

PHASE**ONE**

iXM-FS130

Integration Guide

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1. Introduction

1.1 Scope

This guide describes how to operate the iXM-FS130 as follows:

- [Section 2 - iXM-FS130 Overview](#)
- [Section 3 - iXM-FS130 Features](#)
- [Section 4 - Cable Specifications](#)
- [Section 5 - Unboxing the iXM-FS130](#)
- [Section 6 - Mounting and Dismounting a Lens](#)
- [Section 7 - Connecting the iXM-FS130](#)
- [Section 8 - Configuring Auto-Exposure Mode](#)
- [Section 9 - Storing Images](#)
- [Section 10 - Live View/HDMI Display](#)
- [Section 11 - Miscellaneous Camera Settings](#)
- [Section 12 - Managing Camera Firmware](#)
- [Section 13 - Interpreting the iXM-FS130 LEDs](#)
- [Section 14 - Specifications](#)

1.2 Applicable Documents

Item	Manual
Phase One Software Development Kits (SDKs) including Phase One CameraSDK	developer.phaseone.com

1.3 List of Terms and Abbreviations

Term/Abbreviation	Description
FMS	Flight Management System.
HDMI	High-Definition Multimedia Interface connector for monitors.
XQD card	Format for flash memory cards.
CFexpress	Format for flash memory cards.

2. iXM-FS130 Overview

The iXM-FS130 is a wide area high resolution camera with high sensitivity, low noise, and minimal integration time for diverse demanding applications. The iXM-FS130's patented fusion shutter enables record-breaking short exposures.

The iXM-FS130 can be used with various Phase One lens series featuring focal length options, ranging from 35 mm to 180 mm.

The following figures show the location of iXM-FS130 parts.



- 1. Pod mounting threaded holes (four)
- 2. Lens secure screws (four)



- 3. Memory card slot cover
- 4. Memory card slot cover screw



- 5. Storage LED
- 6. Operation LED
- 7. USB 3.1 port cover screw
- 8. USB 3.1 port cover
- 9. Left LEMO port (data)
- 10. Center LEMO port (data)
- 11. Right LEMO port (power)
- 12. Power LED



- 13. SFP+ port cover screw
- 14. SFP+ port cover
- 15. HDMI port cover
- 16. HDMI port cover screw

3. iXM-FS130 Features

3.1 Fusion Shutter Technology

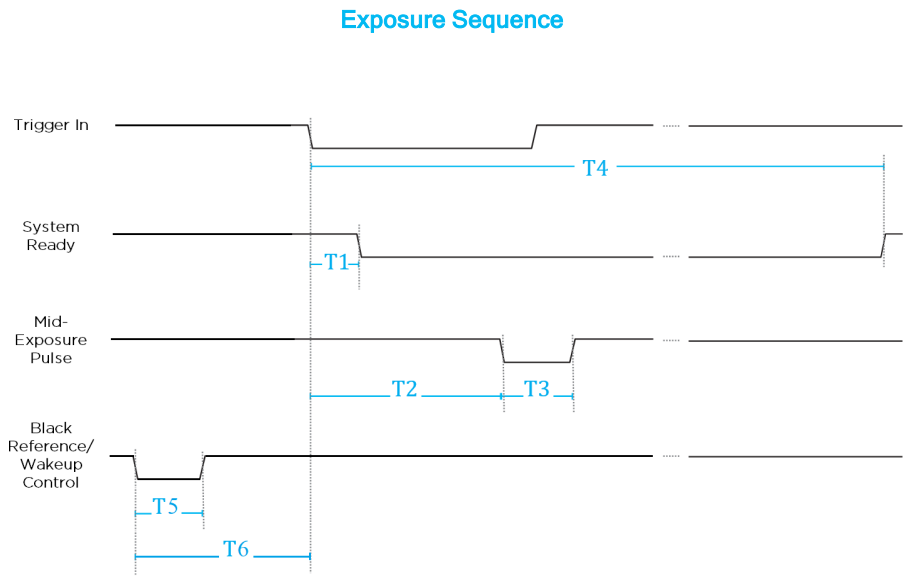
The Phase One Fusion Shutter combines mechanical leaf and electronic global shutter technologies to deliver high-speed, distortion-free imaging.

The Fusion Shutter specifications include the following:

- **Speed:** Captures up to 4 frames per second (fps) with a shutter speed of 1/16,000 second.
- **Imaging Quality:** Achieves sub-centimeter Ground Sampling Distance (GSD) while eliminating Parasitic Light Sensitivity (PLS).
- **Durability:** Rated for a minimum lifespan of 500,000 actuations.
- **Data Efficiency:** Supports the IIQ-X file format for compact, easily transferable data.

3.2 Exposure Sequence

The following figure and tables describe the signals and hardware pulses that control the exposure sequence.



Exposure Sequence Signals

Signal	Description
Trigger In	The FMS signals the iXM-FS130 to capture an image.
System Ready	Camera ready/busy signal.
Mid-Exposure Pulse	Indicates the midpoint of the exposure time.
Black Reference/Wakeup Control	Dual-purpose signal.

Hardware Pulses and Delay Parameter Signals

Sequence Step	Shutter
T1 Trigger IN – SysRdy (Low)	2 ms
T2 Trigger IN – Mid Exposure	2.0 ms + 0.5*(Exposure Time)
T3 Mid Exposure Width	0.5 * Exposure Time
T4 Trigger IN – SysRdy (High)	Readout Time + Exposure Time
T5 Wakeup pulse (minimum)	1 ms
T6 Wakeup pulse – Trigger IN (minimum)	350 ms

Note

Enabling low power mode can cause slowness in capture rate when the image capture rate is slower than the low power mode timing. If, for example, the capture rate is scheduled at 15 seconds and the low power mode is set at 10 seconds, each capture will be delayed by up to 350 ms. If the capture rate is crucial, disable low power mode or use hardware wakeup signal.

3.3 Black Reference

3.3.1 Understanding Black Reference

A black reference is the process of reading the sensor output during an exposure without the sensor being exposed to light. This data is written to the iXM-FS130 and subtracted from regular captures to filter out sensor noise.

Updating the black reference data whenever possible enhances the image quality, particularly when shooting in conditions where the camera temperature fluctuates. If the exposure time varies considerably, the black calibration reference data should be updated.

To ensure exposure accuracy, a black reference capture should be made before starting your first flight line, or if exposure settings or ISO have been changed. This is best done before starting a new flight line, when images are not being captured.

Note

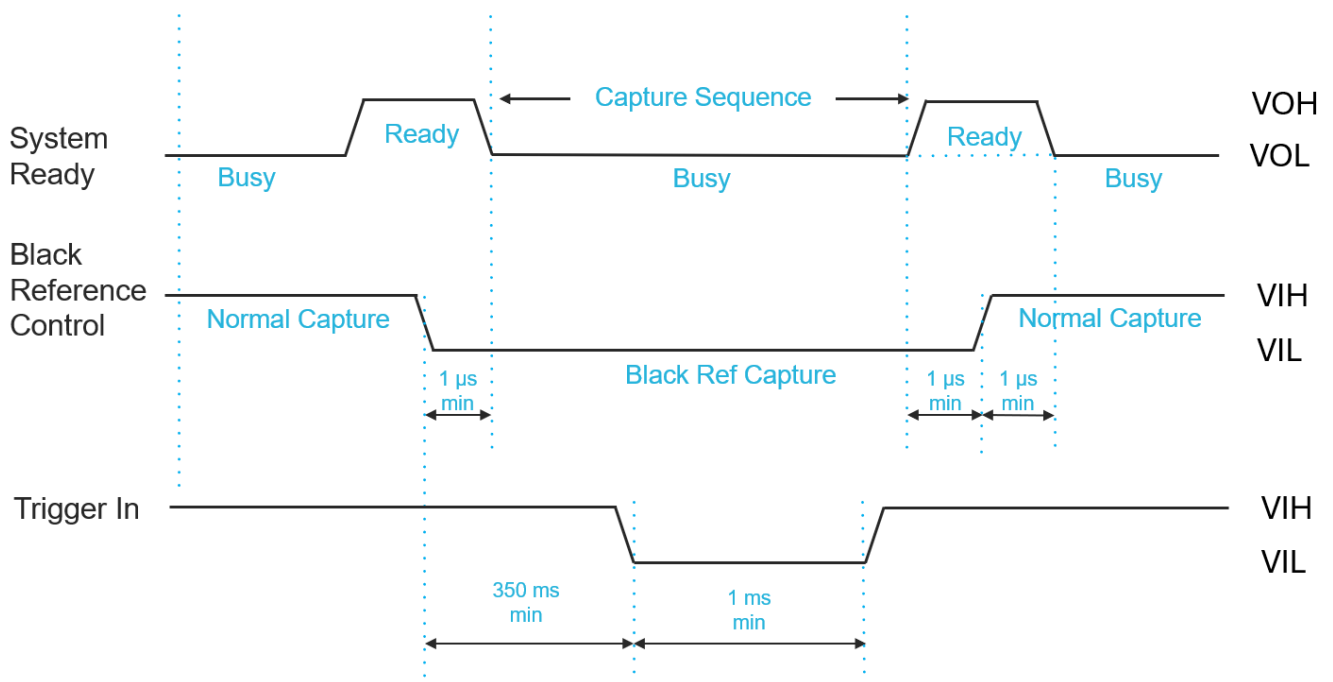
Black reference is performed automatically with the first shot after switching the iXM-FS130 on.

3.3.2 Hardware Activation of Black Reference

If you are building your own hardware control box, you can update the black reference data in the iXM-FS130. The black reference control signal should be kept low while an image capture cycle is initiated. The signal must remain low for the full capture cycle.

This makes it possible to create a black reference whenever it is convenient (such as when turning an aircraft around or between flight lines). When the force black signal is kept high, the iXM-FS130 uses the last updated black reference data.

Black reference timing is shown in the following figure.



Note

The system minimizes trigger latency by waking up immediately when the wakeup control signal changes state.

3.3.3 Software Activation of Black Reference

The iXM-FS130 can perform a black reference sequence through Phase One CameraSDK or the Flight Management System.

There are two possible black reference modes that you set with the **Black Ref.** parameter:

Black Ref. Modes	Description
Create	Use the black reference that is created according to the Black Ref Create parameter setting (see the next table).
Prerecorded	Use a prerecorded black reference created during iXM-FS130 production. There is no delay in capture flow and the same black reference is used for each capture.

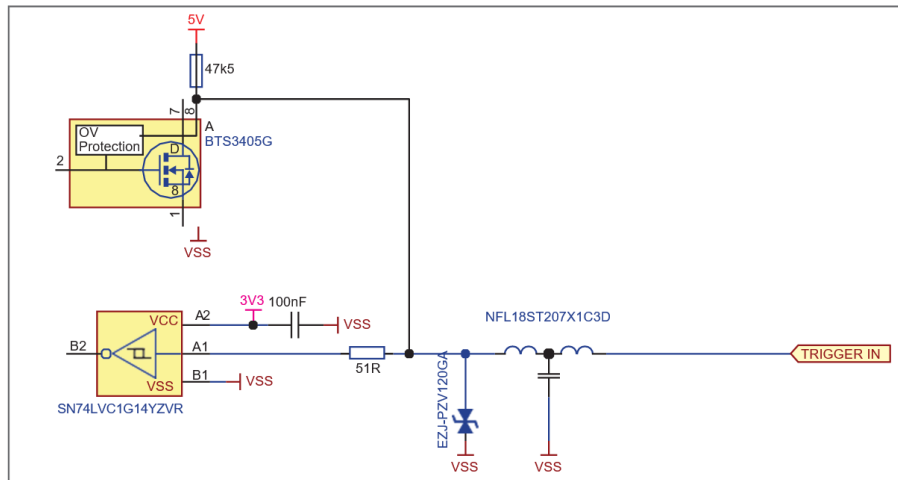
If you set the **Black Ref** parameter above to **Create**, then set the **Black Ref. Create** parameter to the required mode as described in the following table:

Black Ref. Create Modes	Description
Normal	Takes a new black reference when sensor temperature, capture mode, ISO, or shutter speed changes significantly.
Always	Takes a new black reference for every capture. Note This slows the capture cycle (approximately twice as slow) but does provide an accurate, custom black reference for each capture.
Once	Takes a black reference one time only. This mode is usually selected for normal captures in where there are no large changes to exposure time, ISO, or temperature. Phase One recommends that you initiate a new black reference sequence whenever possible (for example, during flight while turning the aircraft). Note To prevent excessive image noise, do not use Once mode with auto-exposure mode.

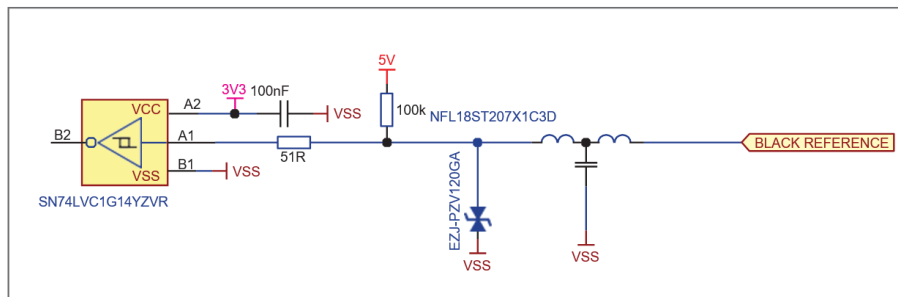
3.4 Electrical Interfaces

The following figure shows the four signals that control the iXM-FS130:

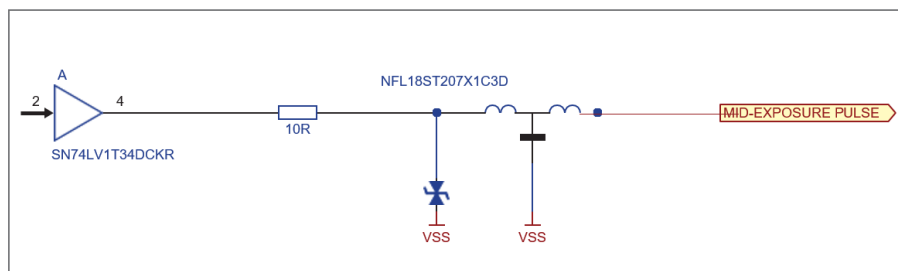
Schematic Drawings



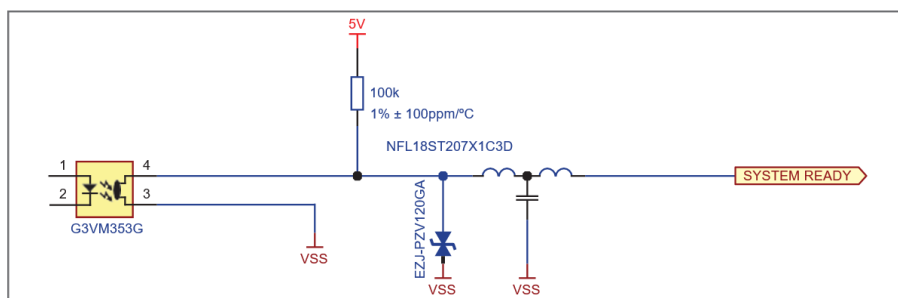
Trigger In triggers the iXM-FS130 for new capture cycle.



Black Reference triggers the iXM-FS130 for a black reference.



Mid-Exposure Pulse indicates midpoint of the exposure time.

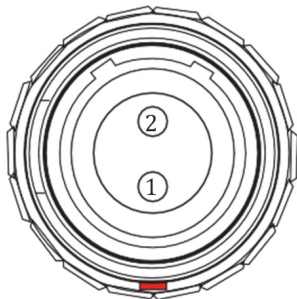


System Ready indicates camera ready/ busy signal.

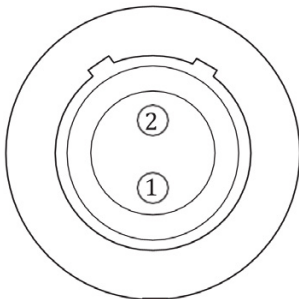
4. Cable Specifications

4.1 Power Cable

The power cable open end is connected to the aircraft’s power bus, and the LEMO connector end is connected to the iXM-FS130 right LEMO (power) port.



Power Cable Plug



Power Socket Pinouts

1. Connect the power cable using the information in the following table:

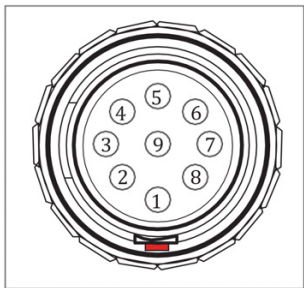
Power Cable Description

Connector Pin	Color	Name	Description	Direction	Level	Notes
1	White or yellow	DC In +	Provides positive power	Input	12 - 30 VDC	Provides up to 20 W
2	Black	DC In -	(Common)	Input		

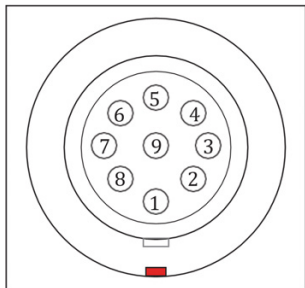
4.2 Control Cable

The control cable open end is connected to your system through nine (28 AWG) wires, and the LEMO connector end is connected to the camera center or left LEMO (data) port, depending on your system configuration.

The following figures and table show the cable pinout and signals.



Control Cable Plug Pinout



Camera Socket Pinout

Control Cable Signals

Pin	Color	Name	Description	Direction	Parameter Voltage Levels (see next table)	Notes
1	Orange	Reserved	For internal only	Reserved	Reserved	Do not use.
2	Green	System Ready	iXM-FS130 ready for next capture.	Out	VOH, min = 4.0 V (I _o = -10 μ A) VOL, max = 0.8 V (I _o = 4 mA)	5 V level pull up resistor 47.5 k Ω to +5 V
3	Red	Black Reference/ Wakeup Control	Indicates a black reference sequence is required. Signal the iXM-FS130 to wake up from low power mode.	In	VIH, min = 2.4 V VIL, max = 0.8 V tiF, tiR < 1 μ s	Isolated. Active low. For black reference, see Section 3.3 - Black Reference . For low power mode control, see Section 3.2 - Exposure Sequence
4	Purple	Trigger In	Trigger the iXM-FS130 for new capture cycle.	In	VIH, min = 2.4 V VIL, max = 0.8 V tiF, tiR < 1 μ s	Active low (for manual triggering, activate by short to common signal, otherwise leave floating).
5	Blue	RS-232 RX	External system can send specific information to the iXM-FS130 .	In	RS-232 input level +/- 15 V (VIT+ max=2.4 V) (VIT- min=0.8 V)	RS-232 voltage level isolated. For baud rate and additional information, see the Phase One Camera and GNSS IMU Installation Guide.
6	Yellow	RS-232 TX	iXM-FS130 can send specific information to external system.	Out	VOH at RL = 3 k Ω to GND + 5.4 V VOL at RL = 3 k Ω to GND - 5.4 V	
7	White	Mid-Exposure Pulse	Midpoint of the exposure time.	Out	VOH min = 4.0 V (I _o = -4 mA) VOL max = 0.8 V (I _o = 4 mA)	5 V level.
8	Gray	Reserved	Reserved	In		Short to pin 9 (mandatory).
9	Black	Common		Common		

Parameters Description

Parameter	Setting
VIH	Minimum voltage level that is interpreted as 1 by an input.
VIL	Maximum voltage level that is interpreted as 0 by an input.
VIT-	Input threshold voltage when the input voltage is falling.
VIT+	Input threshold voltage when the input voltage is rising.
VOH	Guaranteed minimum voltage level that appears on output set to 1.
VOL	Guaranteed maximum voltage level that appears on output set to 0.

5. Unboxing the iXM-FS130

Verify that all parts were supplied according to the specific packing list for your system.

6. Mounting and Dismounting a Lens

Caution

Modifying the lens mount or changing the lens will invalidate the geometric calibration of the camera.

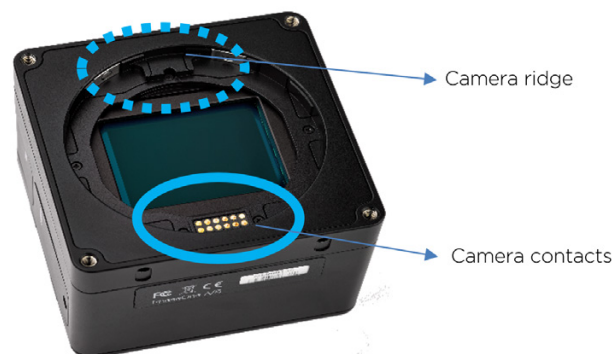
Note

- Before mounting or dismounting a lens, verify that the power cable is not attached to the iXM-FS130.
- Mount/dismount lenses only in a clean environment.
- Place a soft cloth on the table to avoid scratching the iXM-FS130.
- Place a lens cap on the lens.

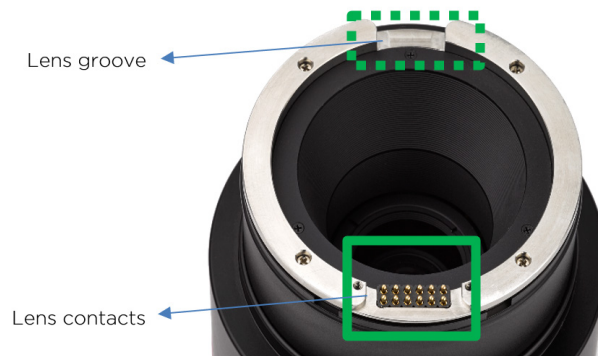
6.1 Mounting an RSM Lens

To mount a lens on a iXM-FS130:

1. Place the iXM-FS130 interface with the sensor facing up and the iXM-FS130 contacts (solid blue) closest to you.



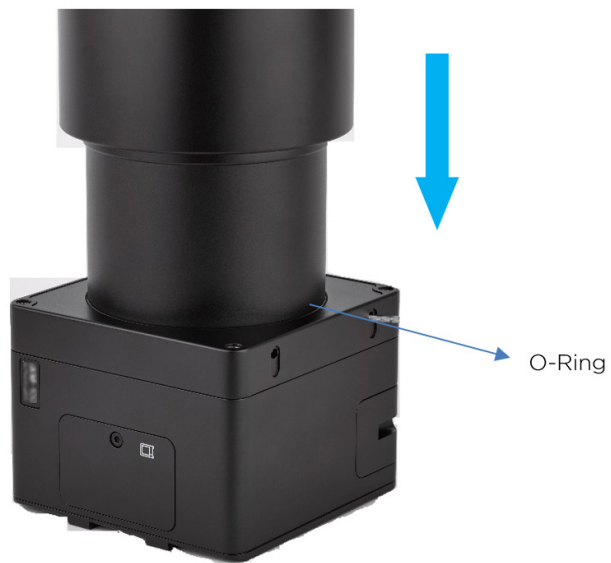
2. Hold the RSM lens so that the lens contacts (solid green) are aligned with the iXM-FS130 contacts (solid blue).



3. Place the lens groove on the iXM-FS130 ridge (opening-to-opening).
4. With the openings touching, lower the lens contacts to the iXM-FS130 contacts.



5. Hold the lens with both hands and press it firmly down onto the camera, so that the O-Ring seal is pressed inside.



6. Use a 2 mm hex key to tighten the 4 screws on the camera interface to a torque of 50 cNm.

6.2 Dismounting an RSM Lens

To dismount a lens from an iXM:

1. Use a 2 mm hex key to unscrew the four screws on the iXM-FS130.
2. Hold the lens and gently pull up at an angle.



6.3 Mounting an RS Lens

To mount an RS lens on the camera:

1. Remove the rear lens cap.
2. Hold the RS lens so that the lens contacts strip is above the RS adapter contacts.
3. Slowly lower the lens opening onto the RS adapter opening (opening -to-opening).
4. Use a 2 mm hex key to secure the lens assembly onto the RS adapter by gently tightening each of the three locking screws.

5. Tighten the 3 locking screws a second time using a torque of 50 cNm.



6.4 Dismounting an RS Lens

To dismount the lens from an iXM-RS:

1. Use a 2 mm hex key to unscrew the three lens screws.

Note

The screws remain attached to the camera.

2. Pull the lens assembly away from the camera.

3. Place a rear cap on the lens.

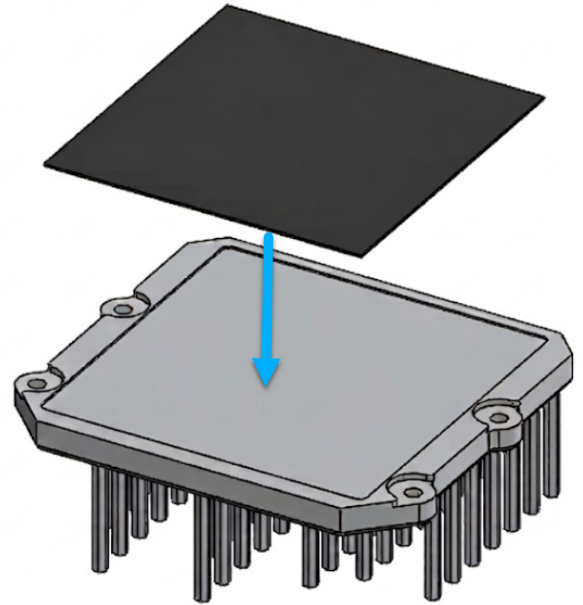


7. Connecting the iXM-FS130

7.1 Attaching the Heatsink to the iXM-FS130

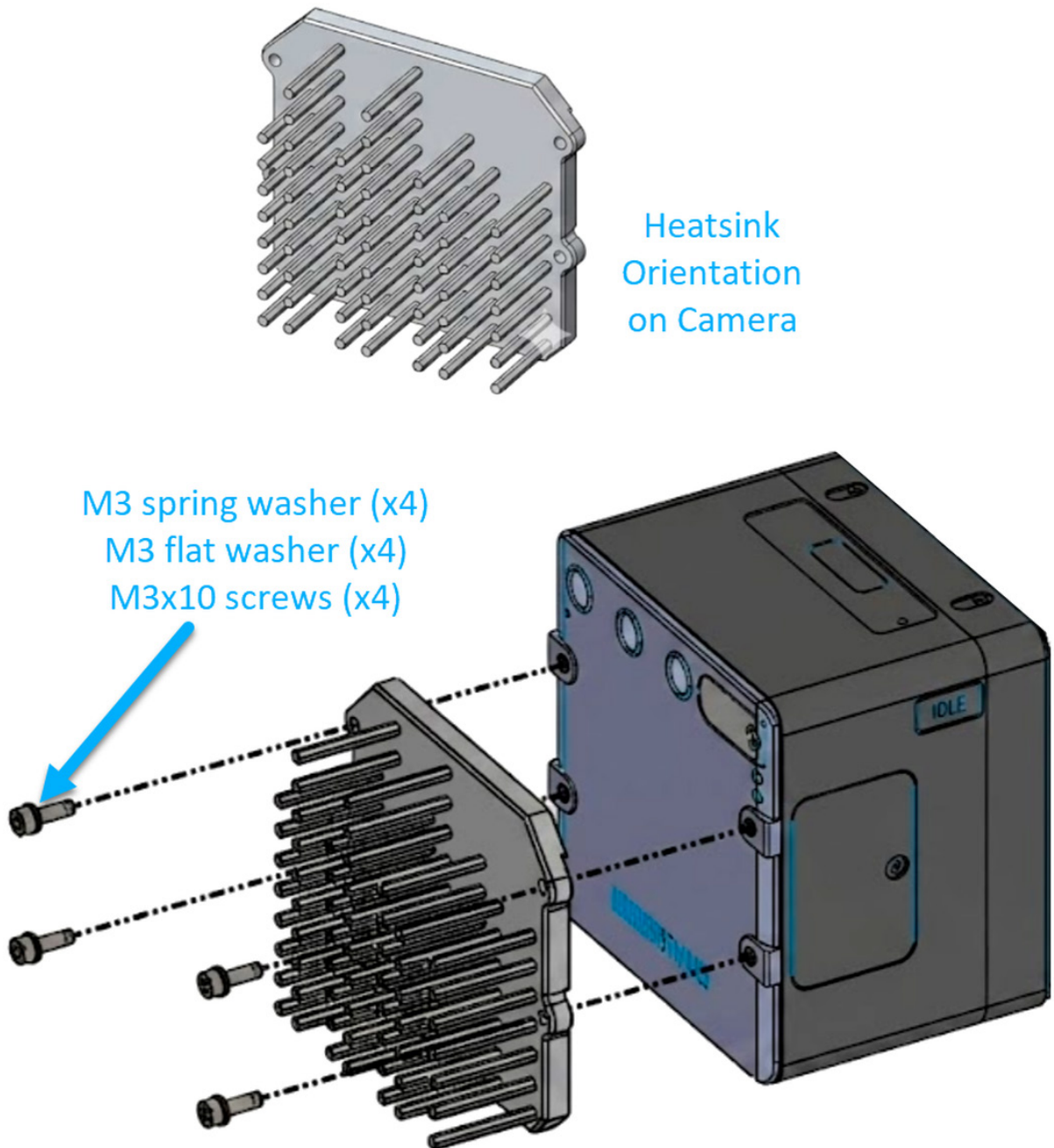
To ensure adequate thermal management of the iXM-FS130 during operation, attach the heatsink provided in the accessories kit to the back of the iXM-FS130 as follows:

1. Clean the iXM-FS130 from any dust or debris.
2. Peel off the protective film from one side of the non-SI thermal pad. Gently press the exposed side of the thermal pad directly onto the heatsink recess.



3. Remove the top protective film from the thermal pad.

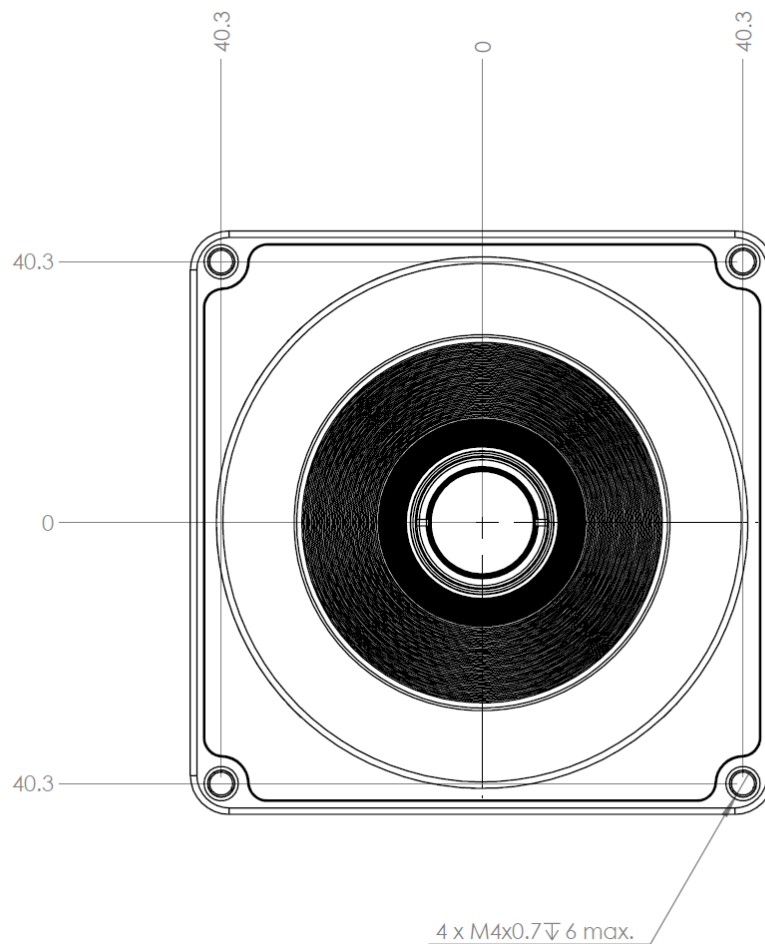
4. Align the heatsink with the back of the iXM-FS130, ensuring the orientation exactly matches that shown in the figure below.
5. Place an M3 spring washer, then an M3 flat washer onto each of the four M3x10 screws. Secure the heatsink to the camera body using the assembled screws.



6. Torque the four screws to 100 cNm.

7.2 Attaching the iXM-FS130 to a Pod

1. Attach the iXM-FS130 to a pod using four M4 screws.



Note

Do not insert screws deeper than 6 mm into the threaded holes on the front of the camera.

7.3 Connecting a Control Cable

1. Connect the control cable LEMO connector to iXM-FS130 left LEMO (data) port.
2. Connect the other end of the control cable to your external device.

Note

- The two data ports (left and center LEMO ports) are not interchangeable.
- If the iXM-FS130 is being used with a Phase One system, use a control cable with LEMO connectors at both ends, and connect the other end to the iX Controller I/O port.

7.4 Connecting the Power Cable

To connect the iXM-FS130 to the aircraft power bus:

1. Connect the power cable LEMO connector to iXM-FS130 power port.
2. Connect the other end of the power cable to the aircraft power bus.



Caution

The iXM-FS130 must be powered by a limited fused power source only, up to 2 A single fault condition.

7.5 Connecting a USB Cable

To connect a USB 3.1 cable to a PC:

1. Using a 2 mm hex key, remove the screw securing the USB 3.1 port cover.
2. Remove the cover and store it.
3. Connect the USB 3.1 cable connector to the iXM-FS130 USB port.
4. Tighten both locking screws on the USB connector to secure it to the port using a torque of 25 cNm.



7.6 Connecting Cables for Multiple Camera Configuration

You can connect multiple iXM-FS130 cameras through a daisy-chain to capture images simultaneously. The first camera in the daisy-chain is triggered through the control cable.

1. On the first camera in the daisy chain, connect a control cable LEMO connector to the left LEMO port.
2. Connect the other end of the control cable to your external device.
3. Connect one end of the multisync cable to the center LEMO port.
4. Connect the other end of the multisync cable to the left LEMO port of the next camera.
5. Repeat for any additional cameras.
6. On the last camera in the daisy chain, connect a control cable LEMO connector to the center LEMO port.
7. Connect the other end of the control cable to your flight management system or other device.

Note

- For a multiple camera setup **use hardware signals only**.
- When creating a daisy-chain between iXM-FS130 and iXU-RS/iXU cameras, each camera can be configured in any position required. However, you must disable the low power mode for the iXM-FS130 cameras.

7.7 Connecting the HDMI Cable

To connect an HDMI cable to an iXM-FS130:

1. Using a 2 mm hex key, remove the screw securing the HDMI port cover.
2. Remove the cover and store it.
3. Connect an HDMI cable connector to the iXM-FS130 HDMI port.

4. Connect the other end of the HDMI to your display.



8. Configuring Auto-Exposure Mode

You can operate the iXM-FS130 in manual or auto-exposure mode.

In auto-exposure mode, the iXM-FS130 controls the following parameters:

- ISO
- aperture
- shutter speed

When auto-exposure mode is active, the iXM-FS130 reads the histogram of each image it captures and adjusts the exposure parameters for the next image. The adjustments are in third-stop increments.

To toggle between manual and auto exposure modes using the Phase One CameraSDK:

- Set Camera Property “Auto Exposure” (id = 1000) to 0 (Manual) or 4 (Auto).

For further details setting the Camera properties using the Phase One CameraSDK see [Section 11 - Miscellaneous Camera Settings](#).

Note

- For the first exposure, the iXM-FS130 uses the following AUTO EXPOSURE values:
 - ISO - MIN.
 - APERTURE - average between MIN and MAX.
 - SHUTTER speed - MAX.
- Capture a few images before your first flight line so that auto-exposure can determine the optimum exposure.
- When auto-exposure is active, the **CAPTURE** tab parameters **ISO**, **APERTURE**, and **SHUTTER** are disabled.
- When auto-exposure is active, set **Black Ref. Create** to either **Normal** or **Always** (see [Section 3.3.3 - Software Activation of Black Reference](#)).

9. Storing Images

To save images on a PC, you can:

- connect the iXM-FS130 with a USB 3.1 cable to a PC running iX Flight Pro or Phase One CameraSDK.
- use an XQD/CFexpress memory card as the storage device.

9.1 Using Memory Cards

Note

- Memory cards are manufactured by external suppliers and Phase One is not responsible for defective cards.
- Phase One recommends testing all new memory cards by verifying that image files are properly stored on the card and that they can be read on a PC.

9.1.1 Inserting and Ejecting a Memory Card

To insert a memory card:

1. Using a 2 mm hex key, remove the screw securing the memory card slot cover.



2. Remove the cover.



3. Insert a memory card with the brand label facing the camera rear.



4. Place the memory card cover in position and secure the cover with the memory card slot cover screw. Tighten the screw to torque 15 cNm.

To eject the memory card:

Caution

Before ejecting the memory card, to prevent data corruption, make sure the iXM-FS130 is in **LOW POWER MODE** as follows using the Phase One CameraSDK:

1. Set Camera Property 1240 (Low Power Mode) to 0 (Immediately).
1. Momentarily push the memory card then release it. The memory card is ejected.

10. Live View/HDMI Display

Note

When in Live View or HDMI modes, repowering the iXM-FS130 does not disable these modes. The iXM-FS130 always powers up in the last working mode, indicated by a blue Operation LED.

10.1 Using Live View

Live View enables you to view the iXM-FS130's sensor output in almost real-time and to capture images while viewing a subject of interest.

To use live view using the Phase One CameraSDK see:

https://developer.phaseone.com/sdk/docs/6_camera_sdk_features/subs-live-view.html.

Note

Video is not recorded during live view.

10.2 Setting HDMI Display

HDMI mode enables you to view full HD video with or without overlay.

For HDMI parameters, see the camera properties through the Phase One CameraSDK (https://developer.phaseone.com/sdk/docs/6_camera_sdk_features/subs-live-view.html).

11. Miscellaneous Camera Settings

This section describes how to set common parameters using the Phase One CameraSDK for the iXM-FS130.

11.1 Setting Common Parameters Using Phase One CameraSDK

Camera parameters for Phase One CameraSDK are called Properties.

The Phase One CameraSDK manages iXM-FS130 settings and features through Properties (e.g., aperture, shutter time, and ISO).

Upon opening a camera connection, the Phase One CameraSDK reads all supported properties directly from the camera.

Only properties received from the connected camera will be displayed under available properties.

Note

For more information about camera settings and setting specific properties for the Phase One CameraSDK see [Properties - Phase One SDK](#).

11.2 Restoring Default iXM-FS130 Values

To restore default iXM-FS130 values:

1. Using the Phase One CameraSDK, set property id 1291 (Restore to Factory Default) to 1 (Restore).

Note

By default, the **Network** and custom **White Balance** parameters are not restored to iXM-FS130 defaults.

12. Managing Camera Firmware

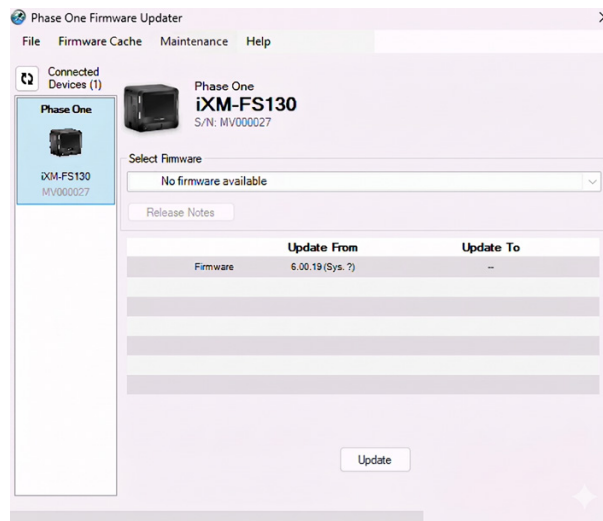
12.1 Upgrading Camera Firmware using the Phase One Firmware Updater

Note

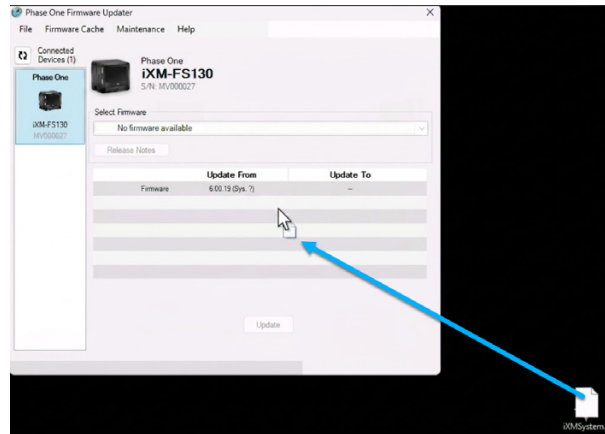
Before starting, make sure Firmware Updater (available at www.phaseone.com/download-categories/ixm-firmware/) is installed on your PC and you have downloaded the latest firmware package for your camera (also available at www.phaseone.com/download-categories/ixm-firmware/).

To update the iXM-FS130 firmware:

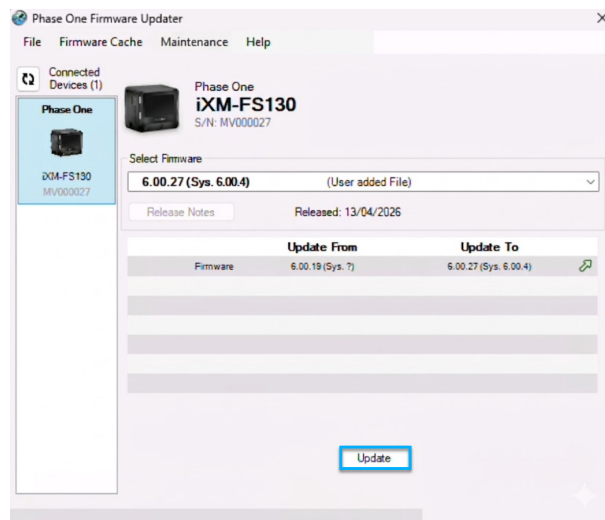
1. Connect the iXM-FS130 to the PC with a USB 3.1 cable.
2. Connect the power cable to the iXM-FS130 and to a power source.
3. Start Firmware Updater and ensure your camera appears in the connected devices list.



4. Drag and drop the firmware package onto the Firmware Updater window.



5. Click **Update**.



Follow the displayed instructions. During upgrade, the Storage and Operation LEDs flash in a distinct pattern. Certain firmware updates might also cause all 3 LEDs to turn solid white for 1-2 minutes.

Note

Keep the camera powered until the LEDs return to normal colors.

6. If the update fails, disconnect the USB 3.1 cable, reconnect it, and repeat the procedure described above.

12.2 Upgrading Firmware Using Phase One CameraSDK

For information on upgrading camera firmware using Phase One CameraSDK, see https://developer.phaseone.com/sdk/docs/6_camerasdk_features/firmware-upgrade.html.

12.3 Restoring Firmware to Factory Version

To restore the iXM-FS130 firmware to the factory version (iXM-FS130 settings are not affected):

1. Open the memory card slot cover.
2. Insert a pin into the hole.



3. Keep the pin in the hole.
4. Supply power to the camera.
5. Wait for 3 to 4 seconds.
6. Put the iXM-FS130 aside for several minutes while the firmware is restored to the factory version. Do not power off the iXM-FS130 until all LEDs resume normal colors (see [Section 13 - Interpreting the iXM-FS130 LEDs](#)).

13. Interpreting the iXM-FS130 LEDs

The iXM-FS130 back has three LEDs that indicate the iXM-FS130 status as follows:



Location in Figure Above	LED	Off	Green	Blue	Orange	Red
1	Storage	No storage	Storage available	-	Storing	-
2	Operation	-	Ready	Live View/ HDMI modes	Capturing	Not ready
3	Power	No power	Power on	-	Starting-up	-

13.1 Temperature Warning

When working continuously for an extended period, such as in HDMI mode or when rapid capturing, the iXM-FS130 internal temperature may exceed its upper limit. Temperature states are indicated by the Operation LED as follows:

State	Indication
Temperature High	Operation LED flashes green slowly (regular mode). Operation LED flashes blue slowly (Live View or HDMI modes).
Temperature Very High	Operation LED flashes green quickly (regular mode). Operation LED flashes blue quickly (Live View or HDMI modes).
Thermal Shutdown	Operation LED flashes red quickly.

Note

Thermal shutdown stops all active capturing:

- All unsaved images are lost.
- The camera remains in Thermal Shutdown mode until it is restarted (and its temperature has fallen below the thermal shutdown threshold).

14. Specifications

Parameter	Value
Resolution (Mpix)	129
Sensor resolution (pix)	13,468 x 9,564
Dynamic range [dB]	80
Color Basic sensitivity [ISO]	200
Monochrome Basic sensitivity [ISO]	800
Pixel size [um]	3.45
Sensor size [mm x mm]	46.5 x 33
Continuous frame rate (w. previews) [fps]	Up to 4
Shortest exposure time [s]	1/16,000
Shutter type	Fusion / Electronic
IIQ-X Support	Yes
Hardware-accelerated preview processor	Yes

Power and voltage	Value
Max. Power consumption (W)	24
Power input (VDC)	12 -30

Interfaces	Value
Image data	USB 3.0, Ethernet 10G (Fiber/Copper)
API	Phase One CameraSDK and ImageSDK
H/W signals (Inputs)	Trigger, Black reference
H/W signals (Outputs)	Camera ready, MEP
Internal data storage	CFexpress card
HDMI	1,920 x 1,080

Mechanical Specifications	Value
Dimensions - excluding lens, RS lens adapter, heatsink (mm)	90 x 90 x 91
Weight - excluding lens, RS lens adapter, heatsink (g)	647
Interface (for mounting)	4 x M4 threads

Operating Conditions	Value
Operating temperature (°C)	-10 to +40 (with heat sink mounted)
Relative humidity (%)	15 to 80 (non-condensing)

Certifications	Value
Standards & regulations	FCC Class A, CE, RoHS, DO160G
IP Rating	IP53