Exif tags for project creation in Pix4D products

Version 0.0.5

In order to create a project and successfully process the calibration, certain Exif metadata is required in the images. Other metadata are optional but improve the results. Below is a list which specifies the behaviour of Pix4D's products.

Name	refers to
![PIX4Dmapper icon]	PIX4Dmapper 4.6.2. This also applies to Cloud products that use the PIX4Dmapper as backend, i.e. PIX4Dcloud and PIX4Dinspect.
API	Products that use the camera creation API. This includes PIX4Dmatic 1.6.0 and newer and PIX4Dengine 2.
![PIX4Dfields icon]	PIX4Dfields 1.8.1 and newer.

Symbol	Meaning
⚠	Required
📎	Required for Exif-driven generic camera model
⊞	Recommended
ⓘ	optional
⊗	unsupported

Notes:
- The XMP namespace Camera (i.e. Xmp.Camera.* tags) is defined by Pix4D, URI: http://pix4d.com/camera/1.0
- Numbers in XMP tags must be written with a dot as decimal separator (not comma).
- For tags regarding radiometric correction, see the Exif/Xmp tags required for radiometric correction for multispectral camera article.

Basic information for camera model assignment

These tags are necessary to find the correct camera model and to organise the captures.

Tag	Description	Accepted values	![PIX4D]	API	![fields]
Exif.Image.Make	The camera manufacturer.	Any string	⚠	⚠	⚠
Exif.Image.Model	The camera model name.	Any string	⚠	⚠	⚠
Exif.Photo.LensModel	The name of the lens, if exchangeable.	Any string	ⓘ	ⓘ	ⓘ
Exif.Photo.BodySerialNumber	The serial number of the camera body.	Any string	⊞	⊞	⊞
Exif.Photo.LensSerialNumber	The serial number of the lens, if exchangeable.	Any string	ⓘ	⊗	ⓘ

Tag	Description	Accepted values	Pix4D	API	
Exif.Photo.FocalLength	The focal length of the camera, in millimeters.	Positive rational number	⊞	⚠	⚠
Exif.Photo.DateTimeOriginal	The date and time of the image acquisition.	String with the format YYYY:MM:DD hh:mm:ss	⊞	⚠	⚠
Exif.Photo.SubSecTimeOriginal	The date and time of the image acquisition, sub-second part, in milliseconds. This tag can be used to make the time more precise than one second.	String containing an integer between 000 and 999, including leading zeros.	ⓘ	ⓘ	⊗
Exif.GPSInfo.GPSDateStamp	The date of the image acquisition as reported by the GPS (UTC).	String with the format YYYY:MM:DD	⊞	⊞	⊞
Exif.GPSInfo.GPSTimeStamp	The time of the image acquisition as reported by the GPS (UTC).	Three positive rational numbers for hour, minute, second $0 <= hour < 24$, $0 <= minute, second < 60$	⊞	⊞	⊞
Xmp.Camera.BandName	Band configuration as user-readable strings.	XmpSeq, with one string per channel	⊞	⊞	⚠
Xmp.Camera.CentralWavelength	Band configuration: The central wavelength of the spectral sensitivity distribution for each channel, in nanometer.	XmpSeq, with one positive real number per channel	⊞	⊞	⚠
Xmp.Camera.WavelengthFWHM	Band configuration: The full-width half maximum of the spectral sensitivity distribution for each channel, in nanometer.	XmpSeq, with one positive real number per channel	⊞	⊞	⚠

Geolocation information

This information is used to geo-locate the scene.

Tag	Description	Accepted values	Pix4D	API	
Exif.GPSInfo.GPSLatitude	The latitude of the acquisition location as reported by the GPS.	List of up to three positive rational numbers for degree, minute, second $0 <= degree <= 90$, $0 <= minute, second < 60$	⊞	⊞	⚠
Exif.GPSInfo.GPSLatitudeRef	The latitude reference (North or South).	String containing either N or S	⊞	⊞	⚠
Exif.GPSInfo.GPSLongitude	The longitude of the acquisition location as reported by the GPS.	List of up to three positive rational numbers for degree, minute, second $0 <= degree <= 180$, $0 <= minute, second < 60$	⊞	⊞	⚠

Exif.GPSInfo.GPSLongitudeRef	The longitude reference (East or West).	String containing either E or W	⊞	⊞	⚠
Xmp.Camera.HorizCS	The horizontal coordinate system used by the GPS receiver.	String with the EPSG code, e.g. EPSG:4326	⊗	⊞	⊗
Xmp.Camera.GPSXYAccuracy	The accuracy (one sigma of the Gaussian distribution) of the horizontal location of the GPS, in meter	Positive real number	⊞	⊞	⊞
Exif.GPSInfo.GPSAltitude	The altitude of the acquisition location as reported by the GPS.	Positive rational number	⊞	⊞	⚠
Exif.GPSInfo.GPSAltitudeRef	The reference of the altitude	Byte, either 0 or 1 0 = above sea level 1 = below sea level	⊞	⊞	⊞
Xmp.Camera.VertCS	The vertical coordinate system used by the GPS receiver.	String with the EPSG code, e.g. EPSG:5773, or the special value ellipsoidal for using ellipsoidal height.	⊗	⊞	⊗
Xmp.Camera.GPSZAccuracy	The accuracy (one sigma of the Gaussian distribution) of the vertical location (i.e. the altitude) of the GPS, in meter	Positive real number	⊞	⊞	⊞
Xmp.Camera.Yaw	Yaw of the orientation of the image as measured by an IMU, in degree (angle convention).	Positive real number between 0 and 360	⊞	⊞	⊗
Xmp.Camera.IMUYawAccuracy	The accuracy (one sigma of the Gaussian distribution) of the yaw, in degree	Positive real number between 0 and 360	⊞	⊞	⊗
Xmp.Camera.Pitch	Pitch of the orientation of the image as measured by an IMU, in degree.	Positive real number between 0 and 360	⊞	⊞	⊗
Xmp.Camera.IMUPitchAccuracy	The accuracy (one sigma of the Gaussian distribution) of the pitch, in degree	Positive real number between 0 and 360	⊞	⊞	⊗
Xmp.Camera.Roll	Roll of the orientation of the image as measured by an IMU, in degree.	Positive real number between 0 and 360	⊞	⊞	⊗
Xmp.Camera.IMURollAccuracy	The accuracy (one sigma of the Gaussian distribution) of the roll, in degree	Positive real number between 0 and 360	⊞	⊞	⊗

Projection information

This information is helping to obtain the correct camera model for a particular unit. The camera model parameters should ideally be measured for each individual unit in the production line in order to obtain precise values for that particular unit.

Tag	Description	Accepted values		
Exif.Photo.FocalPlaneXResolution	Pixels in x direction per physical length unit, used to compute the pixel size. For the unit see Exif.Photo.FocalPlaneResolutionUnit. pixelSizeX = unitLength / FocalPlaneXResolution	Positive rational number	📎	📎	⚠
Exif.Photo.FocalPlaneYResolution	Pixels in y direction per physical length unit, used to compute the pixel size. For the unit see Exif.Photo.FocalPlaneResolutionUnit. For square pixels this tag has the same value as Exif.Photo.FocalPlaneXResolution.	Positive rational number	📎	📎	⚠
Exif.Photo.FocalPlaneResolutionUnit	The unit for Exif.Photo.FocalPlaneXResolution and Exif.Photo.FocalPlaneYResolution.	A short integer with the following possible values: 2 = Inch 3 = Centimeter 4 = Millimeter 5 = Micrometer	📎	📎	⚠
Xmp.Camera.ModelType	The type of camera model. For perspective, the tags Xmp.Camera.PrincipalPoint, Xmp.Camera.PerspectiveFocalLength, and Xmp.Camera.PerspectiveDistortion are required. For fisheye, the tags Xmp.Camera.PrincipalPoint, Xmp.Camera.FisheyeAffineMatrix, and Xmp.Camera.FisheyePolynomial are required and Xmp.Camera.FisheyeAffineSymmetric is optional.	String with the possible values perspective or fisheye.	📎	📎	➕
Xmp.Camera.PrincipalPoint	The principal point in millimeter. The origin of the coordinate system is at the top left of the image, with positive x towards the right and positive y towards the bottom.	Two positive real numbers, for x and y, respectively, separated by a comma	📎	📎	➕
Xmp.Camera.PerspectiveFocalLength	If perspective model, the exact focal length in millimeter.	Positive real number	📎	📎	➕
Xmp.Camera.PerspectiveDistortion	If perspective model, the distortion parameters	Five real numbers, for R1, R2, R3, T1, T2, respectively, separated by comma	📎	📎	➕

Xmp.Camera.FisheyeAffineMatrix	If fisheye model, the affine matrix C, D, E, F as defined in the fisheye model.	Four real numbers, C, D, E, F, separated by comma	🖉	🖉	⊞
Xmp.Camera.FisheyePolynomial	If fisheye model, the polynomial coefficients are defined in the fisheye model.	Real numbers separated by comma	🖉	🖉	⊞
Xmp.Camera.FisheyeAffineSymmetric	If fisheye model, specifies if a symmetric affine matrix should be used. Optional, if not given, false is assumed.	An integer, either 0 or 1, with 1 meaning true	ⓘ	ⓘ	ⓘ

Rig information

The information in this section refers only to rig cameras. *For non-rig cameras none of those tags are applicable.*

Tag	Description	Accepted values			
Xmp.Camera.RigName	The name of the rig. This unique key is used to find the rig in the database.	Any string	⚠	⚠	⚠
Xmp.Camera.RigCameraIndex	The index of the camera in the rig model in the database.	Positive integer number ≥ 0	⚠	⚠	⚠
Xmp.Camera.CaptureUUID	Unique capture identifier, required for creating rig instances.	Any string	⊞	⚠	⚠
Xmp.Camera.FlightUUID	Unique flight identifier, required if two capture UUIDs for two different flights could be identical.	Any string	ⓘ	ⓘ	ⓘ
Xmp.Camera.RigRelatives	Rig relative rotation with respect to the reference camera for that particular unit as calibrated in the factory line, in degree (Angle convention).	XmpText with three comma-separated real numbers	📎	📎	📎