PAS 280/PAS 880

Operation Guide

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PHASEONE

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1.1 Scope

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1.2 Applicable Documents

Item	Manual
Applanix GNSS/IMU	GNSS Configuration Guide for PAS Systems
Phase One iX Flight Pro	iX Flight Pro Operation Guide
Phase One iX Process	iX Process Operation Guide
Somag GSM 4000 Mount	SOMAG GSM 4000 Manual
Trimble AV39 Antenna	Trimble AV39 Antenna Datasheet

2 PAS 280/PAS 880 Overview

Note

- There are no user serviceable parts inside the PAS 280/PAS 880 Controller. All warranties are void if access panels are opened or cables not supplied by Phase One are connected, unless specifically instructed by Phase One personnel.
- Installation of the PAS 280/PAS 880 in an aircraft must be performed by certified personnel while following the relevant Civil Aviation Authority regulations in the country of aircraft registration and operation. A Supplemental Type Certificate or Minor Change may be required.

There are four configurations of the PAS:

- PAS 280 - With over 20,000 pixels across, and compact size and weight, the PAS 280 provides a higher return on investment compared to any other large-format system available on the market.
- PAS 280i - The PAS 280i, with over 20.000 RGB pixels across flight direction, is an effective large format aerial solution of the PAS 280 combined with a 150 MP NIR camera. This ensures a higher return on investment than other large-format systems. PAS 880i is based on the PAS 280i solution, enabling a seamless upgrade to the PAS 880 or PAS 880i, ensuring a future proof and effective investment and flexibility in service offering.
- PAS 880 - The PAS 880 provides 20,000 pixels across flight lines for the nadir and 14,000 pixels for each of the oblique cameras. The combination of 90 mm/150 mm lenses ensures balanced ground resolution products for all cameras. The PAS 880 delivers the highest quality and accuracy for oblique aerial imagery.
- PAS 880i - The most efficient solution for wide-area mapping and 3D city modeling. PAS 880i is a large-format nadir and oblique aerial solution comprises four oblique RGB cameras of 150 MP and for nadir, a 280 MP RGB and a 150 MP NIR camera integrated into a single pod to simultaneously capture photogrammetric imagery.

2.1 Hardware

2.1.1 PAS 280/PAS 880 Controller

The PAS 280/PAS 880 Controller is the communication center, and data storage for the PAS. Based on Microsoft Windows 10, it is responsible for controlling power and communication for all ancillary systems.

A preconfigured precision GNSS-Inertial (AP+ AV) is integrated in the PAS 280/PAS 880 Controller.

The PAS 280/PAS 880 Controller contains three SSD drive bay frames that contain removable carriers with SATA SSDs that store the captured images. The number of SSDs depend on the PAS 280/PAS 880 configuration as follows:

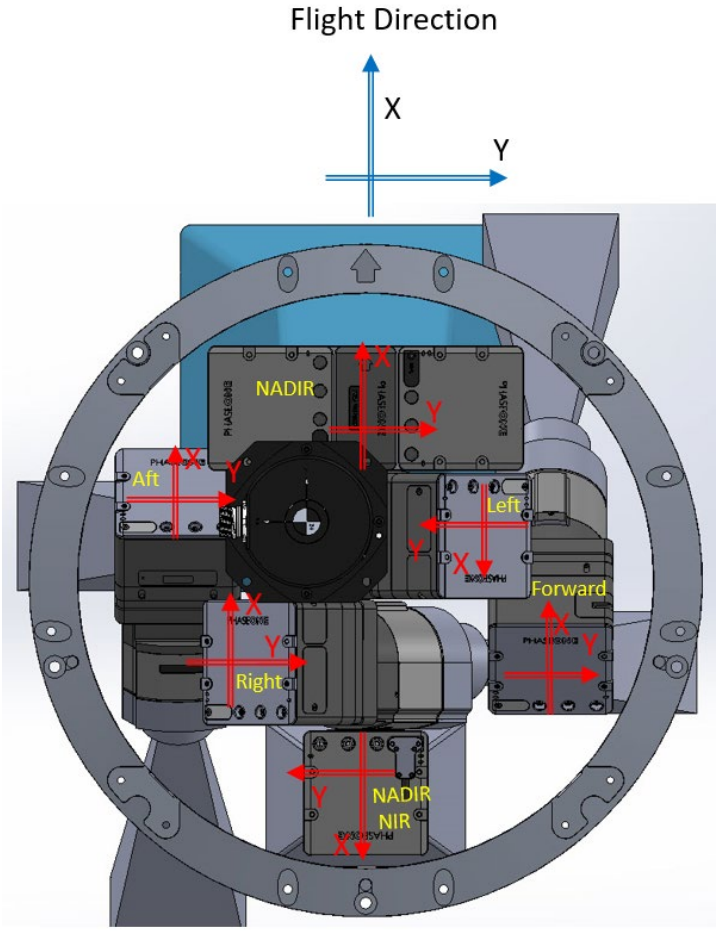
PAS 280/PAS 880 Type	SSDs
PAS 280/PAS 880 280	2 x 2TB
PAS 280/PAS 880 280i	3 x 2TB
PAS 280/PAS 880 880	6 x 2TB
PAS 280/PAS 880 880i	6 x 2TB

2.1.2 Cameras

The types and quantities of cameras depend on the PAS 280/PAS 880 configuration as follows:

PAS 280/PAS 880 Type	iMX-RS280F	iXM-RS150F RGB	iXM-RS150F Achromatic
PAS 280/PAS 880 280	1 (nadir)		
PAS 280/PAS 880 280i	1 (nadir)		1 (nadir)
PAS 280/PAS 880 880	1 (nadir)	4 (forward, right, aft, left)	
PAS 280/PAS 880 880i	1 (nadir)	4 (forward, right, aft, left)	1 (nadir)

The following figure shows the orientation of the PAS 280/PAS 880 cameras (PAS 280/PAS 880 880i configuration).



2.1.2.1 iXM-RS280F Camera

The iXM-RS280F camera is used for the nadir.

The iXM-RS280F camera head uses two BSI CMOS sensors operated with two RS90 mm Rodenstock lenses. The iXM-RS280F camera produces a geometrically accurate 284 MP central projection image. The iXM-RS280F can capture 2 frames per second.

2.1.2.2 iXM-RS150F Camera

The iXM-RS150F camera is equipped with a full-frame sensor (14,204 x 10,652 pixels), using 3.76-micron pixel technology that enables high ground resolution from high flight altitudes. It provides large aerial coverage resulting in higher aerial survey productivity.

The PAS 280/PAS 880 iXM-150F camera is fitted with RS150 mm lenses.

Designed and built for aerial photography by Rodenstock and Schneider-Kreuznach, the lenses are factory calibrated for infinity focus and equipped with a central leaf shutter with a speed to up to 1/2500 sec.

2.1.2.3 iXM-RS150F Achromatic Camera

PAS 280i and PAS 880i also include an iXM-RS150F achromatic camera.

The iXM-RS150F achromatic camera provides NIR data in the spectral range of 720 nm-1000 nm.

The PAS 280/PAS 880 iXM-150F achromatic camera is fitted with RS50 mm lens.

Post processing this data in combination with the iXM-RS150F RGB data allows output imagery as IRG/RGBi CIR products or NDVI.

2.1.3 SOMAG GSM 4000 Mount

The PAS 280/PAS 880 is mounted on a SOMAG GSM 4000 mount, a hydraulic gimbal containing four cylinders and two servo pumps.

Note

- PAS 280/PAS 880 can only operate with SOMAG GSM 4000 mounts with serial numbers 090236 and higher, or with earlier mounts that were refurbished by SOMAG to the dual communication port configuration.
- If you are providing the SOMAG GSM 4000, you also need to provide Vibration Damping Ring P/N 112300-228-02/04.

2.1.4 Applanix GNSS/IMU

The Applanix GNSS/IMU contains a precision GNSS receiver and inertial sensor components, logging capability, and interfaces for cameras and flight management systems.

Data such as geographic position (latitude, longitude and altitude), velocity, acceleration, angular rate, orientation (roll and pitch), ground track and performance metrics are available in real-time and through post-processing.

The Applanix GNSS/IMU is comprised of the Applanix AP+ card located in the PAS 280/PAS 880 Controller and one of the following IMU models:

- AP+ 510 with IMU-91
- AP+ 610 with IMU-57

Note

For detailed information on the differences between the above Applanix GNSS/IMUs, refer to www.applanix.com.

The Applanix GNSS is configured and managed via a browser-based application supported by the Applanix AP+ card. You can access the application through the shortcut on the PAS 280/PAS 880 Controller software taskbar.

2.1.5 Trimble AV39 Antenna

The Trimble AV39 antenna is a lightweight, TSO certified antenna that provides centimeter precision with superior phase center repeatability. The antenna is connected to the PAS 280/PAS 880 Controller via a coaxial cable supplied with the antenna.

2.1.6 Monitor Kit

The monitor kit allows full control and flight feedback of the PAS 280/PAS 880 and includes the following:

- pilot monitor
- operator monitor

2.1.6.1 Pilot Monitor

The 7” pilot monitor provides all flight information from iX Flight Pro (see section 2.2.1 - iX Flight Pro), ensuring that the pilot has all required information to conduct a successful survey mission. The touch screen allows the pilot to perform several quick-access operations in iX Flight Pro (map display, zoom, line selection).

2.1.6.2 Operator Monitor

The 15.6” operator monitor provides all required information from iX Flight Pro, ensuring the operator can control all aspects of the flight, including run selection, camera control, and data management using the touch screen.

The operator is installed with the cables leading to the lower part of the monitor. The monitor orientation is then set in Microsoft Windows to flipped landscape.

> **Note**
>
> You can install a 21” screen for the operator instead of the 15.6” screen. For details, contact Phase One.

2.2 Software

2.2.1 iX Flight Pro

iX Flight Pro uses iX Plan data to manage and guide the precise execution of aero-photography flight. Using the pilot and operator monitors, the pilot can easily maintain a precise trajectory by following altitude and localizer instructions, while the operator manages the flight, controls the order of passes, tags images and start/stops image collection. iX Flight Pro is pre-installed in PAS 280/PAS 880 Controller.

For detailed information on using iX Flight Pro, see the iX Flight Pro Operation Guide provided with your PAS 280/PAS 880.

> **Note**
>
> To process captured images, use iX Process available from Phase One.

2.2.2 Licensing

The iX Flight Pro software license is preinstalled in the PAS 280/PAS 880 Controller.

2.3 PAS 280/PAS 880 Dataflow

The following table details the dataflow for the PAS 280/PAS 880.

Dataflow for the PAS 280/PAS 880

Cable	Signal/Data	From	To	Protocol	Description
Camera Trigger & MEP	Camera trigger	PAS 280/PAS 880 Controller	Camera	Analog I/O discrete	iX Flight Pro (in PAS 280/PAS 880 Controller) calculates when to capture an image (based on NMEA/GSOF data received from Applanix AP+) and issues a trigger.
	MEP (Mid Exposure Pulse)	Camera	PAS 280/PAS 880 Controller-AP+	Discrete	Camera sends an event input to the PAS 280/PAS 880 Controller when the image is captured.
	Event data	PAS 280/PAS 880 Controller	Camera	RS-232	Applanix AP+ (in PAS 280/PAS 880 Controller) sends event metadata to camera for image metadata.
Mount Control	Start/Stop pass IMU angle data	PAS 280/PAS 880 Controller	SOMAG GSM 4000 mount	RS-232	• iX Flight Pro (in PAS 280/PAS 880 Controller) sends angle data to SOMAG mount for stabilization enhancement. • iX Flight Pro (in PAS 280/PAS 880 Controller) calculates Start of Line and before reached, sends "Stab" command to SOMAG mount. • iX Flight Pro (in PAS 280/PAS 880 Controller) calculates End of Line and after reached, sends "Manual" command to SOMAG mount.
	GIM01	SOMAG GSM 4000 mount	PAS 280/PAS 880 Controller AP+	RS-232	SOMAG mount platform sends GIM01 message with platform angles to the Applanix AP+ (in PAS 280/PAS 880 Controller) for registration in T04 files.
USB3 (for each camera)	Images	Camera	PAS 280/PAS 880 Controller	USB	Images taken by camera transferred to PAS 280/PAS 880 Controller SSD.

3 Unboxing the PAS 280/PAS 880

PAS 280/PAS 880 is delivered in two cases:

- system case
- equipment case.

Verify that all parts were supplied according to the specific packing list for your PAS 280/PAS 880.

3.1 Product Identification

To enable support for your PAS 280/PAS 880, you must identify and record the model and serial numbers for each of the following components:

- PAS 280/PAS 880: serial number is located on a label on the PAS 280/PAS 880 Controller rear panel.

> **Note**
>
> You can view camera serial numbers in iX Flight Pro See the iX Flight Pro Operation Guide.

- Mount: model number and serial number is located on a label on the mount.

4 PAS 280/PAS 880 Height Adjustment and Testing in the Office

This section describes how to adjust the PAS 280/PAS 880 mount ring height to suit your aircraft and how to test the PAS 280/PAS 880 in the office.

Phase One recommends connecting and testing the PAS 280/PAS 880 in the office prior to transporting it and installing it in the aircraft. This allows for quick installation in the aircraft with little risk of missing cables or incorrect configuration.

Note

- When placing the PAS 280/PAS 880 down on a work bench, make sure that the area is clear of debris to avoid damaging the lens. The PAS 280/PAS 880 frame legs provide ample clearance between the lenses and the surface, but any objects underneath the PAS 280/PAS 880, including loose cables, could impact the lenses.
- Make sure you place the PAS 280/PAS 880 on a work bench capable of withstanding the PAS 280/PAS 880 weight.
- The PAS 280/PAS 880 does not have to be assembled in the mount for testing. You can place the PAS 280/PAS 880 next to the mount.

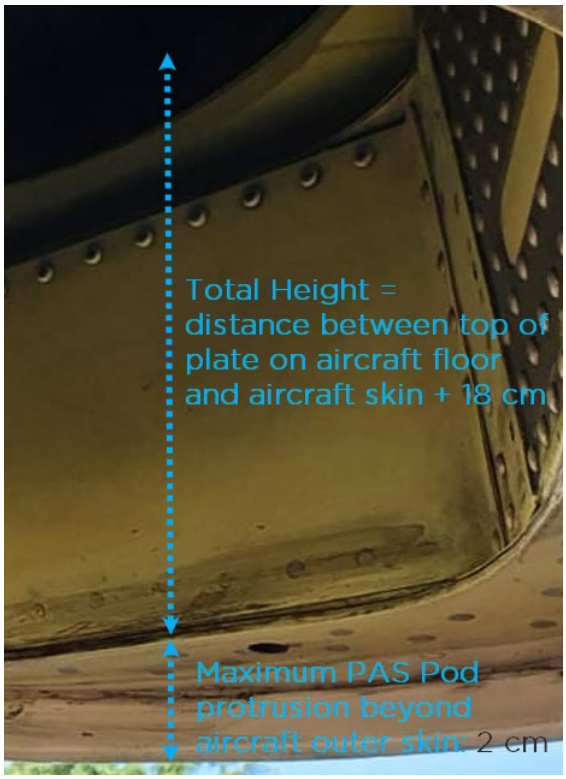
The following tools are required to adjust and connect the PAS 280/PAS 880 in the office:

- Allen key set.
- Standard tools.

4.1 Adjusting the PAS 280/PAS 880 Mount Ring Height

To adjust the PAS 280/PAS 880 mount ring height:

1. Calculate the Total Height by measuring the distance from the top of the plate mounted on the aircraft floor to the aircraft outer skin and adding 18 cm for the mount.



2. Open the PAS 280/PAS 880 system case and remove the PAS 280/PAS 880.
3. Loosen (but do not remove) all four vertical screws in two adjacent pairs of T-mounts on the PAS 280/PAS 880 mount ring.

4. Remove both horizontal screws from all four T-mounts on the PAS 280/PAS 880 mount ring.

5. Taking into account the Total Height you calculated in Step 1 above, adjust the PAS 280/PAS 880 mount ring height to the nearest hole that matches this height. Make sure to align the mount ring to same hole on each of the four vertical rails.

> **Note**
>
> Note the number of the hole used. You will need it later when calculating lever arms.

6. Insert both horizontal screws (that you removed above) in all four T-mounts on the mount ring and tighten the screws to 3 Nm torque.

7. Tighten to 4 Nm torque all four vertical screws that you loosened (in step 3 above) in two adjacent pairs of T-mounts on the mount ring.

4.1.1 Adjusting the PAS 280/PAS 880 System Case Mount Plate Height

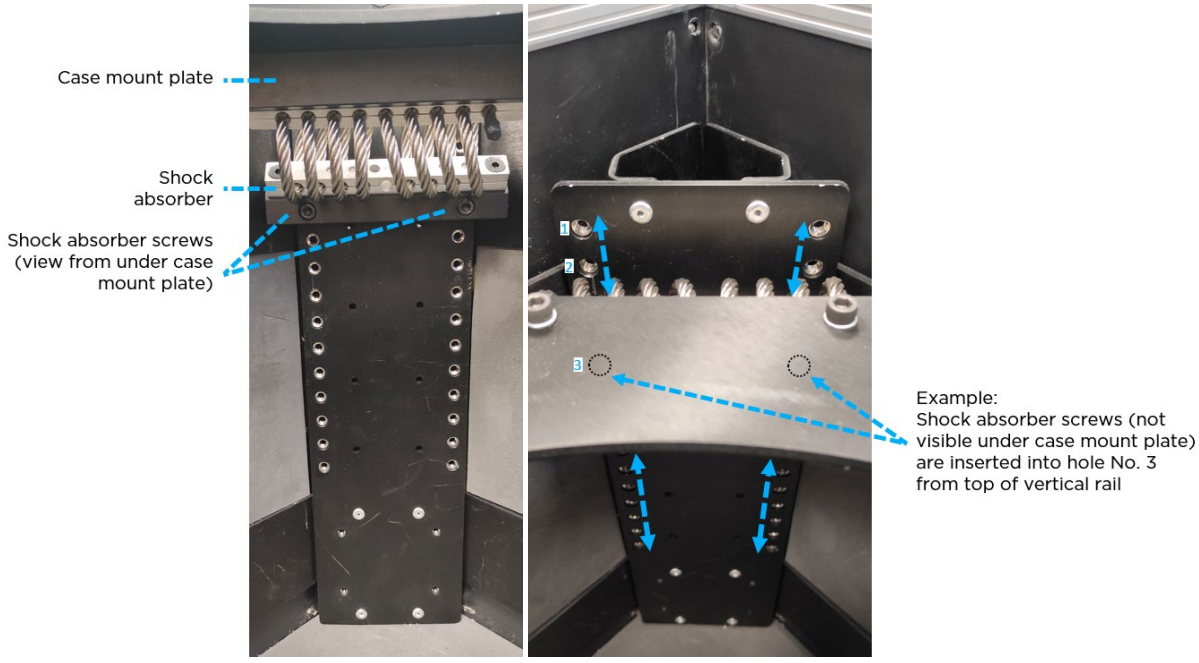
After adjusting the PAS 280/PAS 880 mount ring height as explained in 4.1 above, you must verify that the height of the PAS 280/PAS 880 system case mount plate matches the PAS 280/PAS 880 mount ring height and adjust the system case mount plate height to the same hole number.

To adjust the PAS 280/PAS 880 case mount plate height:

1. On the PAS 280/PAS 880 vertical rails, note in which hole the PAS 280/PAS 880 mount ring T-mount upper horizontal screw is inserted. For example, in the image on the right, it is inserted in hole number 3 from the top.

Example: T-mount upper screw is inserted into hole No. 3 from top of vertical rail

2. In the PAS 280/PAS 880 system case, check into which holes the shock absorber screws are inserted.

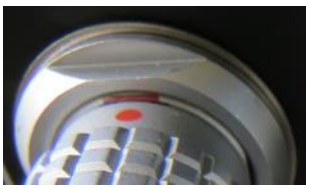


3. If height adjustment is required, perform the following:
   a. Place the PAS 280/PAS 880 system case on its side.
   b. For all four shock absorbers, remove both shock absorber screws.
   c. Adjust the height as required.
   d. For all four shock absorbers, insert and secure the shock absorber screws.

4.2 Connecting a PAS 280/PAS 880 in the Office

Note

- Do not excessively bend cables. Allow a bending radius of at least 40mm for all cables.
- Insert connectors into ports with care to prevent damage to pins. All LEMO connectors have a red dot to indicate correct alignment.



- Make sure that the port connectors for both monitors are properly secured in their sockets.
- Use cable ties to secure the cables to the appropriate points on the monitors to ensure that the connectors are secured. Do not overtighten the cable ties.

Warning

Do not connect any components while the PAS 280/PAS 880 is connected to a power source.
Connecting monitor cables while the power cable is attached to the system will damage the PAS 280/PAS 880 Controller motherboard.

4.2.1 Connecting PAS 280/PAS 880 Components

To connect the PAS 280/PAS 880:

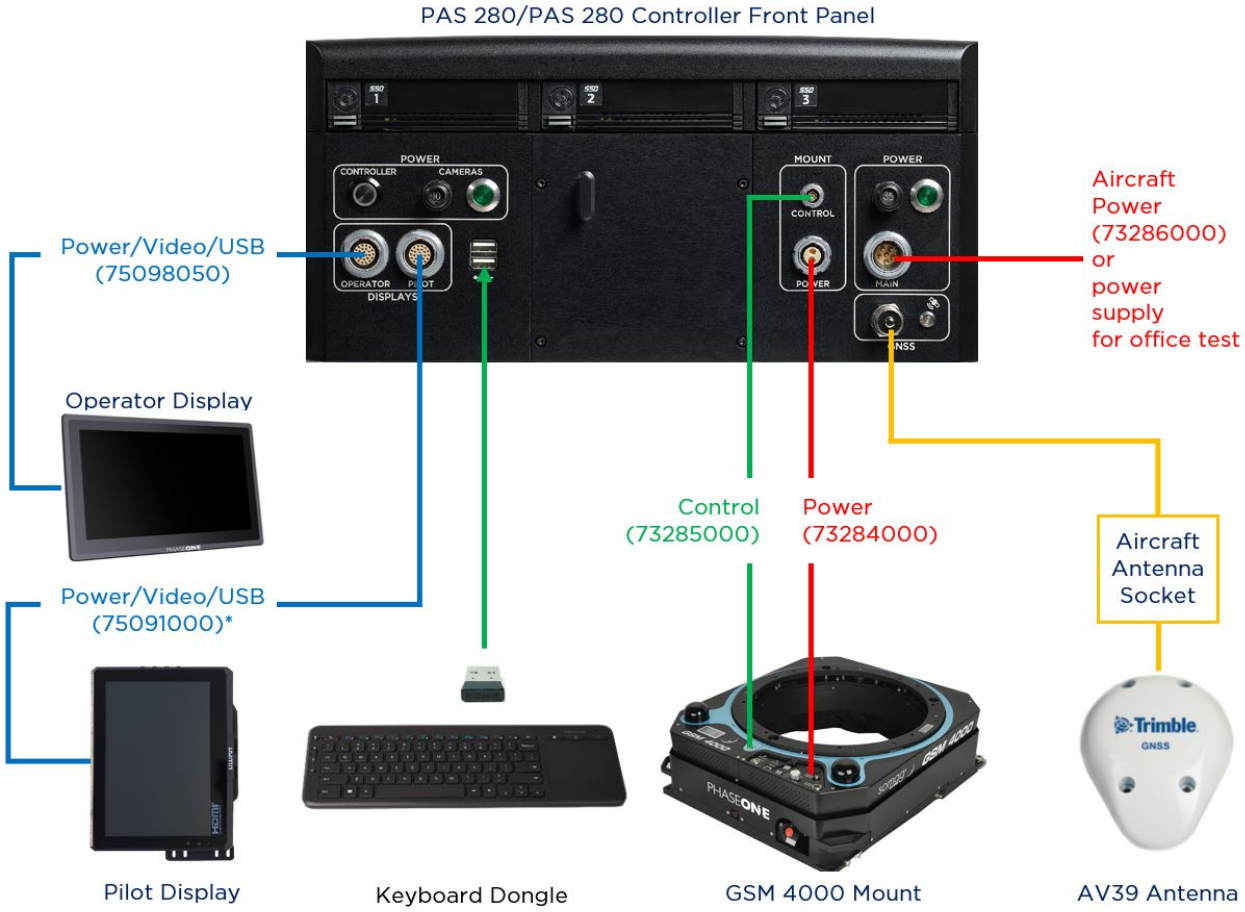
1. Connect all PAS 280/PAS 880 components as described in the following table and figure.

PAS 280/PAS 880 Connection Details

Order	P/N	Description	Connects to
1	73284000	PAS 280/PAS 880 Controller to Somag GSM 4000 mount power cable	1. PAS 280/PAS 880 Controller, POWER 2. Somag Mount, POWER SOCKET
2	73285000	PAS 280/PAS 880 Controller to Somag GSM 4000 mount control cable	1. PAS 280/PAS 880 Controller, CONTROL 2. Somag Mount, INTERFACE
3	75098050	PAS 280/PAS 880 to HDMI +USB + Power operator display cable	1. Operator monitor (pre-connected to operator monitor). **Note** If the operator monitor cable is not connected to the operator monitor, see Appendix C - Connecting the PAS 280/PAS 880 – Operator Monitor Cable to the Monitor. 2. PAS 280/PAS 880 Controller OPERATOR
4	75091000 (5m) 75098070 (10m)	PAS 280/PAS 880 to HDMI/USB + Power pilot display cable	1. Pilot Display (power, video - includes USB signal) 2. PAS 280/PAS 880 Controller PILOT
5	76000600	Keyboard dongle	PAS 280/PAS 880 Controller USB port

Order	P/N	Description	Connects to
6	-	Antenna cable (supplied with antenna)	PAS 280/PAS 880 Controller GNSS port **Note** Place the antenna outside an open window in full view of the sky.

PAS 280/PAS 880 Schematic Connection Diagram



*See table: PAS 280/PAS 880 Connection Details above.

4.3 Powering the PAS 280/PAS 880 and Mount in the Office

Note

For testing in the office, you will need the power supply provided with your PAS 280/PAS 880.
Before connecting the PAS 280/PAS 880 to the power supply, make sure you have connected the pilot and operator monitors.

To connect the PAS 280/PAS 880 power supply to the PAS 280/PAS 880:

1. Connect the PAS 280/PAS 880 power supply to a mains power outlet in the office.
2. Connect the PAS 280/PAS 880 power supply cable LEMO connector to the PAS 280/PAS 880 MAIN port (in the POWER section).

To power up the PAS 280/PAS 880:

1. On the PAS 280/PAS 880 Controller, push in the POWER circuit breaker and confirm that the green LED turns on.
2. On the PAS 280/PAS 880 Controller, push the CONTROLLER pushbutton.
3. Set the mount POWER SWITCH to ON.

Once the PAS 280/PAS 880 Controller has booted, you will see the Windows 10 Desktop on both the operator and pilot monitors.

Note

The pilot monitor is an extended desktop as defined under **Multiple displays** in Windows Display Settings.

4.4 Configuring the PAS 280/PAS 880

Note

All display settings (monitor orientation and touch) are relevant to the specific set of monitors attached to the system. These settings are Windows properties not controlled by Phase One software.
If you replace monitors (even with monitors of the same type), you will need to reconfigure orientation.
If the location of the USB connectors is changed, you may need to recalibrate the touch monitors.

4.4.1 Changing Monitor Orientation

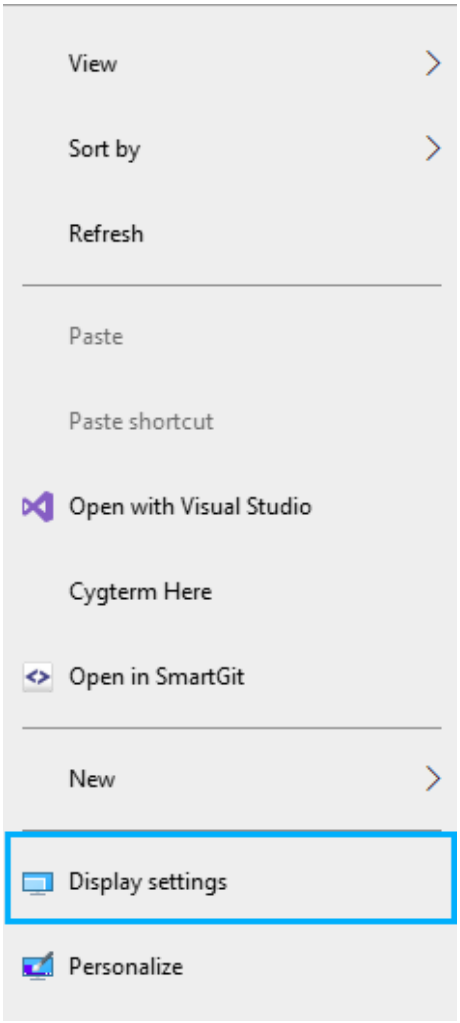
Both monitors are installed in the aircraft with their cables leading downward from the lower part of the monitor. This requires a change in display orientation.

In Windows Display Settings, the displays are identified as follows:

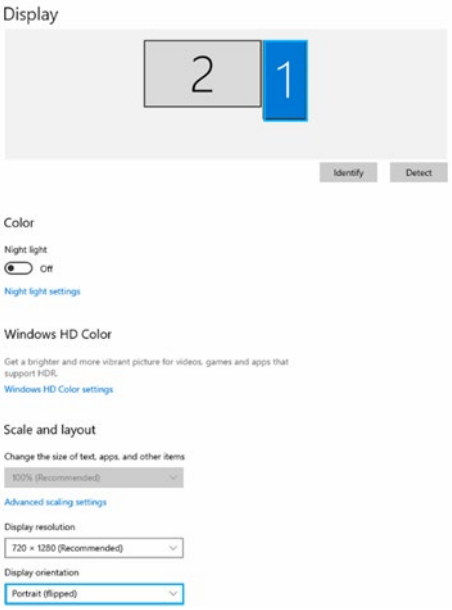
- **1** - pilot monitor.
- **2** - operator monitor.

To change the orientation of the monitors in Windows:

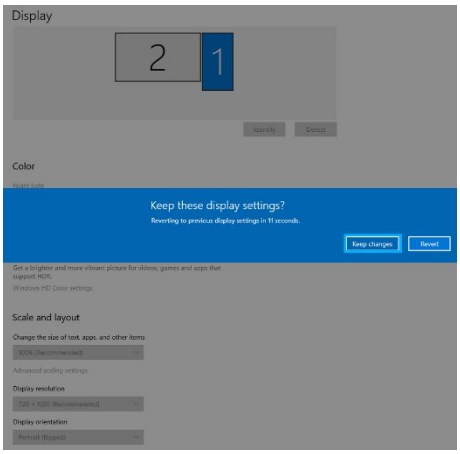
1. On the desktop, tap and hold for 1 second.
2. Tap **Display settings**.



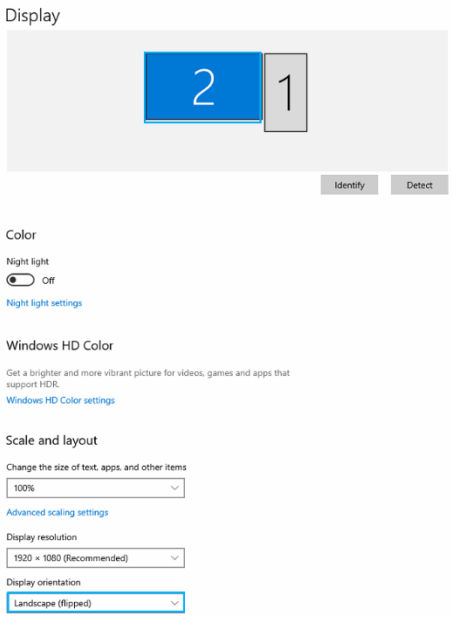
3. Tap display 1 (pilot monitor), then in **Display orientation**, select **Portrait (flipped)**.



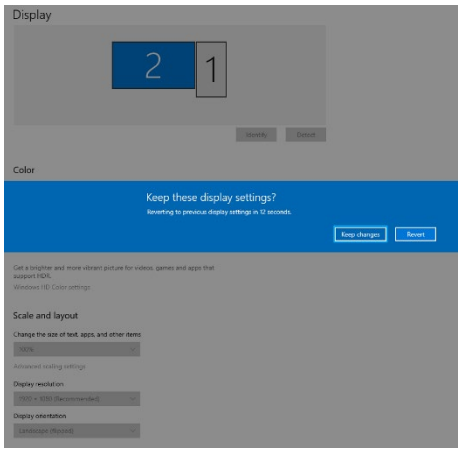
4. Tap **Keep changes**.



5. Tap display 2 (operator monitor), then in **Display orientation**, select **Landscape (flipped)**.



6. Tap **Keep changes**.

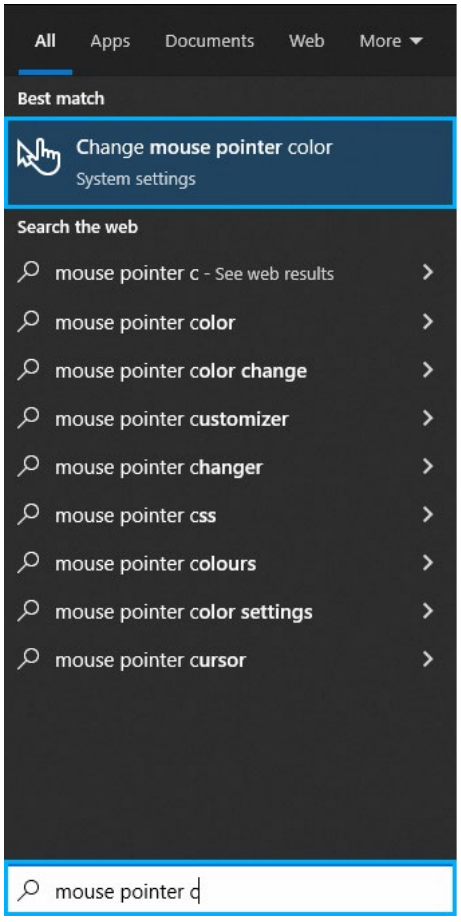


4.4.2 Changing the Mouse Pointer Color

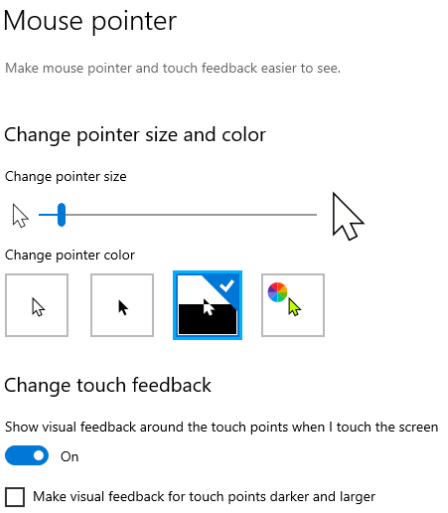
Usually, the operator controls the mouse. In order for the operator to see the pointer on the pilot display, it needs to be enlarged.

To increase the mouse pointer visibility on the pilot monitor:

1. In the Windows search box, type **mouse pointer c** and tap **Change mouse pointer color**.

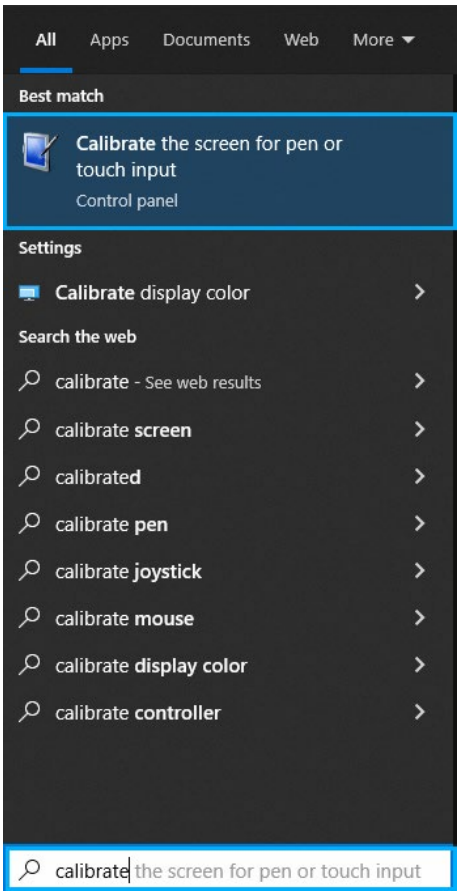


2. Tap the inverted pointer color.

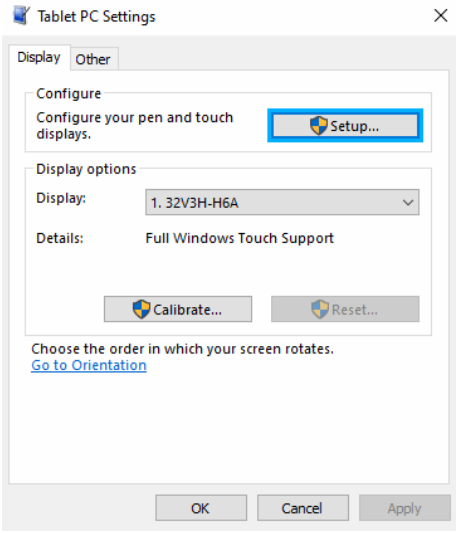


4.4.3 Configuring Touch Monitors

1. In the Windows search box, type **calibrate** and tap **Calibrate the screen for pen or touch input**.

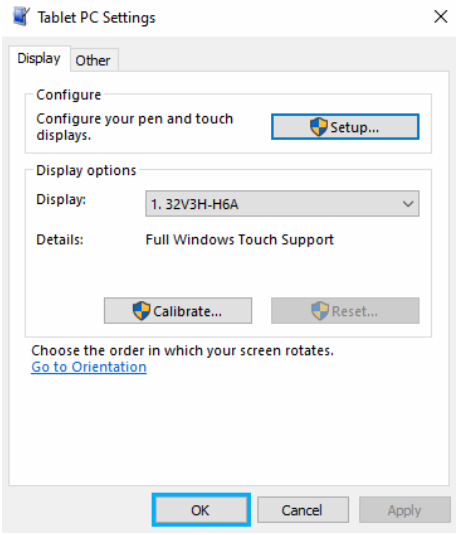


2. On the **Display** tab, tap **Setup**.



3. Follow the instructions that appear on the monitors.

4. Tap **OK**.



5. Test the configuration on each monitor by tap and dragging. The blue frame created by your finger should appear only on the monitor you are touching.

4.4.4 Check Camera Firmware for Updates

The latest firmware and instructions on how to upgrade firmware is available at: https://www.phaseone.com/download-categories/ixm-firmware/.

Warning

Update each camera individually.

4.4.5 Configuring GNSS/IMU Parameters

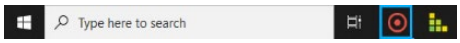
Configure GNSS/IMU Parameters as described in the GNSS Configuration Guide for PAS Systems.

4.4.6 Configuring Screen Recorder Pro

Note

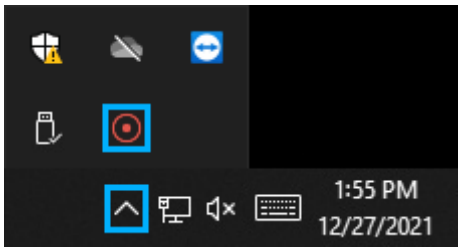
The procedure in this section is required only if screen recording is necessary.

1. On the taskbar, tap the Screen Recorder Pro icon.

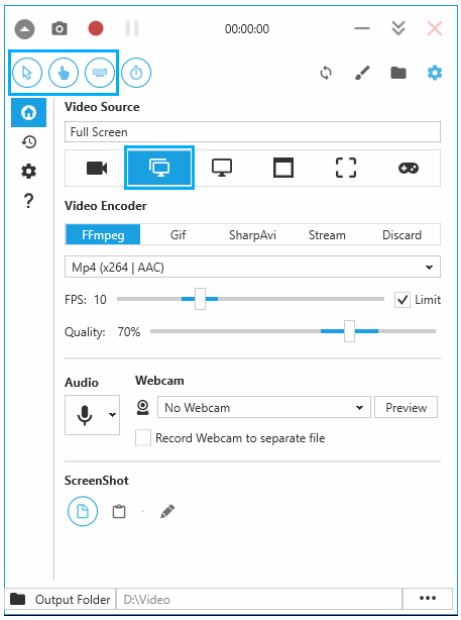


Note

If Screen Recorder Pro is already running, tap its icon in the taskbar corner ((if it is not shown, first tap the overflow window arrow).



2. Verify that the following icons are active (each icon has a blue circle around it):
   - **Include Cursor**
   - **Include Mouse Clicks**
   - **Include KeyStrokes**
3. Under **Video Source**, verify that **Full Screen** is selected.

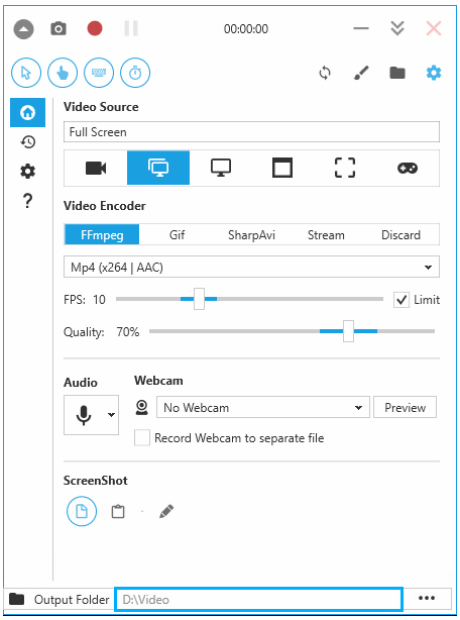


4. Verify that the **Output Folder** is set to the **D:\Videos** folder.
   To change:

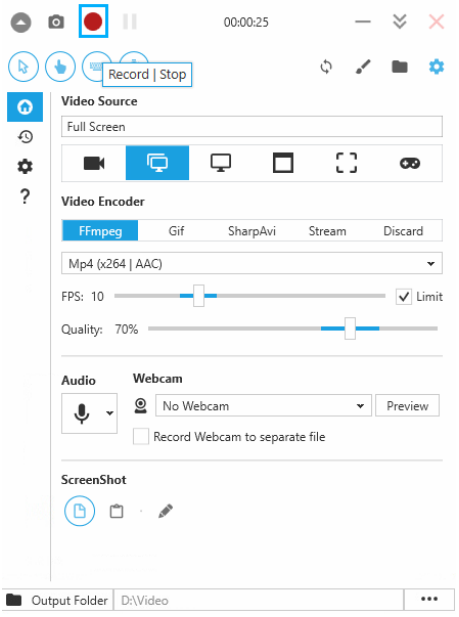
   a. Tap •••.

   b. Navigate to **D:\Videos**.

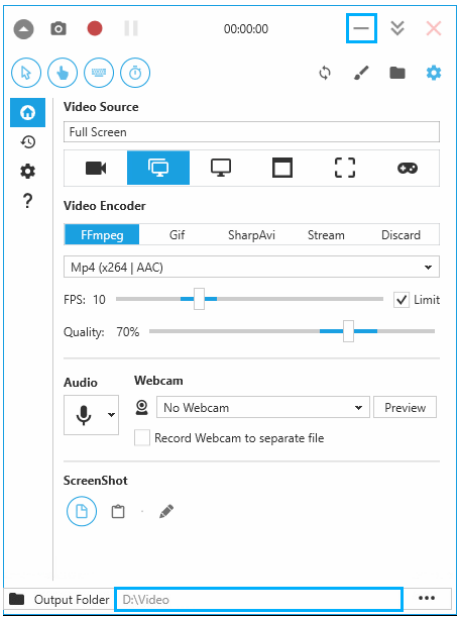
   c. Tap **Select Folder**.



5. Tap **Record | Stop**.



6. Tap minimize.



4.4.7 Configuring iX Flight Pro

1. In iX Flight Pro, configure **System Settings** and **Camera Settings** as described in the iX Flight Pro Operation Guide.

4.4.8 Checking the PAS 280/PAS 880

1. In iX Flight Pro, perform a **Preflight Check** as described in the iX Flight Pro Operation Guide.

4.4.9 Configuring Lever Arms

4.4.9.1 Introduction

Photogrammetric solutions require accurate camera 6DOF data when the image is captured. Position 3D is measured by the GNSS at the antenna location. The 3 angular DOF are measured by the IMU at the IMU measurement center.

Transferring these position and angular measurements to the camera entrance pupil (nodal point) location requires accurate determination of the lever arms between the antenna and the camera entrance pupil and between the IMU measurement center and the mount rotation center. This determination is performed by Applanix POSPac MMS® software.

The origin of the reference coordinate system used by PosPac MMS is the mount rotation center.

In order to obtain the 6DOF data for each image, PosPac MMS needs the following lever arms:

- Lever arm from the mount rotation center to the antenna.
- Lever arm from the mount rotation center to the entrance pupil of each camera.
- Lever arm from the mount rotation center to the IMU measurement center.

POSPac MMS performs the following calculations:

Calculation	Lever Arm Inputs	Other Inputs
North-East-Down (NED) coordinates for each image	• Lever arm from the mount rotation center to the antenna. • Lever arm from the mount rotation center to the entrance pupil of each camera.	• Mount angles at time of image capture. • IMU angles at time of image capture.
Omega, phi, kappa angles	• Lever arm from the mount rotation center to the IMU measurement center.	• Mount angles at time of image capture. • IMU angles at time of image capture. • Camera boresight to the IMU.

4.4.9.2 Calculating and Entering Lever Arm Values

For lever arm values, see the Excel Spreadsheet provided with your PAS 280/PAS 880.

> **Note**
>
> You must enter the lever arm values in the Applanix GNSS browser UI as described in the GNSS Configuration Guide for PAS Systems.

4.5 Disconnecting the PAS 280/PAS 880 in the Office

When you have completed testing the PAS 280/PAS 880 in the office:

1. On the operator monitor, shut down Windows.
2. After the power LEDs have turned off, set the mount POWER SWITCH to OFF.
3. On the PAS 280/PAS 880 Controller, pull the POWER circuit breaker out.
4. Power supply – disconnect from the mains power outlet.
5. On the GSM 4000 mount, open the main oil valve, wait until the mount returns to the lowest position then close the main oil valve.
6. Power cables - disconnect from PAS 280/PAS 880 Controller and between PAS 280/PAS 880 Controller and mount.
7. Control cable – disconnect from the PAS 280/PAS 880 Controller and mount.
8. Pilot and operator monitors - disconnect cables from the monitors and from the PAS 280/PAS 880 Controller.
9. GPS antenna connection – disconnect.
10. If the PAS 280/PAS 880 is in the mount, remove it.

5 Installing the PAS 280/PAS 880 in the Aircraft

Note

- The following aircraft installation procedure assumes the system was previously assembled and tested in the office as described in Section 4 - PAS 280/PAS 880 Height Adjustment and Testing in the Office.
- There are no user serviceable parts inside the PAS 280/PAS 880 or PAS 280/PAS 880 Controller. All warranties are void if access panels are opened or cables not supplied by Phase One are connected, unless specifically instructed by Phase One personnel.
- Installation of the PAS 280/PAS 880 in an aircraft must be performed by certified personnel while following the relevant Civil Aviation Authority regulations in the country of aircraft registration and operation. A Supplemental Type Certificate or Minor Change may be required.

5.1 Required Tools

The following tools are required to install the PAS 280/PAS 880 in the aircraft:

- Allen key set.
- Standard tools.
- Microfiber Cloth, Grey.

5.2 Installing the Trimble AV39 Antenna

Note

For antenna installation instructions, refer to the Trimble AV39 Antenna Datasheet.

1. Install the Trimble AV39 Antenna on the aircraft roof. It is recommended to install the antenna as close as possible above the PAS 280/PAS 880 location on the aircraft body ridge so that the antenna will have maximum visibilty of space vehicles.
2. Lead the antenna cable into the aircraft cabin.

5.3 Securing the Interface Plate to the Aircraft

Note

Phase One recommends mounting the PAS 280/PAS 880 on an interface plate to properly secure the PAS 280/PAS 880 to the aircraft and isolate the PAS 280/PAS 880 from aircraft floor sheet metal vibrations.

5.4 Securing the Mount to the Interface Plate

Note

- For complete installation instructions and user care for the GSM 4000, refer to the SOMAG GSM 4000 Manual.
- Make sure that the installation area is free from obstruction by objects.
- It is recommended that at least two people perform the installation procedures.
- Make sure you have allowed sufficient height clearance around the mount location, as described in the SOMAG GSM 4000 Manual.
- When installing the PAS 280/PAS 880 in the aircraft, take extra care that the camera lenses does not make contact with any objects.
- Make sure the mount ring height is properly adjusted so that the pod does not come into contact with the hatch glass of pressurized aircraft. Also, take into account that the PAS 280/PAS 880 system rotates inside the mount.

To secure the mount to the interface plate:

1. Place the mount on the interface plate with the mount switches facing forward in the direction of flight.

Note

You may install the SOMAG mount facing the rear of the aircraft, but it requires an additional license. For more information, contact Phase One Technical Support.

2. Secure the mount to the interface plate using 4 screws and torque as described in the SOMAG GSM 4000 manual.

Note

The following figure shows a fixed installation not using the Somag GSM4000's capability to rotate about its rear axis.

Note

Make sure that the pod does not protrude more than 2 cm beyond the aircraft skin.

5.5 Installing the PAS 280/PAS 880 on the Mount

Note

- Make sure that the installation area is free from obstruction by objects.
- Two people are required to lift and insert the PAS 280/PAS 880 in the mount.
- Before installing the PAS 280/PAS 880 in the mount, make sure that the mount vibration damping ring is clear of all cables before lowering the PAS 280/PAS 880 onto the mount.

To install the PAS 280/PAS 880 on the mount:

1. Carefully lower the PAS 280/PAS 880 into the center cavity while making sure that there is enough vertical space between the camera lenses and the aircraft optical glass hatch.

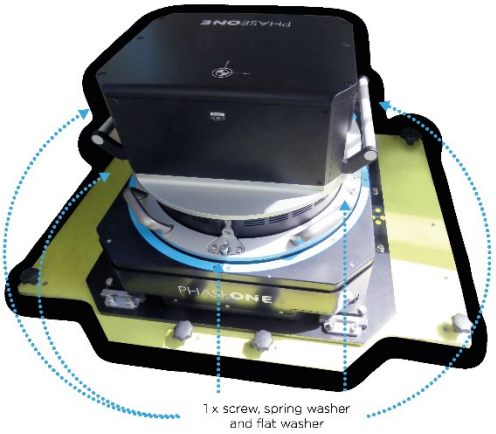
Warning

For open air camera hatches, make sure the pod does not protrude beyond the aircraft skin.

2. Align the holes in the PAS 280/PAS 880 mount ring with the holes in the mount.

To secure the PAS 280/PAS 880 to the mount:

1. Secure the PAS 280/PAS 880 to the mount using 5 x M8 screws with a length of 20 mm.
2. Tighten the bolts to 40 Nm torque.



5.6 Installing the Pilot Monitor

1. Mount the pilot monitor. A suggested method is using a proper mount with a suction cup.

5.7 Installing the Operator Monitor

1. The operator monitor is provided with a device for attaching the monitor to the head rest base. You can use this device or mount it with your own mounting device.

5.8 Connecting a PAS 280/PAS 880 and Mount in the Aircraft

5.8.1 Connecting PAS 280/PAS 880 Components

1. Verify that all components are connected as described in section 4.2 - Connecting a PAS 280/PAS 880 in the Office.

5.8.2 Powering the PAS 280/PAS 880 and Mount in the Aircraft

Warning

- The PAS 280/PAS 880 Controller has been tested and certified for connection to a 28 VDC power supply. Installation on aircraft with other power supplies is not recommended unless special measures are taken to provide the PAS 280/PAS 880 with a 28 VDC supply.
- On the aircraft side, a 20 A circuit breaker must be installed on the 28 VDC power supply.
- It is highly recommended to connect the PAS Power cable to the aircraft power supply using a proper connector in accordance with aviation standards.

To connect the PAS 280/PAS 880 to the aircraft power supply:

1. Connect the open end of the PAS Power cable to the aircraft power supply as shown in the following figure and table:

Caution

Before connecting the power cable to the aircraft power supply, verify voltage polarity.

PAS Power Cable Polarity

Wire	Polarity
Red	+
Black	GND

2. Connect the PAS 280/PAS 880 power cable LEMO connector to the PAS 280/PAS 880 MAIN port (in the POWER section).

To connect the mount to PAS 280/PAS 880 Controller power supply:

1. Connect the mount power cable LEMO straight connector to the PAS 280/PAS 880 POWER port (in the MOUNT section).
2. Connect the other end of the mount power cable to the mount POWER SOCKET.

Caution

Verify that no cables are entangled with other cables or equipment.

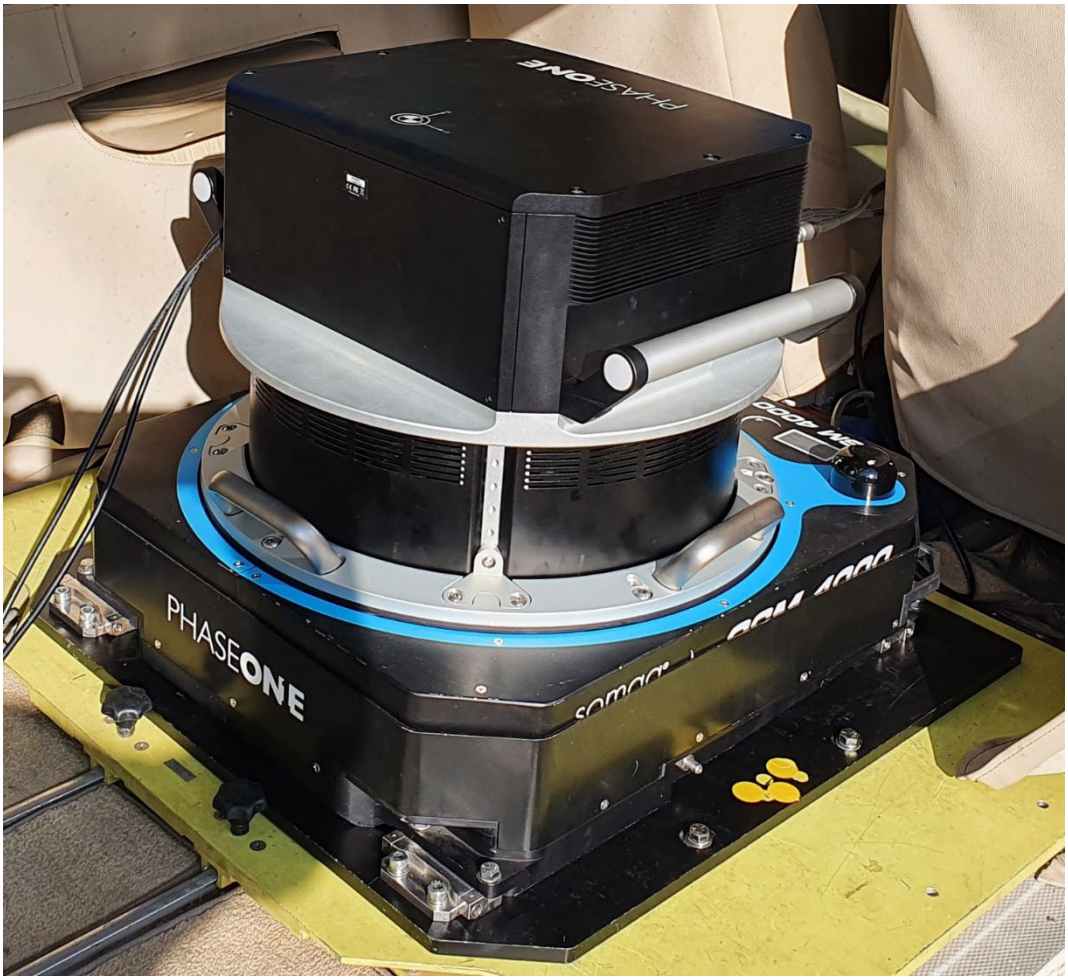
To power up the PAS 280/PAS 880:

1. On the PAS 280/PAS 880 Controller, push in the POWER circuit breaker and confirm that the green LED turns on.
2. On the PAS 280/PAS 880 Controller, push in the CAMERAS circuit breaker.
3. On the PAS 280/PAS 880 Controller, push the CONTROLLER pushbutton.
4. Set the mount POWER SWITCH to ON.

5.9 PAS 280/PAS 880 Installed in Aircraft

Figure 1 shows the complete PAS 280/PAS 880 installed and connected.

Figure 1. PAS 280/PAS 880 Installed in Aircraft



6 Recommended Flight Operation Procedure

1. Follow the recommended flight operation procedure as described in the iX Flight Pro Operation Guide.

7 Post Flight Operations

1. Follow the recommended post flight operations as described in the iX Flight Pro Operation Guide.

8 Disassembling the PAS 280/PAS 880

1. On the operator monitor, shut down Windows.
2. Set the mount POWER SWITCH to OFF.
3. On the PAS 280/PAS 880 Controller, pull the POWER circuit breaker out.
4. Power switch on aircraft switches panel - verify off.
5. On the GSM 4000 mount, open the main oil valve, wait until the mount returns the lowest position then close the main oil valve.
6. PAS Power cable – disconnect from aircraft power outlet and from PAS 280/PAS 880 Controller.
7. Mount power cable - disconnect from PAS 280/PAS 880 Controller and from mount.
8. Mount control cable - disconnect from PAS 280/PAS 880 Controller and from mount.
9. Pilot and operator monitors - disconnect cables from monitors and from PAS 280/PAS 880 Controller.
10. Remove monitors from aircraft.
11. GPS antenna connection - disconnect from PAS 280/PAS 880 Controller.
12. PAS 280/PAS 880 - remove 5 screws securing PAS 280/PAS 880 to mount and remove PAS 280/PAS 880 from aircraft.
13. Mount – remove 6 screws securing the mount to the adaptor plate and remove the mount from aircraft.
14. Interface plate - remove screws securing interface plate to aircraft floor and remove interface plate from aircraft.
15. Perform any other changes required to return aircraft to regular approved configuration.

Note

For information on transferring the SSD from the PAS 280/PAS 880 Controller to the processing computer, see Appendix B - Data Storage Management.

9 Troubleshooting

The following table details how to troubleshoot common PAS 280/PAS 880 faults.

Troubleshooting PAS 280/PAS 880 Faults

Fault	Probable Cause	Solutions
Camera not ready.	No space on SSD storage.	• Change SSD storage. • Change save location.
Image too dark or too bright.	Incorrect camera settings.	Change camera settings.
All images are black.	Lens cap is still on lens.	Remove lens cap.
iX Flight Pro pilot display “frozen” and GPS icon is red.	iX Flight Pro is not receiving GPS data.	• In iX Flight Pro, check GPS status. **Note** You may need to reset the GPS or remove and reconnect the GPS antenna.
In iX Flight Pro > Preflight Check, the following error appears: Missing GPS in USB: MRXXXXXX – capture number XXXXXX?	1. GNSS antenna disconnected. 2. GNSS configuration incorrect. 3. Camera configuration incorrect.	1. Connect antenna. 2. Refer to GNSS Configuration Guide for PAS Systems for PAS for COM2 configuration. 3. In iX Flight Pro > Settings > Camera Settings > Left Terminal, set: ▪ Terminal - GPS ▪ Baud Rate - 115200 ▪ GPS Receiver - Applanix GPS
In iX Flight Pro > Preflight Check, the following error appears: Missing Mount Data in T04	• Configuration error • PAS 280/PAS 880 Controller hardware issue.	1. Connect a USB cable between the mount and the PAS 280/PAS 880 Controller. 2. Power up the PAS 280/PAS 880 and the mount. 3. Open the SOMAG mount management application and verify that it connected to the mount (mount type and S/N is displayed). 4. In the mount application, go to Setting 2 page and verify that the Aux Port is enabled and that AVX210 is selected. 5. In the mount application, go to the home page, change to **MAN**, move angle sliders to 2 degrees in roll pitch and yaw. 6. Make sure nothing is blocking the system and nobody is close to it, and click **Apply**. The mount moves. 7. Open the Applanix GNSS browser UI. 8. Click I/O Configuration > Port Configuration and verify that for **Serial/COM1** port, **GIMBAL** is set to **GIM01**. 9. Click **Receiver Status** > **INS Status** and verify that the gimbal angles are the same as those displayed in the mount application. If the angles dis[played are “0”,– there is a hardware issue. Contact Phase One Technical Support.

Appendix A Technical Data

A.1 PAS 280/PAS 880 Weight

The weight of the PAS 280/PAS 880 is listed in the following table:

Description	Connects to
PAS 280/PAS 880	50 kg / 110 lb
SOMAG GSM 4000 Mount	29 kg / 63.9 lb

A.2 Power Specifications

A.2.1 Power Requirements

Parameter	Requirement
Voltage	24 - 32 VDC
Maximum current	20 A

A.2.2 Power Consumption

Power consumption for the PAS 280/PAS 880 is listed in the following table:

Parameter	PAS 280/PAS 880
Average power consumption	380 W
Peak power consumption	450 W

Appendix B Data Storage Management

B.1 Disk Management

The PAS 280/PAS 880 Controller storage consists of three SSD drive bay frames that contain removable carriers with SATA SSDs that store the captured images. The number of SSDs depend on the PAS 280/PAS 880 configuration (see section 2.1.1 - PAS 280/PAS 880 Controller).

The carrier front panel contains the following LEDs:

LED	Color	State	Description
Drive power	Green	Solid	The drive is powered on.
Drive activity	Amber	Blinking	The drive is being accessed by the PAS 280/PAS 880 Controller.

The drives are assigned the following drive letters:

- D - Drive Bay 1 top drive
- E - Drive Bay 1 bottom drive
- F - Drive Bay 2 top drive
- G - Drive Bay 2 bottom drive
- H - Drive Bay 3 top drive
- I - Drive Bay 3 bottom drive

Note

For information on transferring data from the SSDs to the processing computer, see the iX Process Operations Guide.

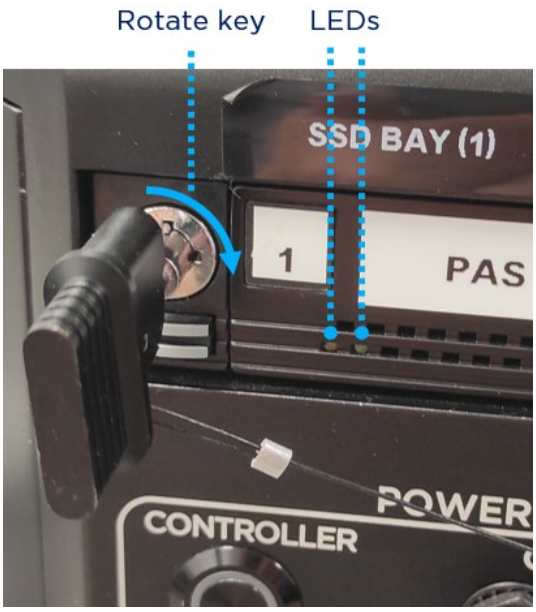
B.2 Locking the Carrier

Note

- The carrier must be locked with the SSD carrier key for the PAS 280/PAS 880 Controller to recognize the drives.
- The SSD carrier key is located in the front panel of the PAS 280/PAS 880 Controller.

To lock the carrier in the SSD drive bay frame:

1. Insert the SSD carrier key into the SSD carrier keylock and turn it 90° clockwise. The yellow and green SSD drive LEDs turn on momentarily and the green LED remains on.



B.3 Removing the SSD Drive Carrier

An additional frame is provided with the PAS 280/PAS 880 Controller. This frame should be installed in a computer used for post-flight processing. You can then transfer the carrier with its SSD drives between the PAS 280/PAS 880 Controller and the processing computer.

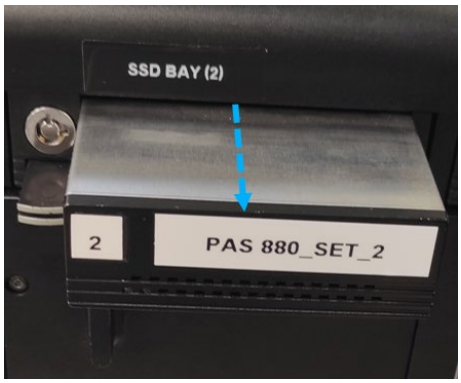
Note

Additional carriers (with or without SSD drives) with SATA or USB 3 based frames can be ordered through your Phase One sales representative.

To remove the SSD drive carrier from the PAS 280/PAS 880 Controller:

1. On the operator monitor, shut down Windows.
2. On the PAS 280/PAS 880 Controller, pull the **MAIN** circuit breaker out.
3. Insert the SSD carrier key into the SSD carrier keylock and turn it 90° counterclockwise.
4. Push in the SSD carrier eject button once to release the button, and again to eject the carrier from the frame.

5. Gently remove the SSD carrier from the PAS 280/PAS 880 Controller.



B.4 Inserting the SSD Drive Carrier

To insert the SSD drive carrier into the PAS 280/PAS 880 Controller:

1. On the operator monitor, shut down Windows.
2. On the PAS 280/PAS 880 Controller, pull the **MAIN** circuit breaker out.
3. If the SSD carrier eject button is protruding, push it all the way in.
4. Gently insert the SSD carrier into the PAS 280/PAS 880 Controller.
5. Insert the SSD carrier key into the SSD carrier keylock and turn it 90° clockwise.
6. Power up the PAS 280/PAS 880 Controller by pushing in the **MAIN** circuit breaker.
7. Verify that the green SSD drive LED turns on.

B.5 Replacing SSD Drives

The PAS 280/PAS 880 Controller is factory provided with two 1 TB SSD drives installed in a removable carrier.

You can replace the SSDs as required. To achieve optimal performance, both SSDs should have a high writing speed (>500 MB/S). Drive capacities can be different.

To replace the SSD drives:

1. On the operator monitor, shut down Windows.
2. On the PAS 280/PAS 880 Controller, pull the MAIN circuit breaker out.
3. Remove the carrier from the PAS 280/PAS 880 Controller (see Appendix B.3 - Removing the SSD Drive Carrier).

4. Remove both cover screws at the rear of the carrier.

5. Slide the carrier out from the carrier cover.

6. Remove all screws securing the SSD drives to the carrier.

7. Replace the SSD(s) in the carrier.
8. Secure the SSD(s) to the carrier.
9. Slide the cover back on to the carrier and secure it with the cover screws.
10. Insert the carrier into the PAS 280/PAS 880 Controller.

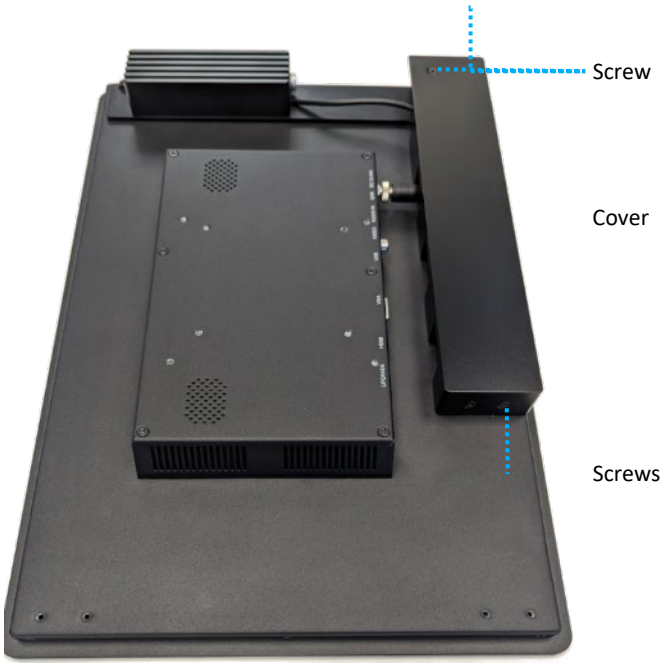
Appendix C Connecting the PAS 280/PAS 880 – Operator Monitor Cable to the Monitor

> **Note**
>
> If the operator monitor cable is not connected to the operator monitor, perform the procedure in this appendix.

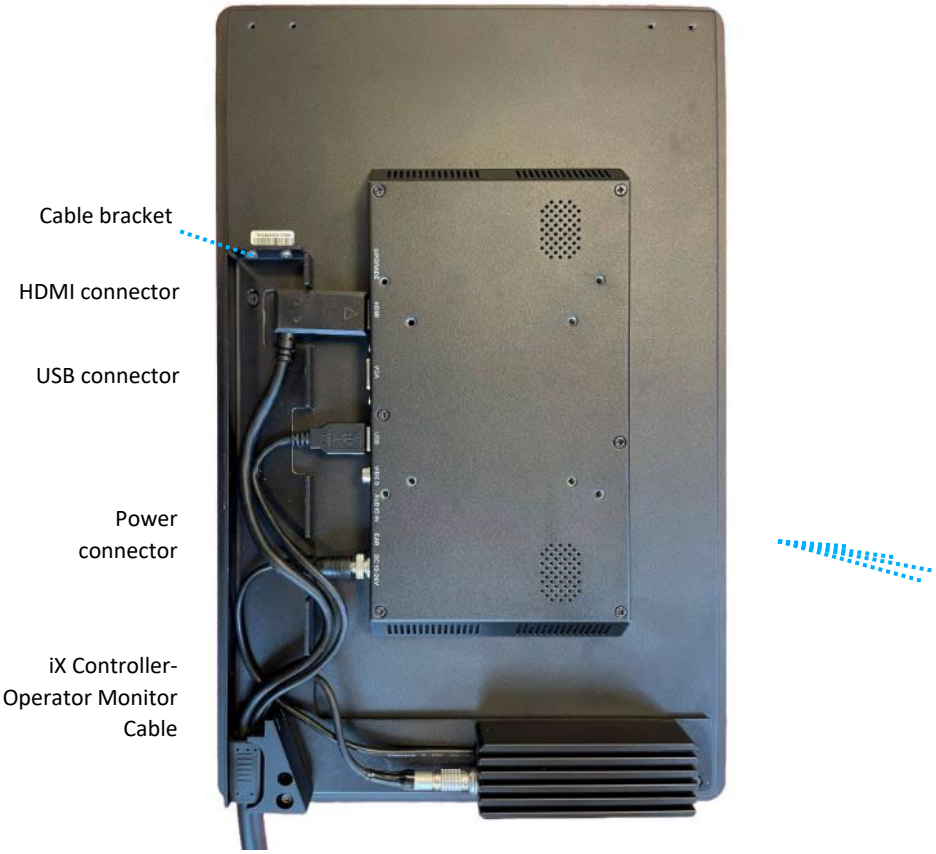
The PAS 280/PAS 880 – Operator Monitor Cable is connected to the operator monitor through the cable bracket on the rear of the monitor.

To connect the PAS 280/PAS 880 – Operator Monitor Cable to the operator monitor:

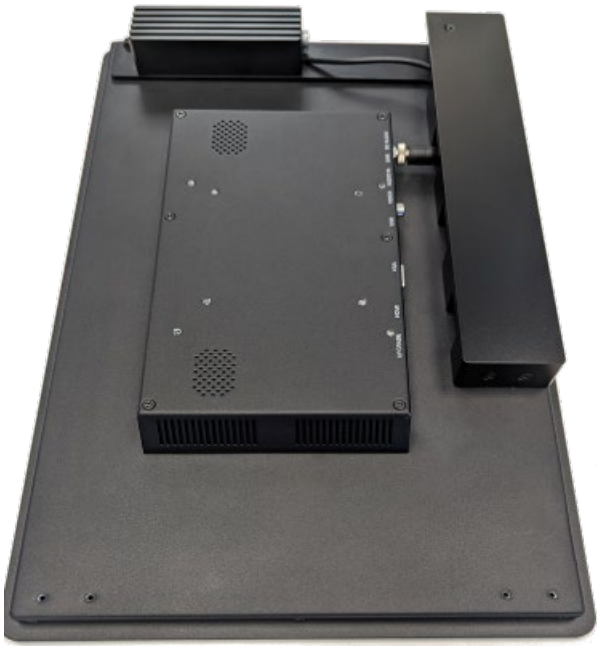
1. Locate the cable bracket on the rear panel of the operator monitor.
2. Using a 2 mm Allen key, remove all three screws securing the cover to the cable bracket.
3. Remove the cover.



4. Insert the iX Controller - Operator Monitor cable into the cable bracket and connect the following connectors:
   - HDMI
   - USB
   - Power



5. Place the cover on the housing.
6. Replace the three screws securing the cover to the cable bracket as follows:
   a. Place a drop of Loctite 222 on the screw thread and insert the screw in position.
   b. Tighten the screw with a torque of 60 cNm.



Appendix D Declarations of Conformity

D.1 PAS 280/PAS 880 Controller

PHASEONE

EU Declaration of Conformity

This declaration of conformity is issued under our sole responsibility and belongs to the following product(s):

Product: Phase One Aerial System
Trade Name: Phase One A/S
Model: PAS 880i, PAS 880, PAS 280i, PAS 280, PAS Pana

The product is in conformity with the following standards and/or other normative documents:

Other (voluntary specs):
RoHS: Article 4(1)

DO160G RTCA/DO-160G: sections 4.5.1-4.5.4 Cat. B4
Operating range: -10C to 40C
Ground survival: -55C to 85C,
5.3.1
6 Cat. C
7.2.1 Cat. B, 7.3.1 Cat. B
8.2.1.1, 8.5.2 – Category S, Curve M

Technical Documentation relevant to the product described above is held by:
Phase One, Roskildevej 39, DK-2000 Frederiksberg, Denmark

Frederiksberg, Denmark, 10-2022

d. meler

Dedi Meler / Compliance Specialist

Phase One A/S ♦ Roskildevej 39, DK-2000 Frederiksberg, Denmark
Tel: (45) 36 46 0111 ♦ Website: industrial.phaseone.com ♦ E-mail: geospatial@phaseone.com

D.2 iXM-RS280F Camera

PHASEONE

EU Declaration of Conformity

This declaration of conformity is issued under our sole responsibility and belongs to the following product(s):

Product: Phase One iXM-RS camera
Trade Name: Phase One A/S
Model: Phase One iXM-RS280F

The product is in conformity with the following standards and/or other normative documents:

EMC: EN 61000-6-3:2020 + EN 61000-6-1:2019,
EN 55035:2015 + A1:2020, EN 55032:2015/A11:2020

Other (voluntary specs):
EMC: FCC CFR 47 Part 15 Subpart B
ANSI C63.4:2014
Industry Canada ICES-003:06
VCCI Technical Requirements, V-3/2016

RoHS: Article 4(1)

DO160G RTCA/DO-160G: sections 4.5.1-4.5.4, 4.6.1 Cat. B4
Operating range: -10C to 40C
Ground survival: -55C to 85C,
5.3.1 Cat C,
6 Cat. B,
7.2.1, 7.3.1 Cat. B
8.5.2 – Fixed Wing Category S, Curve M
8.8.2 – Helicopter Category U

MTBF: *20,000 Hours*

Technical Documentation relevant to the product described above is held by:
Phase One, Roskildevej 39, DK-2000 Frederiksberg, Denmark

Frederiksberg, Denmark, March 2022

d. meler

Dedi Meler / Compliance Specialist

Phase One A/S ♦ Roskildevej 39, DK-2000 Frederiksberg, Denmark
Tel: (45) 36 46 0111 ♦ Website: industrial.phaseone.com ♦ E-mail: industrial@phaseone.com

D.3 iXM-RS150F Camera

PHASEONE

EU Declaration of Conformity

This declaration of conformity is issued under our sole responsibility and belongs to the following product(s):

Product: Phase One iXM-RS camera
Trade Name: Phase One A/S
Model: Phase One iXM-RS150F

The product is in conformity with the following standards and/or other normative documents:

EMC: EN 61000-6-3:2007 + EN 61000-6-1:2007,
EN 55024:2010 + A1:2015, EN 55032:2012/AC:2013

Other (voluntary specs):
EMC: FCC CFR 47 Part 15 Subpart B
ANSI C63.4:2014
Industry Canada ICES-003:06
VCCI Technical Requirements, V-3/2016

RoHS: Article 4(1)

DO160G RTCA/DO-160G: sections 4.5.1-4.5.4
Operating range: -10C to 40C
Ground survival: -55C to 85C,
4.6.1 (B4)
5.3.1
6 (B)
7.2.1 (B),
8.2.1.1, 8.5.2 – Category S, Curve M

MTBF: 20,000 Hours

Technical Documentation relevant to the product described above is held by:
Phase One, Roskildevej 39, DK-2000 Frederiksberg, Denmark

Frederiksberg, Denmark, 7-2022

d. meler

Dedi Meler / Compliance Specialist

Phase One A/S ♦ Roskildevej 39, DK-2000 Frederiksberg, Denmark
Tel: (45) 36 46 0111 ♦ Website: industrial.phaseone.com ♦ E-mail: industrial@phaseone.com

D.4 iXM-RS150F Achromatic Camera

PHASEONE

EU Declaration of Conformity

This declaration of conformity is issued under our sole responsibility and belongs to the following product(s):

Product: Phase One iXM-RS camera
Trade Name: Phase One A/S
Model: Phase One iXM-RS150F Achromatic

The product is in conformity with the following standards and/or other normative documents:

EMC: EN 61000-6-3:2007 + EN 61000-6-1:2007,
EN 55024:2010 + A1:2015, EN 55032:2012/AC:2013

Other (voluntary specs):
EMC: FCC CFR 47 Part 15 Subpart B
ANSI C63.4:2014
Industry Canada ICES-003:06
VCCI Technical Requirements, V-3/2016

RoHS: Article 4(1)

DO160G RTCA/DO-160G: sections 4.5.1-4.5.4
Operating range: -10C to 40C
Ground survival: -55C to 85C,
4.6.1 (B4)
5.3.1
6 (B)
7.2.1 (B),
8.2.1.1, 8.5.2 – Category S, Curve M

MTBF: 20,000 Hours

Technical Documentation relevant to the product described above is held by:
Phase One, Roskildevej 39, DK-2000 Frederiksberg, Denmark

Frederiksberg, Denmark, 7-2022

Dedi Meler / Compliance Specialist

Phase One A/S ♦ Roskildevej 39, DK-2000 Frederiksberg, Denmark
Tel: (45) 36 46 0111 ♦ Website: industrial.phaseone.com ♦ E-mail: industrial@phaseone.com