Pipe Inspection Camera System

Operation Manual

Read this Operation Manual carefully before using this tool

[INTRODUCTION]

The pipe inspection system is a powerful set of tools that helps you locate and diagnose problems in a pipeline system.
The system is widely used in inspections of Sewer, central air conditioning, chimney, plumbing, building, cable pipe and pipes ventilation systems and other places.

[GENERAL SAFETY RULES]

Precautions

Read all safety warnings and instructions. Failure to follow warnings and instructions may result in electric shock, fire and/or serious injury.

⚠ WARNING

1. Save this operation manual for future reference.
2. Do not operate this device in explosive atmospheres, such as in the presence of flammable liquids, gases, hazardous chemicals, superheated liquid or heavy dust. It may create sparks which may ignite the dust or fumes.
3. The camera head and the push cable are waterproof, however, the battery pack, DVR and connecter cable are not. Do not expose them to water or rain. This increases the risk of electrical shock.
4. Avoid using the device in environments of extreme cold, heat or humidity as it may damage the device.
5. Do not drop or press hard on the device.
6. Always backup your data before connecting your SD memory card to this system. The manufacturer is not responsible for any data of damage on your SD memory card for any reason.
7. Do not disconnect the unit while recording or playing back. It may damage the unit and/or the SD memory card.
8. Only qualified person are allowed to repair this device. Service or maintenance performed by unqualified person could result in injury.
9. Do not use this device in places where there is high voltage equipment. The device doesn't contain high voltage protection and isolation.
10. Check or maintain this device regularly, repair it or replace new parts if there is any damage.

[APPLICATION AND KNOW YOUR TOOL]

Application

Suitable for pipes at diameter of 25mm-200mm. Ability to go through 90° bend places with diameter at 50mm.

Know Your Tool

The pipe inspection system includes the following four main parts: Camera head, Cable reel, Frame and Toolbox((including DVR, control device, battery, keyboard).
The camera head includes 12 high-light white LEDs and a highly scratch-resistant sapphire lens cover; this coupled with stainless steel housing allow the camera to withstand repeated hits in various pipes.
Flexible stainless steel spring and associated components make the camera head possible to go through bend pipes. Also the cable reel is mounted and rotatable in the case therefore the fiberglass rod cable can be pushed in and out without the need to hold the reel. Further, the battery pack provides power supply for the system and the DVR monitor can record video and take photos.
The stable and open composite structure is easier to rinse and clean.
The integrated toolbox is more reliable for keeping products and convenient to control. With the built-in DVR, users can manually adjust the luminance of the LED lambs for the camera, and shoot videos or photos.

Camera Head

1.. Sapphire Lens
2. 304#Stainless Steel Shell
3. Stainless Steel Spring
4. Gold Connecter

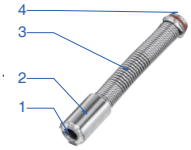


Figure 1. Camera Head

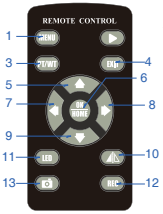


Figure 2. Remote Control

Remote control

1. Menu: Select Menu
2. Playback: Playback Mode
3. Pt/Wt: Reserve Function
4. Exit: Exit Menu
5. Up: Select Up/Previous Item
6. OK & Home: Confirm/Select Menu
7. Left: Select Left Item
8. Right: Select Right Item
9. Down: Select Down/Next Item
10. Mirror: Mirror And Flip Image
11. LED: Adjust The Led Brightness
12. REC: Start/Stop Recording
13. Photo: Take Phone

Frame and Cable Wheel

1. Frame
2. Wireless Keyboard Receiver
3. Meter-Zero (Meter Counter Zero Set Button)
4. Cam (connect to toolbox)
5. Push Cable
6. Cable Connector (To Camera)
7. Stop Cup
8. Hook

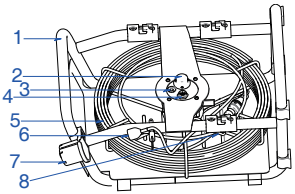


Figure 3. Frame and Cable Reel

DVR AND TOOLBOX

1. Power Switch
2. USB 2.0 To PC
3. SD Card Slot
4. Color TFT LCD
5. Sun Visor
6. DC In
7. Meter-Zero (Meter Counter Zero Reset Button)
8. Wireless keyboard
9. Aviation Socket
10. Playback: Playback Mode
11. Menu: Select Menu
12. Power Indicator LED
13. Exit: Exit Menu
14. Left: Select Left Item
15. Down: Select Down/Next Item
16. Right: Select Right Item
17.LED:Change The Led Brightness
18. IR For Remote Control
19. REC: Start/Stop Recording
20. Photo: Take Photo
21. Mirror: Mirror And Flip Image
22. Up: Select Up/Previous Item
23. OK & Home: Confirm/Select Menu

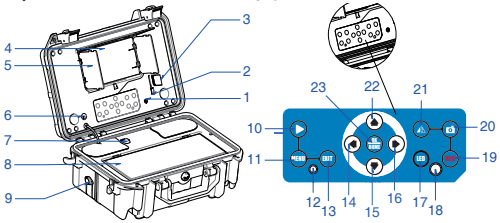


Figure 4. DVR and Toolbox

Package Contents

1. Panel with DVR
2 Wireless keyboard
3. Adapter
4. Car changer
5. Remote control
6. 46 Support guides
7. 80 Support guides
8. Screw (2x), nut (2x) and waterproof-ring
9. Screw Driver
10. Operation manual

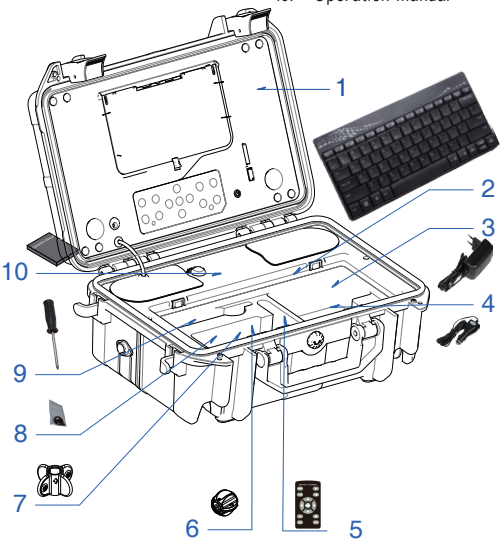


Figure 5. Package Contents

[DESCRIPTION SPECIFICATIONS AND STANDARD EQUIPMENT]

specifications

	Item	Parameter
General	Operating Temperature	-10~50°C/+14~+122°F
	Operating Humidity	30%RH~90%RH
	Storage Temperature	-20~60°C/+4~+140°F
	Power adapter	Input:110VAC~240V AC, Output:12V DC 1200mA
	MEAS.	55×43.5×34.5cm (LxWxH)
	Weight	13Kg(Approx)
Camera	Sensor	1/3" Sony CCD
	TV-Line	480 TV-Line
	View Angle	120°
	Focus Distance	20cm (approx)
	Depth Of Field	100cm(approx)
	Camera Size	Φ23mm×45mm (Main body)
	Camera Length	150mm
	Front Lens	Sapphire
	Shell Material	304#Stainless Steel
	Lighting	Built-in 12×LED (White)
	Water-Proof	20m water (Camera fix on Cable)
	Power Supply	DC12V
	Current Consume	60mA (LED OFF), 140mA (LED ON)
DVR	Screen	7-inch 16:9 super bright high-definition color LCD screen
	Resolution	800×480 RGB
	Mirror and Flip	Support image mirror, Flip, Mirror & Flip
	Video Resolution	PAL 720×576 25FPS Max. NTSC 720×488 30FPS Max
	Video Encoding	H.264
	Photograph	720×480/720×576
	Audio Recording	Local Sound
	Out Put	TV and Audio output
	External Memory	Support SD Memory Card up to 32GB
	Data Output	USB2.0 To PC
	LED Driver	Built-in Dimmer
	Play Back	Video, Photo and Audio
	Language	English, German, French, Spanish, Italian, Chinese, Japanese, Russian, Portuguese
	Power Supply	DC 6~12V input
	Current Consume	700mA Max
	Batter y Capacity	7.4V 5200mAh Li-ion Batter y
	A Single Charge Work Time	6 Hour
	Charge Time	8 Hour
Battery pack	Keyboard Compatibility	Suppor t Specific PC Wireless keyboard
	Typing Language	English
	Max Characters	384
	Hide Characters	Quick One Key hiding
	Precision of Meter	Counter ±0.5%
	Meter and Feet Switch	Support
	Set Zero	Support
	Power Consume	40mA @ 12V DC
	Waterproof	P66 (for connection por ts panel only)
Cable Wheel	Cable Diameter	Φ5.2mm
	Cable Length	20/30/40 meter (Selectable)
	Meter Counter	Selectable
Tool Box	Size	380×260×150mm(L×W×H)
	Box color	Black

[INSTALLATION]

⚠ WARNING

To reduce the risk of serious injury during use, follow these procedures for proper assembly.

1. Install cable reel

Put the cable reel into the frame from the right side, place it in the right direction and then tighten the screw and nut. Pull out the cable with care, thread it through the hook and lead the cable out. (Figure 6.)

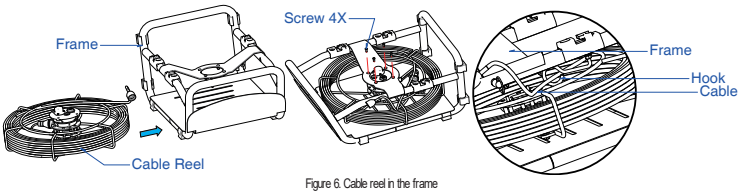


Figure 6. Cable reel in the frame

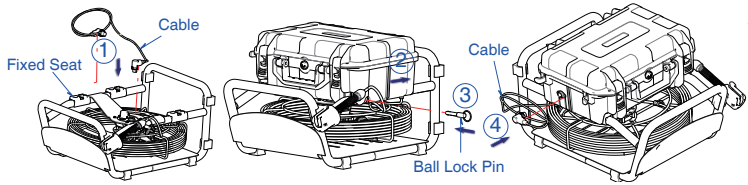


Figure 7. Install toolbox

2. Install toolbox

Step1. Plug one end of the spring cable into the cable wheel aviation socket according to the direction, and tighten the screw.

Step 2. Clip the toolbox holder into the fixed seat on the frame, and push it inside according to the direction.

Step 3.Thread the ball lock pin through the toolbox holder and the frame.

Step 4.Connect the other end of the spring cable with the aviation socket of the toolbox and tighten the screw.(Figure 7.)

3. Install camera head

Hold the cable connector in one hand, then screw the camera and fix it on the cable tightly.(Figure 8.)

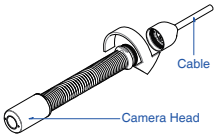
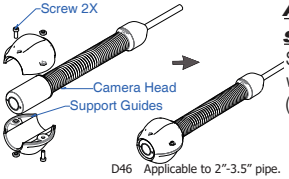


Figure 8. Assembly/Disassembly Camera

4. Install guide fitting

Support Guide are designed to help position the camera towards the middle of the pipe. There are 2 kinds of guides, choose guides properly per application requirement.



D46 Applicable to 2"-3.5" pipe.

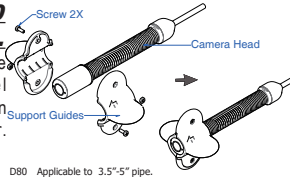
Figure 9. Install 46 Support Guides

A. Install 46 support guides.

Sleeve the camera heads with 46 Support guide. (Figure 9.)

B. Install 80 support guides.

Mount the 80 support guides onto the stainless steel camera head. Then tighten the screw by screwdriver. (Figure 10.)



D80 Applicable to 3.5"-5" pipe.

Figure 10. Install 80 Support Guides

5. Install SD card

(Figure 13.)

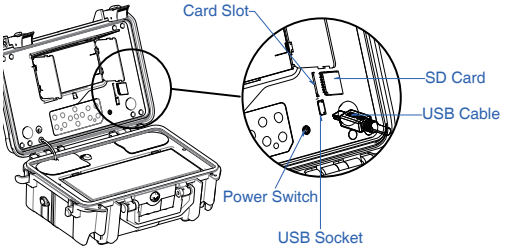


Figure 11. Install SD Card

6. Turn on the battery pack and DVR.

[FUNCTION GUIDE AND OPERATING INSTRUCTIONS]

DVR Icon

1. SD Card
2. Battery Level
3. Image Reverse
4. Image Reverse & Mirror
5. Image Mirror
6. Timestamp
7. LED Brightness
8. Record
9. Meter Counter (optional function)

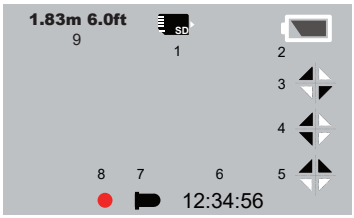


Figure 12 Screen icon Definition

[FUNCTION GUIDE]

1. Live video

Press [ ] to turn on/off DVR to enter the live video mode, then press [ ] to enter playback mode.

Press [REC] to start/stop recording.

Press [ ] to mirror or/and reverse the image.

Press [LED] adjust the brightness of camera LEDs.

Press [ ] to take a picture.

2. Video Option

Press [MENU] to enter the video option menu. Press [ ] and [ ] to select items that you need, press [OK HOME] to confirm the selection. Press [ ] or [ ] to change the value. Press [OK HOME] to save the setting. Press [EXIT] to exit video option and save.

- Size D1 (720*576) / VGA (640*480) / QVGA (320*240)
- Video Seg: 10min/20min/30min/40min/OFF. Set 10-40min to restrict files length and open cycle-cover. Elder files will be covered by new files when SD card is full. Set OFF to close this function.
- Meter Counter: Reserve function.
- Sound: Turn on/off the local sound in Video Recording.
- Timestamp: Enable/Disable time stamp on screen.

3. Playback

Press [ ] the button to enter the playback, the user can browse, preview and playback media files.

Press [ ] and [ ] to browse and select media files.

Press [OK HOME] to confirm the selection and preview media file. Press [ ] to preview the previous file. Press [ ] to preview the next file. Press [OK HOME] to playback video. Press [MENU] to enter the play setting.

- Delete: Delete media files.
- Slide Show: 3sec/5sec/10sec. To set interval time of the slide shows.
- Protection: To protect important media files.
- Thumbnail: Browse 9 media files per page.
- File List: Browse 3 media files per page.
- LCD: LCD brightness.

4. Playing Movie

[OK HOME] Pause/Play movie, [ ] Stop play movie, [ ] Rewind, [ ] Forward, you can press [ ] to set speed rate of rewind/forward.

5. SETUP

Press [MENU] to enter the preferences of Record/Playback. Press [ ] enters Setup menu.

The following items are in the setup menu.

- Format: format SD card.
- LCD: LCD brightness.
- Language: English, German, French, Spanish, Italian, Chinese, Japanese, Russian, Portuguese.
- Sys. Reset: Reset all setting.
- Light frequency, 50Hz/60Hz, specifying your ambient light frequency.
- TV output: PAL/NTSC.
- Date input: To set date and time.

[WIRELESS KEYBOARD OPERATION]

The keyboard text writer is used to type characters with the wireless keyboard and display on screen. The characters can be displayed in recorded video or captured photo. It supports max. 384 characters and quick one key hiding characters.

Text Input

1. Typing characters with wireless keyboard. Using arrow key to move cursor, backspace key to delete ,and enter key to change a new line.
2. Esc key to hide or appear all characters.Ctrl + Del to delete all characters.
3. You can type and edit characters while recording, the typing and editing will be recorded in the video files.
4. The typed characters will be stored in memory.

Note: You have to change the wireless keyboard Receiver together when changing a new keyboard.

Backstage Operation

You can press “F1” or “F2” key within 5 seconds after DVR monitor starts to enter F1 or F2 backstage operation.

1. The first line is reserved for user to type company name, name of operator, phone number etc., and these contents won’t be hid by pushing ESC button. You can edit the contents by using F1 key, and press Enter key to save and exit.
2. Please refer to meter counter operation prior to this operation. Using F2 background key to select the unit of length or the total length of push cable (this is designed in case the total length of push cable is changed). When the “L=” flashes, press up or down arrow key to select the unit of length, or select the correct total length. Press enter key to save and exit.

[METER COUNTER OPERATION]

1. Press the meter-zero button to set the meter to zero on screen display.
2. Change the unit of length or the total length of push cable, please refer to ‘F2 backstage operation’ contents in the wireless keyboard operation.

Note1: The deviation of MC will increase if the total length is not correct. You need to select the correct total length to decrease the deviation. Use this function to change the displayed total length when the push cable is cut off for more than 3 meters.
Note 2: Turn on the system before pulling out the push cable from the cable reel. It can decrease the deviation of the MC.

[PUSH CABLE AND CAMERA OPERATION]

At the job site

1. Always wear rubber gloves to operate the camera for health and safety reasons. Properly positioning the cable reel will save time and strength to push out and in the cable, and minimize the rate of equipment damage.

- When pushing, the end of your stroke should be as close to the entry as possible. Standing too far back with an excess of cable between your hands and the entry may cause the cable to fold on itself outside the entry and damage the cable.
- Try to keep the push cable away from sharp edge of a pipe entry because this may cause damage. If the camera does not seem to go any farther, **DO NOT FORCE TO PUSH THE CAMERA!** Try another entry if possible.

NOTE! Hands should be close to the line opening. DONOT catch the cable on the edge of an entry and continue to push.

2. Always try to run water down the pipe under going inspection. This will keep the system much cleaner, and allow you to push noticeably farther with less friction. If the water is preventing you from seeing an area of importance, temporarily turn it off.

3. When push the push cable through the pipeline by steady and slowly, a short distance entry per time, keeps the hands at the entrance, so that can control the push cable and prevent it stuck, bent or scratch.

4. When inspecting a pipe, most of the time a slow steady push through the system works the best. At changes in direction such as P-traps, Tee's, Y's, Elbows, etc. It is usually necessary to give a little extra push in the bends. Back the camera head approximately 8" (20cm) from the bend, if necessary, and give it a quick push, "popping" the camera through a turn, using the least amount of force required. Try to be as gentle as possible, and do not hammer or snap the camera head through corners. After some practice, you may learn that the best way to inspect a section of pipe is to push the camera through quickly. Then draw the camera back home slowly and evenly.

5. Make sure the sapphire window is clean prior to entry. Some users claim that a slight film of detergent on the lens minimizes the possibility of grease sticking to the port. If necessary, take advantage of any standing water in the pipe to wash the front of the camera by jiggling it in the water.

6. When you place the camera head into the pipe remember, as the materials of pipe vary, it will be necessary to adjust the lighting settings to maximize picture quality.

7. The system can travel through multiple 45 and 90 degree bends and wyes. Do not, however, try to force it through a P-trap or tee if there is a large amount of resistance.

NOTE! Do not try to use the camera head to clear obstructions. This System is a diagnostic tool, not a drain cleaner. Using the camera head to clear obstructions could damage the camera head or cause it to be caught in the obstruction.

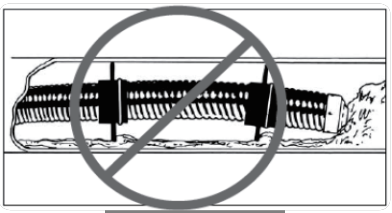


Figure 13. Improper operation

8. Do not attempt to remove or stores push cable on the reel solely by turning the reel itse if. You can manually push or pull cable from the reel and wind or unwind it.

9. If the camera sits in a pipe, or an enclosed environment, heat will build-up. This may lead to the camera head overheating which will cause fuzzy lines to appear on the monitor. In the event, this happens, turn off the system, remove the camera from the pipe (or enclosed environment) and let the camera head cool for 10 to 15 minutes. Running water into the line will also help cool the camera head. Always use the minimum illumination required to maximize picture quality and to avoid excessive heat build-up.

Retrieving the push cable

1. Once the inspection has been completed, pull the push cable back with slow, steady force. Do not force the push cable or exert excessive force. This could damage the camera or push cable. The push cable may get hung up while being retrieved, and may need to be manipulated as did during insertion.

NOTE! The camera head can get HOT! When finished with your inspection, or if taking a prolonged break in the middle of the inspection, turn off the system. 2. Once the inspection has been completed, pull the push cable back with slow, steady force. Do not force the push cable or exert excessive force. This could damage the camera or push cable. The push cable may get hung up while being retrieved, and may need to be manipulated as did during insertion.

Note! NEVER USE SOLVENTS to clean any part of the system. Substances like acetone and other harsh chemicals can cause cracking of the camera ring, which could affect waterproofing.

3. Storing the push cable into the cable reel. One hand holds the push cable, the other hand close to the cable wheel. Slowly and gently push the push cable slide via the hook of the handle, cable reel will rotate and store the push cable inside.

Note! The hands should be close to the cable wheel when storing the push cable. Push the push cable a small piece every try. Push a long distance can cause the push cable bend or broken.

[BATTERY SAFETY AND USING GUIDE]

Using safety

Read the following battery precautions before using the battery and charger, to reduce the risk of electrical shock.

1. Recharge batteries with accessory charging units.
2. Check the power units and battery every time before using the equipment, be sure no problem, use of unauthorized parts may result in electrical shock, fire and/or serious personal injury or damage other instruments and system.
3. Never connects the car charger to any 24 volt cigarette lighter slot. It will harm the battery and DVR.
4. Do not short circuit, it may cause fire, electrical shock.
5. Do not charge the battery under rain or wet conditions. Water entering the charger will increase the risk of electrical shock.
6. If the charger and battery are damaged, do not use or stop to charge. It may cause electrical shock.
7. Don't disassemble the case, only qualified repair person can repair and maintenance.
8. Properly dispose of the battery. Exposure to high temperatures can cause the battery to explode. So do not dispose of in a fire. Some countries have regulations concerning battery disposal. Please follow all applicable regulations.
9. Do not touch anything which out from battery, which would burn or damage the skin, once touches please flush with water. If in eyes, immediately get medical help fast.

Using Guide

Follow the steps as below to reduce the injury of the electric shock.

1. Power indicator LED will be red during charging, will be turned to green when charged fully. If battery empty for a long term, it will pre-charge the battery automatically in 10 minutes, and LED will be blinking in red.
2. It needs about 8 hours to charge the battery fully. The battery can charge online, charging and supplying of work will not increase charging times.
3. User can use a power adaptor or car charger to charge the battery. If no use in a long term, take a recharge per 6 month, to ensure the battery in normal working status.

[OTHERS]

Troubleshooting

Problem	Probable fault location	Solution
Meter is not accurate	Knurled wheel slip	Fit glassfiber cable into the guide solt and hook.
	not set to zero	Press reset button to set zero.
No image	Cable connection faulty or loosely	Check cable connection, clean and reconnect if necessary
	Camera connector soiled	Clean the camera connector
	Wrong SD memory card	Turu off power and replace SD card
	Wrong setting	Enter the setup menu and select reset
DVR Can not boot	No power	Recharge
	Transient short circuit in the cable cause the battery short circuit protection.	Recharge the DVR more than 2 seconds with adaptor or car-charger to activate the battery.
Can not input Characters	The wireless keyboard low battery	Chang battery
	Wireless Keyboard or Receiver fault	Check the Keyboard Receiver and the keyboard on a PC
The deviation of MC more than 0.5%	select the wrong total length	Re-select the correct total length. You can press F2 key when the machine boot within 5 sec to enter background to select it.
	Pull out cable more than 3 meters before turning on the system.	Turn on the system before pulling out the push cable from the cable reel.

FCC Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation. Any changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the device.

CE

This product complies with standards including Low Voltage Device Directive 73/23/EEC;

EMC

Directive 89/336/EEC. It passed the subject tests by the authority concerned and is authorized to bear CE mark.

Camera C23MNS Specifications （**Optional**）

Type	Item	Parameter
General	Camera Size	Φ23mm×45mm (Main body)
	Camera Length	150mm(Total)
	Power Supply	DC9~15V
	Current Consume	55mA(LED OFF)；110mA(LED ON)
	Water-Proof	20m Water (Camera fix on Cable)
	Shell Material	304# Stainless Steel
	Lighting	Built-in 12×LED(White)
	Weight	150g(approx)
	Operating Temperature	-10~50°C/+14~+122°F
	Operating Humidity	30%RH~90%RH
	Storage Temperature	-20~60°C/+4~+140°F
Image	Sensor	CMOS
	TV-Line	420 TV-Line
	Resolution	720×576
	View Angle	120°
	Focus Distance	20cm (approx)
	Depth-of-Field	100cm(approx)
	Front Lens	Sapphire

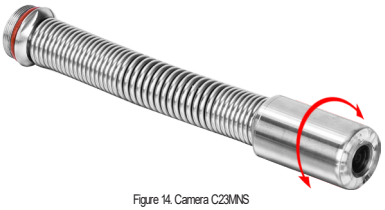


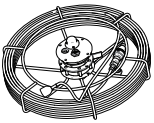
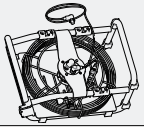
Figure 14. Camera C23MNS

Camera C23MTO Specifications （**Optional**）

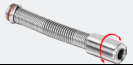
Type	Item	Parameter
General	Camera Size	Φ23mm×45mm (Main body)
	Camera Length	150mm(Total)
	Power Supply	DC9~15V
	Current Consume	70mA(LED OFF)；125mA(LED ON)
	Water-Proof	20m Water(Camera fix on Cable)
	Shell Material	304# Stainless Steel
	Lighting	Built-in 12×LED(White)
	Weight	150g(approx)
	Operating Temperature	-10~50°C/+14~+122°F
	Operating Humidity	30%RH~90%RH
	Storage Temperature	-20~60°C/+4~+140°F
Image	Sensor	CMOS
	TV-Line	480 TV-Line
	View Angle	120°
	Focus Distance	20cm (approx)
	Depth-of-Field	100cm(approx)
	Front Lens	Sapphire
Transmitter	Frequency	512±2Hz
	Transmit Mode	Constant
	Transmission Distance	5 meter under ground (max)

Figure 15. Camera C23MTO

Part Number List

No.	Part Number	Part Name	Specifications	Picture
1	C23MNO	Camera head	Sony CCD 480TVL, Φ23×150mm, 120° View Angle	
2	4-601	Cable	Spiral cable with 6pin aviation plug. 71cm long. Connect panel to. toolsbox	
3	2-312	Adaptor	DC 12V 1.5A Adaptor	
4	2-323	Car Charger	DC 12V 2A Car Charger	
5	3-412	Remote Control	13 Key Remote Control	
6	R1820U R1830U R1840U	Cable Wheel	Φ5.2mm cable. push rod and keyboard text writer unit components 20/30/40m length optional.	
7	M1820U M1830U M1840U	Cable wheel and frame	Include frame, coil, cable, push rod and keyboard text writer unit components Cable length: 20/30/40m (optional)	
8	K7924K	Wireless keyboard	Wireless keyboard and receiver	
9	8-901	Guide	80 Support Guide	
10	8-923	Guide	46 Support Guide	
11	9-001	Maintenance	The parts for fiberglass Connector	

Optional Part List

No.	Part Number	Part Name	Specifications	Picture
1	C23MNS	Camera head	CMOS 420TVL, Φ23×150mm, 120° View Angle with Self Leveling	
2	C23MTO	Camera head	CMOS 480TVL, Φ23×150mm, 120° View Angle with 512Hz Transmitter