.

Ball marker

Nail marker

Disc-shaped marker

Electronic identifiers can be classified into two categories：

1. Ordinary electronic identifier:

Allow users to mark the pipeline routes and important underground facilities during the construction and maintenance of underground pipelines, so as to accurately locate the routes and conduct depth detection of underground pipelines in the future.

2. Electronic identifier with ID:

It is equipped with a readable and writable RFID chip. When it is manufactured, a globally unique identification code (ID) is preset. The relevant information of underground facilities can also be pre-written into the chip, such as: the owner of the underground facility, the type of the facility, the description of the facility, the identification number of the facility, the implementation size, the pipeline direction, the installation or maintenance date, the relative depth, and the ID code. The stored information can be read by a detector.如 A power company decided to convert the following content into code and input it into the electronic identification device:

Cable number	Identification ID code	Target object	Application	description	relative depth	Pipeline dimensions	installation date	Maintenance unit	longitude and latitude
DL035	188-3000002420	Low voltage Cable	direct burial	Indoor connector	1.5m	50m	2015/7/21	XX power company	65.20/73.25

Color, frequency and usage environment of the electronic identifier：

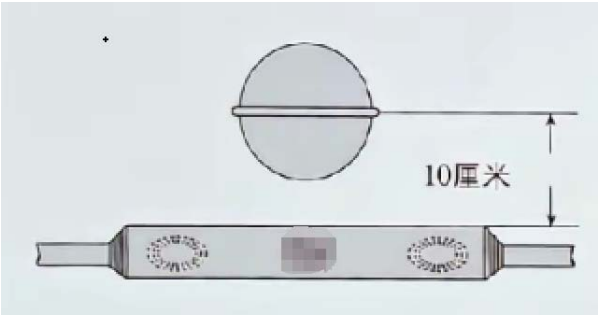
The underground pipeline electronic identification system is widely used in various industries. Based on the AWPA standards, the frequency and color codes have been formulated. We have developed 7 different frequency electronic identifiers for industries such as communication, power, cable TV, water supply, drainage, and gas, which are used to mark various underground facilities.

Reference table for color, frequency, industry and industry applications of electronic identifiers								
								
66.4 kHz	77.0 kHz	83.0 kHz	92.0 kHz	101.4 kHz	121.6kHz	134.0 kHz	145.7 kHz	169.8 kHz
General	CATV	Fuel gas	Optical fiber	Communication	Drain away water	European Union power grid	Water supply	Electric power
Wastewater treatment Airport Campus Mining area Cemetery area Danger zone Danger zone; Snow park Golf course; Garden	Cable path Optical fiber equipment Direct burial termination point Various crossover points Direct burial splicing point Turning point Maintenance point	Pipeline path Non-metallic pipeline Various valves Metering table Various crossing points Three-way connection Reserved opening Various elbows Well diameter variation Well Well cover Maintenance point	cable path All connection points Direct buried termination point Turning point Deep transformation Entering the manhole cover Various crossing points Maintenance point	cable path All connection points Direct buried termination point The end of the pipeline Optical cable equipment Turning point Deep transformation Entering the manhole cover Various crossing points Maintenance point	cable path Business stake non-metal pipe Various crossing points Discharge Port Various types of valves three links well lid Maintenance point	cable path Offline point Pre-buried pipes Pre-buried cable Various crossing points Direct-buried transformer Business cycle Streetlight Turning point Entering the manhole cover Cabling loop Maintenance point	Pipeline route Business stake non-metal pipe Various types of valves Various crossing points valve chamber water meter reserved port Deep transformation Various types of elbows Pipe diameter change Maintenance point	cable path Offline point Pre-buried pipes Pre-buried cable Various crossing points Direct-buried transformer Business cycle Streetlight Turning point Entering the manhole cover Cabling loop Maintenance point

7. Type of Electronic Identifier

Marker ball

The flexible self-leveling design ensures that the electromagnetic induction coils inside the spherical marker remain at a horizontal position regardless of the angle at which the marker is inserted into the excavated ditch. This guarantees the most stable reception effect and detection depth. The anti-freezing liquid in the spherical marker enables it to be used in extremely cold environments as low as -40℃.



Marker ball widely used in:

1. High-density underground pipeline system in the city.
2. Rural areas with few ground references.
3. Areas that are difficult for non-metallic and traditional electromagnetic positioning devices to effectively detect.
4. Key systems, life support systems and digital city systems.

Features: Outer diameter 10 cm. Maximum measurement depth 1.5 meters. It is recommended to maintain a minimum distance of 10 cm from the marked object (measured from the center of the ball).

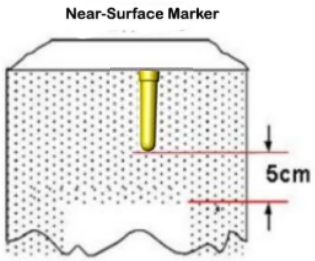
Marker ball parameter									
									
Color	紫色	黑/橙	黄色	黑/黄	橙色	绿色	红/蓝	蓝色	红色
frequency	66.4 kHz	77.0 kHz	83.0 kHz	92.0 kHz	101.4 kHz	121.6kHz	134.0 kHz	145.7 kHz	169.8 kHz
service environment	General	CATV	Fuel gas	Optical fiber	Communication	Drain away water	European Union power grid	Water supply	Electric power
Item No	127067	127068	127069	127070	127071	127072	127073	127074	127075
Item No with ID	127067/ID	127068/ID	127069/ID	127070/ID	127071/ID	127072/ID	127073/ID	127074/ID	127075/ID
Dimension	Φ110mm	Φ110mm	Φ110mm	Φ110mm	Φ110mm	Φ110mm	Φ110mm	Φ110mm	Φ110mm
weight	380-400g	380-400g	380-400g	380-400g	380-400g	380-400g	380-400g	380-400g	380-400g
operating temperature	-40~55℃	-40~55℃	-40~55℃	-40~55℃	-40~55℃	-40~55℃	-40~55℃	-40~55℃	-40~55℃

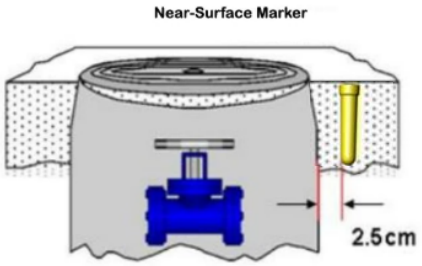
IP grade	IP68	IP68	IP68	IP68	IP68	IP68	IP68	IP68	IP68
Maximum depth of exploration	1.5m	1.5m	1.5m	1.5m	1.5m	1.5m	1.5m	1.5m	1.5m
ID reading depth	1.2m~1.3m	1.2m~1.3m	1.2m~1.3m	1.2m~1.3m	1.2m~1.3m	1.2m~1.3m	1.2m~1.3m	1.2m~1.3m	1.2m~1.3m
ID ball recommended burial depth	⩽1.2m	⩽1.2m	⩽1.2m	⩽1.2m	⩽1.2m	⩽1.2m	⩽1.2m	⩽1.2m	⩽1.2m

Other types of identifiers

Taking into account the various needs of our customers, in addition to the spherical electronic identifier, we have also developed cylindrical identifiers and disc-shaped identifiers. The main difference lies in the detection distance and installation method.

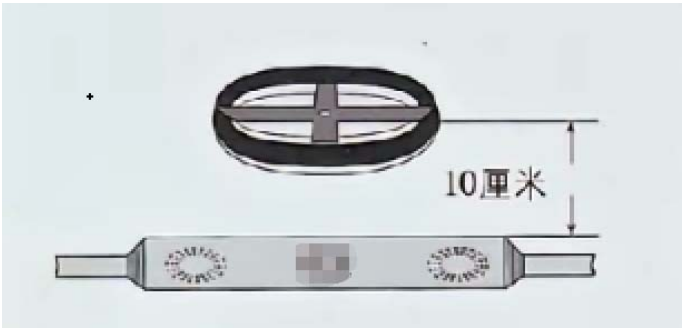
Nail marker:





The recommended burial depth is 0.6 meters. This allows users to easily mark the existing underground facilities. The nail-type marker must be installed vertically within the drilled hole. The diameter is 2 cm, the length is 7.6 cm, the maximum measurable depth is 0.6 meters, and it is recommended to maintain a minimum vertical distance of 5 cm from the marked object.

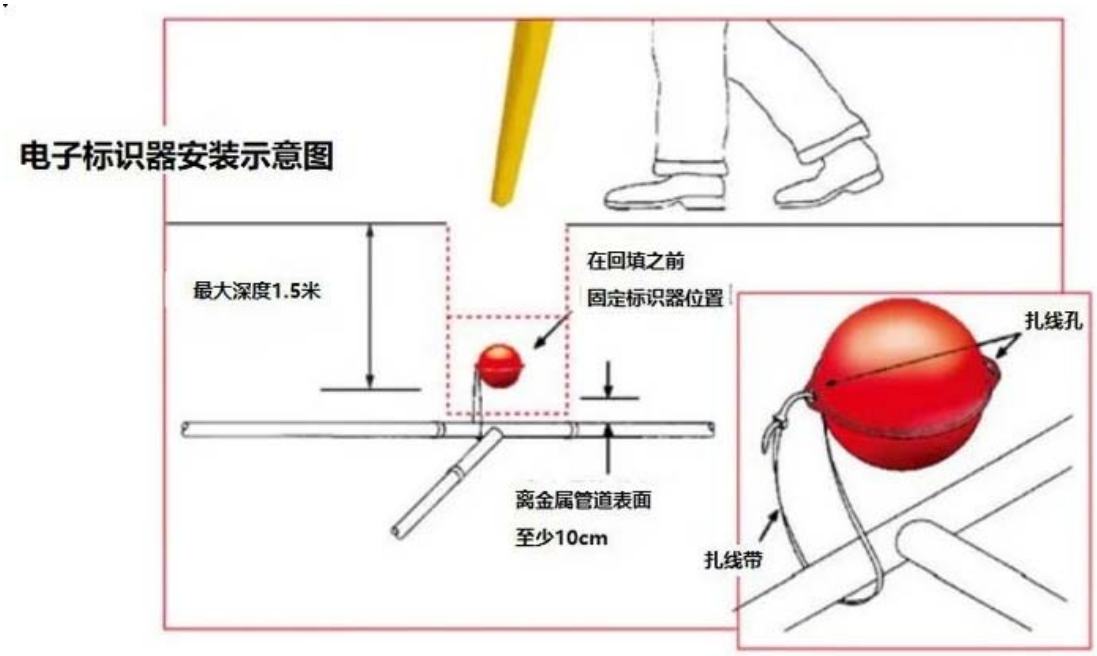
Disc-shaped marker:

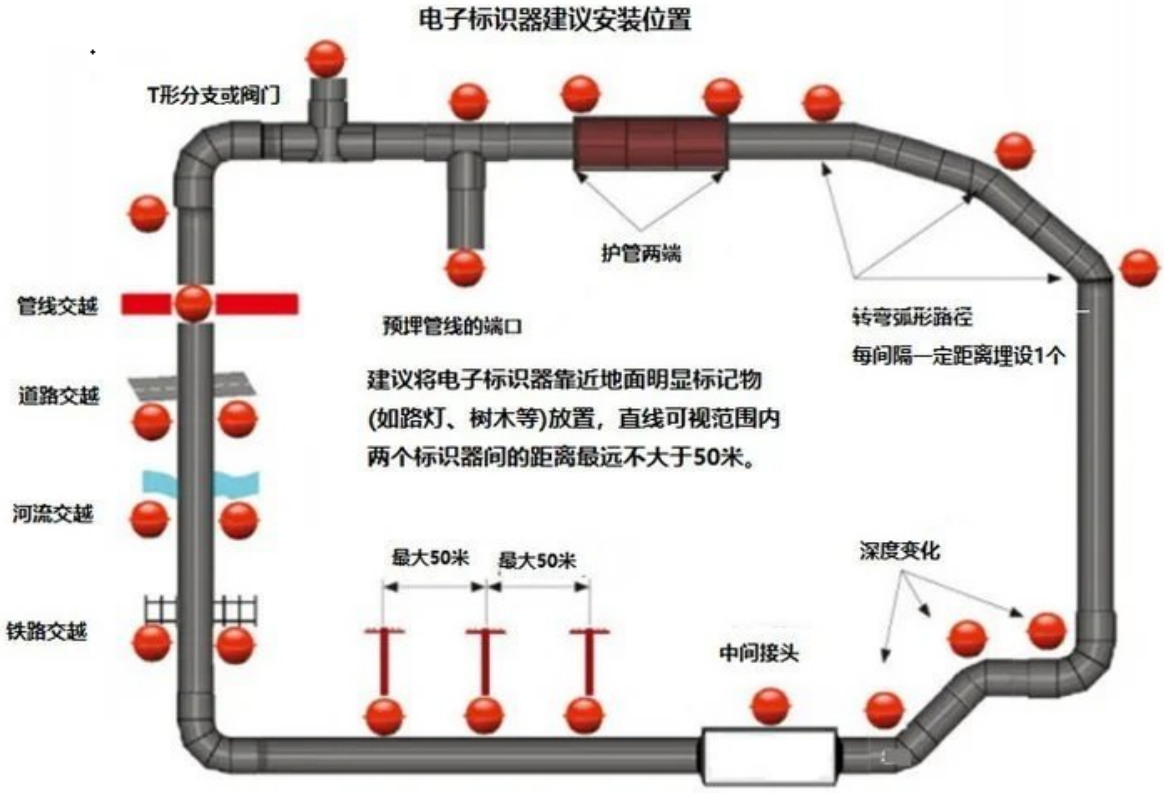


The disc-shaped identifier is suitable for low-density, high-buried underground facilities, such as connection points, maintenance points, cable storage, service piles, and underground pipeline routes beyond the detection depth of the spherical identifier. Due to its relatively large size, it is usually suitable for excavating large areas rather than being used in narrow trenches.

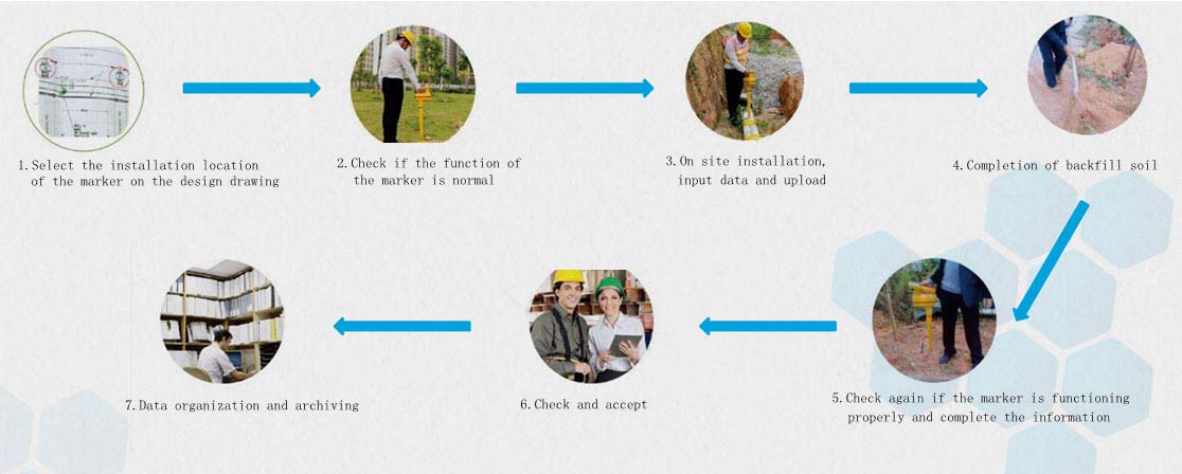
Diameter 21 cm, thickness 3 cm, maximum measurable depth 1.8 meters, and it is recommended to maintain a minimum distance of 10 cm from the identified object.

8. 电子标识器现场安装


电子标识器安装示意图
最大深度1.5米
在回填之前
固定标识器位置
离金属管道表面
至少10cm
扎线孔
扎线带


电子标识器建议安装位置
T形分支或阀门
护管两端
管线交越
预埋管线的端口
转弯弧形路径
每间隔一定距离埋设1个
道路交越
建议将电子标识器靠近地面明显标记物
(如路灯、树木等)放置，直线可视范围内
两个标识器间的距离最远不大于50米。
河流交越
最大50米
最大50米
深度变化
铁路交越
中间接头

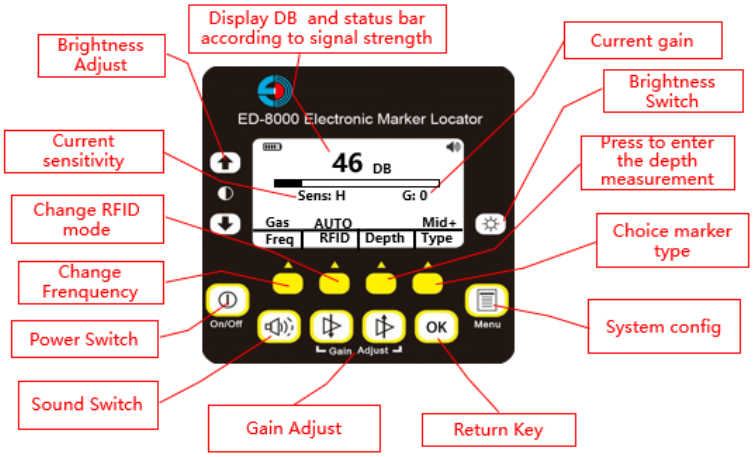
9. 电子标识器现场施工流程



10. 电子标识器探测仪

Model	ED-8000
Shape	
Weight	2.8~3.2KG(According to the type of antenna)
Working Temperature	-25℃~55℃
Dimensions	81.3cm×55cm×11.8cm
power supply	14.8V Li-On rechargeable
Interface	Bluetooth
Characteristic	1. Supports analog and digital marker detection 2. Strong anti-interference ability 3. Detachable dual UI interface

Locator operation interface (basic interface)



Locator operation interface (Android interface)

Can run on mobile phones, tablets, or professional positioning handheld devices that support Android systems, and can take over the operating interface of the detector through Bluetooth connection.