HM-Series

Thermal Night Vision Camera

Operator's Manual

Document Number: 432-0004-00-10
Revision: 120
March 2012



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1 Introduction

The HM-Series handheld thermal imaging camera gives every mariner the power to see at night like never before.

The HM-Series camera gives you the power to see more—and to see farther—than every other night vision technology around:

- When you have the HM-Series camera on deck, at night in dark anchorages you will be able to see your surroundings, even when it is cloudy and there is no moonlight or starlight.
- See clearly in total darkness—unlike other night vision systems, HM-Series cameras require no light at all
- See logs, rocks, land, and other hazards that radar can miss
- Boat with confidence at night knowing that you can see harbor entrances and waterways in total darkness
- See with FLIR's award-winning maritime thermal night vision technology in the palm of your hand



Your Vision

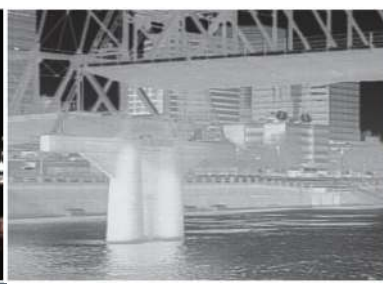


Image with HM-Series Camera

1 – 1 HM-Series Camera Features



- Rugged design—Built to withstand the demands of maritime use. It is fully submersible (IP67).
- Microbolometer sensor for excellent image quality and clarity
- Hot Shoe—Provides convenient power input and video output.
- Choose the 19 mm lens with 24° field of view or include a removable 2× optical extender.
- Two-sided Hand Strap—Accommodates both left-handed and right-handed users.
- Software upgrades using an SD card.
- SD Card Slot—Allows for storing captured still images and video (HM-324 XP+ only) on the removable SD card.[1]
- USB 2.0 Connection—Rapid transfer of files from the camera to a PC.[1]
- Four rechargeable AA NiMH batteries—Provides up to 5 hours of camera operation on a single charge.

1. Available only with the HM-224 Pro or HM-324 XP+ models.

1–2 Cautions

Do not disassemble the camera enclosure. Disassembly can cause permanent damage and will void the warranty. Keep the compartment covers closed to avoid exposing the cameras electronics to water or debris.

Do not point the camera directly at extremely high-intensity radiation sources, such as the sun, lasers, arc welders, etc.

Only use the auxiliary power adapter provided with your HM-Series camera. Connecting the camera to an improper power source may damage the camera and void your warranty.

Be careful not to leave fingerprints on the camera's infrared optics.

Caution!

The camera window has an anti-reflective coating and should only be cleaned with low pressure fresh water and a lens cloth. Improper care of the camera window can cause damage to the anti-reflective coating, degrade the camera's performance, and void the camera warranty.


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2 Getting Started

The HM-Series cameras shown below are available with the features, options, and accessories described in this manual.



19 mm Lens Configuration



19 mm Lens with 2× Extender

2–1 Shipping Kits

Refer to the packing list enclosed with your camera shipment to determine the actual contents of your camera package.

- **HM-224 and HM-324 XP Cameras**
- **HM-224 Pro and HM-324 XP+ Cameras**
- In addition to the camera, Quick Start card, and Documentation/ Training CD or DVD; the following items are included in the camera package:



2–2 Options and Accessories

2× Optical Extender for 19 mm lens:

Note

The 2× Optical Extender is not waterproof and should not be used in wet environments.

The attachable 2× Optical Extender lens doubles the range of performance when needed, without sacrificing the situational awareness benefits of the wide field of view lens.



Camera Case

Protection for your camera and all accessories.



Hardshell Storage Case

Protection for your camera and all accessories.




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3 Operating Your HM-Series Camera

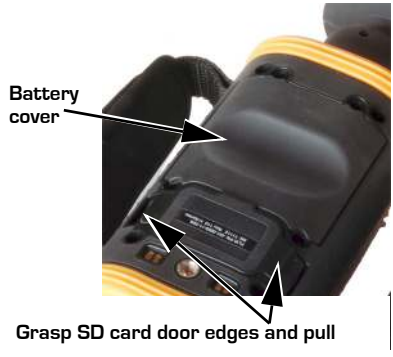
3–1 Camera Features and Controls



3–2 Installing the Batteries and SD Card

The batteries must be installed and charged before using your camera. Also install your SD card at this time.

1. To help when removing the battery cover, remove the small SD card door. No tools are required.
2. Loosen the four captive screws securing the battery cover.
3. Remove the battery cover by grasping the front edge exposed when the card door was removed.



4. Install the batteries as shown.
5. Iinstall the SD card.





6. Snap the SD card door back into place, ensuring that the rubber lanyard retracts into the camera.
7. Re-install the battery cover—it only fits one way.
8. Tighten the four screws.

If you have installed rechargable batteries, they must be charged before using the camera. Regular AA batteries will provide about one and a half hours of camera use.

3–3 Charging the Camera

The batteries in the camera must be fully charged prior to use. If not fully charged or if the recommended batteries are not installed, the battery status indicator may not accurately reflect the remaining battery life. Only use the auxiliary power adapter provided with your HM-Series camera.

1. Connect the Hot Shoe to your camera.
2. Rotate the attachment wheel in the clockwise direction until tight.
3. Plug the power adapter provided with the camera into its power source and also into the Hot Shoe.

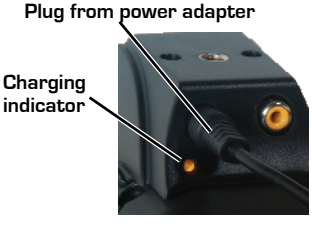


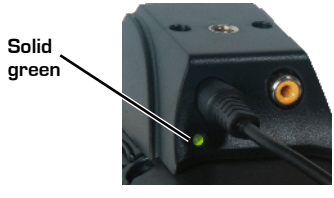
4. Ensure that the plug is fully seated in the Hot Shoe.

   When charging correctly, the charging indicator will be lit yellow and will blink green for one second within about 35 seconds.

   The charging indicator will continue to blink at decreasing intervals until the batteries are fully charged.

   When fully charged, the charging indicator will be lit solid green. The initial charge time is approximately 4 hours.





Note

The charging indicator will be lit solid green when the Hot Shoe is not connected to the camera or the recommended batteries are not installed. Ensure the batteries are charging by verifying the green blink described above.

3–4 HM-Series Power Management

Your HM-Series camera is equipped with a power management system that provides up to five hours of continuous operation and up to five days of standby time between battery charges. To make the best use of the camera and to assure it is always ready when you need it, it is important to understand the basic power states of the camera.

The HM-Series camera is designed to operate much like your cell phone:

- It is rarely turned off unless you do not plan to use it for a few days or more.
- When near a power source or when not in use, you keep it on the charger.
- When you turn it on from all the way off, it takes about 90 seconds to become operational.
- In Standby, it is always ready to go. Press the Power button and it is on in about two seconds.
- It will automatically put itself in Standby to conserve the battery.

A red state LED located next to the display indicates the current power state and can only be seen when the shuttered eyepiece is opened (for example, when the camera is held up to the eye) or when the eyepiece is removed as shown in the photograph below.



Power States

- Three power states: Off, On, and Standby
- The initial power-on Bootup process between the Off state and the On state takes about 90 seconds (fast flashing red state LED). During the Bootup process, pressing the Power button again will turn the camera off. After the camera finishes its power-on Bootup process, it is in the On state (state LED is off). After the camera is On, pressing the Power button will toggle the camera between On and Standby (state LED is flashing slowly).
- When battery powered, if Auto-Standby is enabled (see "Auto-Standby Operation" on page 24), the camera goes to Standby after three minutes if no buttons are pushed. A warning is shown in the display.
- From the Standby state, the camera comes back on within about two seconds when the Power button is pushed.
- The Auto-Standby function is disabled if the camera is powered with external power.

During most use scenarios you will change between Standby and On. When the camera will not be used for extended periods, you might consider putting the camera into the OFF state.

Camera State	How do you know?
Off	The display and the state LED are off
On	Power-on Bootup—Color bars on the display and the state LED is flashing quickly
	There is a thermal image on the display and the state LED is off
Standby	The display is off and the state LED is flashing slowly

3–5 Buttons and Controls

Power Button



Changing between the Off, On, and Standby power states is controlled by the Power button. The table below describes how the camera moves between states.

From State	To State	Method
Off	On	Press the Power button for 1 second. (This will put the camera in power-on bootup for about 90 seconds before going to On.)
On	Standby	Momentarily press the Power button
Standby	On	Momentarily press the Power button
On	Off	Press and hold the Power button for 8 seconds
Standby	Off	Press and hold the Power button for 8 seconds

To shut off the camera completely press and hold the Power button for eight seconds.

After holding the Power button for three seconds this message will be shown in the display and the camera will enter the Off state if the countdown finishes.



Release the Power button at any time during this countdown to terminate Shutdown and resume normal operation.

ESD Recovery Sequence

In the unlikely event of a large Electrostatic Discharge (ESD) to the camera it is possible for the camera system to lose video or become frozen. If this occurs, the following recovery sequence should restore the video:

- Hold down the power button for fifteen seconds and then release.
- Wait for five to ten seconds.
- Press the power button again. The camera should begin its bootup sequence.

Capture Button–HM-224 Pro and HM-324 XP+ models only



Use this button to capture snapshots (in JPEG format) or video clips (HM-324 XP+ only). The files are stored on the SD card.

- Momentarily pressing the button captures a single snapshot.
- Pressing and holding the capture button for three seconds puts the camera in video record state. The video record icon should be displayed. The button may now be released and the camera will continue to record until the capture button is pressed again. The video file is then written to the SD card in AVI format.

Twenty-five seconds of video requires about one megabyte (MB) of storage on the SD card. The image and video files must be transferred to a computer for viewing.

Note

The images must be transferred to a computer via the USB cable, or the SD card can be temporarily removed from the camera and inserted in a card reader.

- If the camera is not an HM-324 XP model, this message will be shown in the display.



- If an SD card is not installed, this message will be shown in the display and no image will be stored.
- If the SD card is full, a warning will be shown in the display and the image will not be stored.



Note

The stored image will include the thermal image, time and date information, and the FLIR logo. Other icons seen in the display are not stored on the saved image.

Still Frame Capture and Store—To capture and store a single still image of what is currently being shown in the display, momentarily press the Capture button. The thermal image will momentarily freeze and the following icons will appear in the display:





The SD Card Memory Gauge indicates how much memory is left on the SD card. The camera icon with the green lens indicates that a single frame was successfully stored to the SD card. Still images are stored in the JPEG file format at the captured pixel resolution. Still images are approximately 90Kb in size.

Video Capture and Store—To capture and store a video sequence of what is currently being shown in the display, press and hold the Capture button for three seconds. Video capture will begin immediately and continue until the Capture button is pressed again.

During the video store process, real-time video will be shown and these icons will appear in the display:



The lens on the camera icon will flash red/green during recording.



Video is stored in an MPEG-4 format at approximately 8 seconds per megabyte.

Zoom Button—not available on HM-224 model



Use this button to switch the camera between no zoom (full resolution) and 2× zoom. The central part of the image is magnified twice its normal size when 2× is selected.

Zoom Indicator—When zoom has been selected the icon is continuously shown in the display:



White/Black Hot/Marine Red Button



Use this button to toggle between the video options. In the default White Hot mode, hotter objects appear as white or light grey. In the Black Hot mode, hotter objects appear as black or dark grey. The Marine Red mode is based on the White Hot mode, but the hottest objects in the scene are red to help maintain normal night vision.

While white hot is the most commonly used and visually intuitive method of viewing thermal imagery, black hot can often enhance contrast of certain objects or provide better visual perspective in some conditions. When switching between modes, the appropriate icon is displayed for approximately 3 seconds.

White hot



Black hot



Marine Red



Display Brightness Button



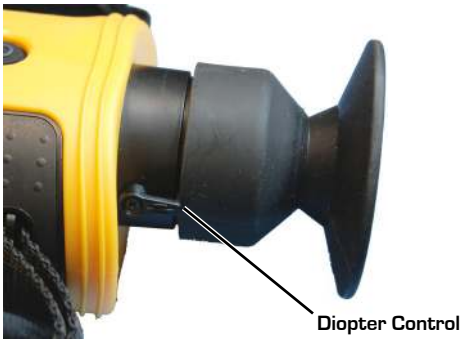
Use this button to cycle through the five levels of display brightness. Each press of the button advances to the next level of brightness.

When the highest brightness level is reached, subsequent button presses advance to the next lower brightness levels. When the lowest brightness level is reached, subsequent button presses advance to the next higher brightness levels. One of the following icons is displayed for approximately 3 seconds after the button is pressed indicating the current brightness level:

Lowest Highest



Diopter Controls



The diopter adjustment lever allows you to adjust for optimum image sharpness in the eyepiece. When the diopter adjustment lever is pointing straight away from the front of the camera, it is in the neutral position.
Adjust the diopter setting for the sharpest image in the viewfinder.

3-6 Batteries

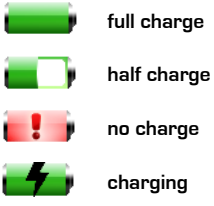
Your HM-Series camera is equipped with a sophisticated power system that accommodates a wide variety of AA battery types. This includes rechargeable and non-rechargeable batteries.

The camera is optimized for operation with the 2700 mAh rechargeable NiMh batteries that were supplied with your camera. It is recommended that you use these batteries in all but emergency situations.

Note

Replacement batteries are available online from FLIR Commercial Systems, Inc.

Battery Status Indicator–While the camera is On, a battery status indicator is always shown in the corner of the display image. This indicator provides an estimation of the remaining battery charge.



Note

If non-rechargable batteries are installed the battery indication may not be accurate.

Using Non-Rechargeable Batteries –The HM-Series camera allows Alkaline non-rechargeable batteries to be used. When non-rechargeable batteries are installed, connecting the Hot Shoe to a power source will power the camera from the power source and the battery charging circuitry will be disabled.

Note

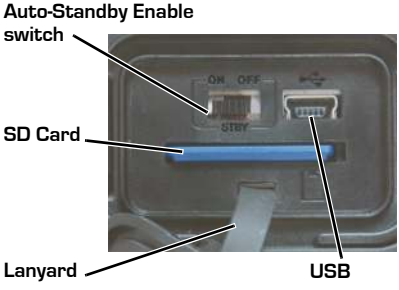
When using Alkaline batteries, operating battery life is reduced to approximately 1.5 hours.

Low Battery Auto-Shutdown–When the batteries are almost fully depleted the camera will automatically initiate a shutdown process.

3–7 SD Card Door

The SD Card door is located on the bottom of the camera in front of the battery compartment. The SD card, the USB connector, and the Auto-Standby Enable switch are located under the door. See "Auto-Standby Operation" on page 24.





Note

The Hot Shoe must be removed to access the SD Card door.

To open the SD Card door, grasp the two edges with your thumb and finger and pull straight up.



Caution!

Do not stretch or break the rubber lanyard that keeps the door captive to the camera when opened.

To close the SD Card door, slide the lanyard strap back into the camera, position the door in place, and then firmly press in the middle of the door until it is fully seated.

SD Card Capacity and Type

The HM-224 Pro and HM-324 XP+ model cameras support storing images and video (HM-324 XP+ only) on standard 1-Gb and 2-Gb SD cards or up to 32-Gb on SDHC cards.

If an SD card is inserted into an HM-224 or HM-324 XP model, it will be ignored unless the camera software detects a valid upgrade file. In order to store images and video on the SD card, the HM-224 model must be upgraded to an HM-224 Pro and the HM-324 XP model must be upgraded to an HM-324 XP+. See "Installing Software Upgrades" on page 29.

Installing an SD Card

To install an SD card, insert the card into the slot and press on the SD card until its edge is nearly flush with the surface and release.

To remove an SD card, use this same motion.



Downloading Stored Files via USB

The HM-224 Pro and HM-324 XP+ model cameras also support downloading stored images and video via the USB port.

With the camera on, plug the USB cable into the USB connector on the camera and a USB port on your computer.

Allow up to two minutes for the USB connection to be recognized by the computer's operating system.

3–8 Auto-Standby Operation

Auto-Standby is a feature of the HM-Series cameras that helps to guard against draining the batteries prematurely by inadvertently leaving the camera on. Auto-Standby puts the camera into the Standby state if the following three conditions are met:

- The camera is in the On state.
- The Auto-Standby switch (STBY) is set to ON.
- No buttons have been pressed for three minutes.

Once these conditions are met you will see the following message in the display and the camera will enter the Standby state after the countdown is finished:



Press any button during this countdown to terminate Auto-Standby and resume normal operation.

Note

Pressing any button during an Auto-Standby countdown will only terminate the countdown and abort the Auto-Standby. The normal function of the button will not occur.

Auto-Standby Switch

Unattended operation of the camera may require disabling Auto-Standby.

Select OFF to turn off Auto-Standby.

Select ON to turn on Auto-Standby.





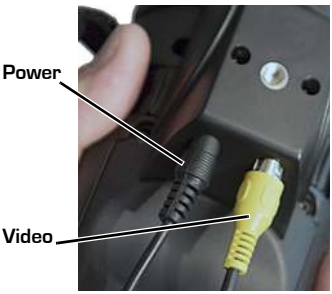
If Auto-Standby is off, a reminder message will appear in the display each time the camera enters the On state.

3–9 The Hot Shoe

Note

The Hot Shoe is not waterproof and should not be used in wet environments.

The Hot Shoe provides the connections to power the camera for continuous operation or charging the batteries; and for accessing the analog video output. The Hot Shoe attaches to the bottom of the camera and is secured via the tripod mount.



The following steps are recommended for quick and easy attachment of the Hot Shoe.

1. With the camera positioned bottom-side up, hold the Hot Shoe in position.



2. Rotate the attachment wheel in the clockwise direction until tight.



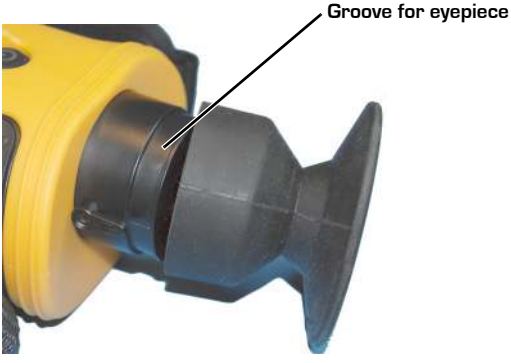
3. To remove the Hot Shoe, simply rotate the attachment wheel in the counter-clockwise direction until it is free.



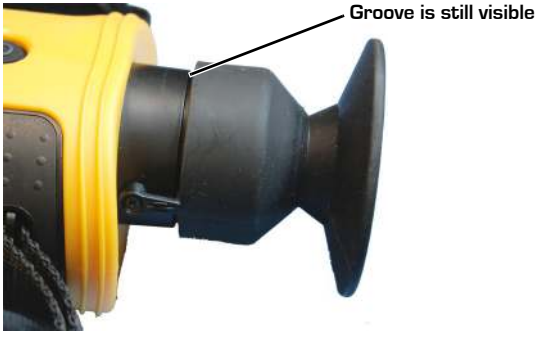
3–10 Installing the Shuttered Eyepiece

The shuttered eyepiece keeps light from coming out of the viewfinder display. Pressing your eye up against the eyepiece opens the shutter. The shutter closes automatically.

The eyepiece fits into a groove around the display housing.



When pressing the eyepiece into position, ensure that the diopter lever is free to move.



If the eyepiece is pushed too far onto the display housing it will interfere with the diopter lever.

3–11 Bayonet Lens Mounting System

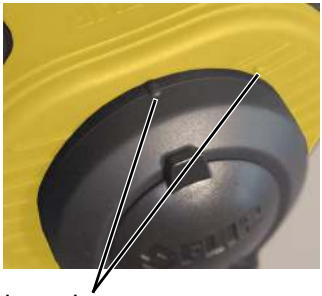
The HM-Series camera is equipped with a robust bayonet mounting system to allow for field-interchangeable optics options. As shipped, the camera comes with a lens-cover assembly mounted on the bayonet mount.

Operation of the Lens-cover Assembly

The lens cover is a simple flip-to-open lens cover that provides protection for the camera lens when not in use. To open, simply flip the lens cover down to the fully open position (45° pointing toward the ground as shown in the photograph at the right).



To remove the lens-cover assembly, rotate the outer ring of the lens cover clockwise so that the index mark on the top of the lens cover aligns with the index mark on the front body of the camera (approximately 45°), and pull straight off.



3–12 2× Extender

Note

The 2× Optical Extender is not waterproof and should not be used in wet environments.

The 2× Optical Extender is compatible with all HM-Series camera models and provides the user the ability to see farther and/or enhance the resolution of objects in the field of view. The 2× Optical Extender is mounted on the bayonet mount in front of the existing lens on the camera.

To mount the 2× extender, first remove the lens cover assembly. Then, position the 2× extender so that the release lever on the 2× extender is in the 5 o'clock position on the bayonet mount. Firmly push the extender onto the bayonet mount, then rotate the lens counter-clockwise so that the release lever reaches the 3 o'clock position where it will hit a hard stop.



Note

The 2× extender is manually focused by rotating the outer rubber-coated ring.

To remove the 2× extender, press the release lever and rotate the extender clockwise until the release lever is roughly at the 5 o'clock position and pull straight off.

Caution!

Be sure to replace the lens cover assembly when the 2× Extender is not in use to avoid moisture, dust, or other contaminants reaching the inner lens surface of the 2× Extender.

3–13 Installing Software Upgrades

Software upgrades may become available during the life of your HM-Series camera. The upgrade process requires an SD card loaded with the upgrade file. After receiving the upgrade file from FLIR, load it onto your SD card.

Caution!

During a software installation, the camera must remain powered on. Turning off the camera, or losing power for any reason, may damage the system files and require that the camera be returned to the factory for repair.

Use the following procedure to install the upgrade:

1. Ensure that the camera battery is fully charged. (The software installation will not start if the battery charge is less than 50%.)
2. With the camera off, install the SD card loaded with the upgrade file. Refer to "SD Card Door" on page 22.
3. Install the Hot Shoe and connect to a power source. Refer to "The Hot Shoe" on page 25.
4. Turn on the camera. During its Bootup process, the camera will check the SD card for a valid upgrade file.
5. Watch the display. When a valid file is found, a message will be shown for about ten seconds directing you to "Press and hold Capture button for 2 seconds to initiate update." If you ignore the message, the camera will resume normal operation and enter the On state.
6. While the message is displayed, press and hold the Capture  button for two seconds.The software upgrade takes about four minutes. When finished you will see this prompt to restart the camera. **SW Upgraded: Please Shutdown & Restart now**

7. To check the current installed version of software, place the camera in standby, then turn on while looking in the upper right corner of the display for the software version number, as shown below.



4 Technical Data

4–1 HM-Series Camera Model Features

The HM-Series cameras are available with either NTSC or PAL video output format and two resolutions. The HM-224 and HM-224 Pro both have video resolution of 240 × 180 pixels, while the HM-324 XP and HM-324 XP+ both have video resolution of 320 × 240 pixels.

HM-Series Model	
HM-224	HM-Series Handheld Thermal Camera with video resolution of 240 × 180 pixels
HM-224 Pro	HM-Series Handheld Thermal Camera with video resolution of 240 × 180 pixels, 2× electronic zoom, still image capture, and enabled USB2 port.
HM-324 XP	HM-Series Handheld Thermal Camera with video resolution of 320 × 240 pixels, 2× electronic zoom.
HM-324 XP+	HM-Series Handheld Thermal Camera with video resolution of 320 × 240 pixels, 2× electronic zoom, still image capture, video capture, and enabled USB2 port.
	Hot Shoe Charging & Video Output Attachment, 4 Rechargeable AA Batteries, AC Power Adapter/Charger, Neck Lanyard, Operator's Manual, Video Output Cable, and USB Cable

Feature	
Start up from stand-by	<1.5 seconds
Thermal Sensitivity, Waveband	<50 mK @ f/1.0, 7.5 - 13.5 µm
Detector Type	VOx Microbolometer
Resolution	240 × 180 pixels HM-224 and HM-224 Pro
	320 × 240 pixels HM-324 XP and HM-324 XP+
Image Processing	FLIR Proprietary Digital Detail Enhancement
Focus, Zoom	Fixed focus, 2× electronic zoom
Video Output	NTSC or PAL composite video; RCA jack; <9 Hz frame rate

4–2 Power

Battery Types	4 AA Batteries; NiMH or Alkaline
Battery Life Operating (Stand-By)	Approximately 5 Hours on NiMH batteries at 25°C, (120 hours on NiMH batteries)

4–3 Environmental

	HM-224 and HM-224 Pro	HM-324 XP and HM-324 XP+
Operational Temp.	32°F – 122°F (0°C – 50°C)	-4°F – 140°F (-20°C – 60°C)
Storage Temp.	-4°F – 158°F (-20°C – 70°C)	-40°F – 167°F (-40°C – 75°C)
Ratings (not including the Hot Shoe or the 2× Optical Extender)	IP-67, Submersible, 1 meter drop	

4–4 Physical

Weight (incl. lens)	1.45 lb. (653 g) with batteries; add 0.7 lb. (315 g) for 2× extender
Size (L × W × H)	10.42" × 3.33" × 2.62" (256 × 84.5 × 66.5 mm)

4–5 Field of View

	HM-Series
Field of View (FoV)	24° × 18°
FoV (w/Optional 2× Extender)	12° × 9°

4–6 Storage File Formats

	HM-224 Pro	HM-324 XP and HM-324 XP+
Still Image Storage, Format	SD, SDHC (up to 32-Gb) card, JPEG; 240 × 180 resolution	SD, SDHC (up to 32-Gb) card, JPEG; 320 × 240 resolution
Video Storage, Format		Approx. 8 seconds/Mb on SD, SDHC card, 320 × 240 resolution AVI format (HM-324 XP+ only)

4–7 Range Detection

	HM-224	HM-324 XP/with 2× Optical Extender
Detect Man (1.8 m × 0.5 m)	1,050' (320 m)	1,500' (450 m)/2,590' (790 m)
Detect Vessel (2.3 m × 2.3 m)	2,940' (900 m)	4,200' (1.2 km)/1.3 mi. (2.15 km)

1. Actual range may vary depending on camera set-up, environmental conditions, and user experience.


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