

# PYLON CAMERA SOFTWARE SUITE

AS EASY AS CONNECTING THE DOTS. SAVE TIME. SAVE MONEY.

**New pylon vTools & Workbench,  
blaze 3D and 5 GigE cameras support.**

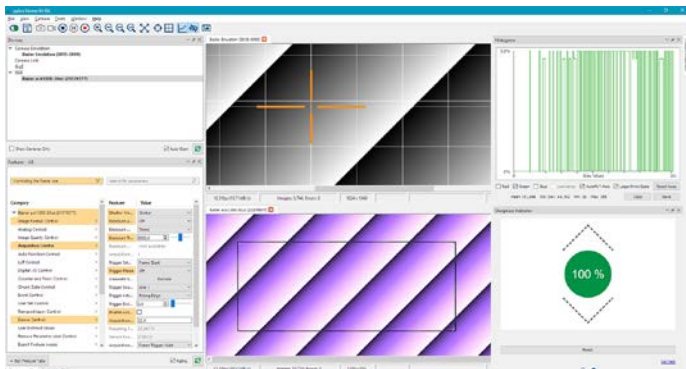


- Powerful image processing for machine vision, medical and other applications
- Easy-to-use tools for camera configuration, and for capturing and recording images
- Access to all camera features thanks to GenICam technology
- User-optimized SDK for desktop and embedded applications
- Windows, macOS, Linux x86, Linux ARM and Android support

## Basler pylon Camera Software Suite

The pylon Camera Software Suite is a collection of drivers and tools for operating any Basler camera with a Windows, macOS, Android or Linux PC or embedded processing board. As it is based on GenICam technology, it offers barrier-free access to the newest camera models and the latest features. Making changes to an existing camera device in your application essentially becomes a plug and play process.

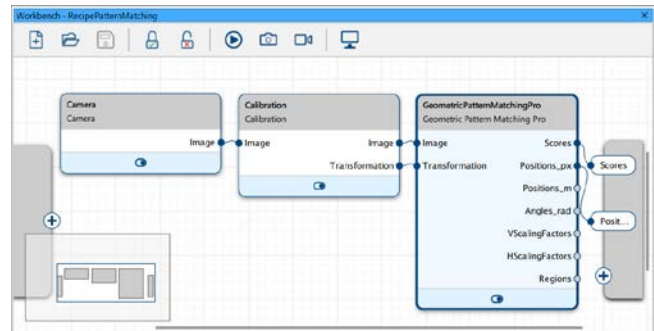
The **pylon Viewer** is a versatile application for testing and evaluating Basler cameras.



The tree structure of the viewer's graphical user interface lets you easily find the best camera parameter setup, adjust image quality, and control advanced camera features. Use predefined use cases to easily find any related parameters for your application use case, e.g. check whether the application is losing image data. Use the **search function** to quickly find all camera features with names containing the search term you entered. You can also create your own **Feature Tabs** that contain your favorite or most used features. This helps you save valuable time during the camera evaluation and setup design.

An easy-to-use set of **configuration tools** allows you to configure the camera's interface. For example, you can easily configure the IP settings of a GigE Vision camera, fix driver or bandwidth problems for USB cameras, or configure baud rates for Camera Link cameras.

The **Workbench feature** offers a graphical editor for creating machine vision, medical and other applications. Instead of writing code, you simply select the processing steps required from a selection of vTools, connect them in the desired order, and then save them in a recipe file, which you can load into and execute from your application.



The pylon Viewer and APIs allow for camera images to be recorded to video files (**MP4** or **AVI**) or into a sequence of single images. Furthermore, the recording speed can be varied to create time-lapse videos.

The **pylon GigE Vision Filter and Socket drivers** support all kinds of hardware, common 1 GigE, 5 GigE and 10 GigE network cards, and any Ethernet ports on your motherboard as well. The pylon GigE Vision drivers quickly separate incoming packets carrying image data from other traffic on the network, and make the data available for use by your vision application while requiring low CPU resources.

Starting with pylon 6, Basler provides support for the new **CoaXPress 2.0** standard for a first time. It takes just a few clicks to install all necessary drivers and libraries and get your Basler CXP-12 interface card and Basler boost camera set up and running.

The **pylon USB3 Vision Driver** fully supports the USB3 Vision standard. It allows Basler USB 3.0 cameras to use the full speed and bandwidth of USB 3.0 for image transmission, while reducing resource load and using off-the-shelf hardware components.

The **pylon Camera Link Configuration Driver** offers easy access to all camera parameters of Basler's latest Camera Link families: ace, aviator, beat, and racer.

The pylon Camera Software Suite is also available for the Basler dart with **BCON for MIPI**, Basler's interface for sophisticated embedded technology requirements.

With pylon and the Supplementary Package for blaze you get all the necessary tools for easy integration and setup of the **blaze 3D camera**. This allows you to develop applications for your 2D and 3D cameras through a single interface

# PYLON WORKBENCH & VTOOLS

AS EASY AS CONNECTING THE DOTS.  
SAVE TIME. SAVE MONEY.



## pylon 7 Camera Software Suite

With the new pylon 7 release, Basler adds professional and powerful image processing functionalities to pylon for the first time.

The new Workbench feature offers a graphical editor for creating machine vision, medical and other applications. Instead of writing code, you simply select the processing steps required from a selection of vTools, connect them in the desired order, and then save them in a recipe file, which you can load into and execute from your application.

The Workbench allows for graphical configuration of vTools and comes with extensive documentation that helps even unexperienced users to realize complex image processing tasks with ease. You can measure and analyze the execution times of single vTools or the complete recipe and optimize the performance. The new Data Processing C++ API extends the existing, powerful C++ API for camera configuration and image acquisition, and allows for rapid application development.

Multiple vTools for calibration, pattern matching, blob analysis, measurement, code reading, etc. are available as Basic and Pro version to fulfil different requirements on your individual level of functionality and price point.

With pylon 7, Basler enables all pylon users to evaluate the new vTools in the pylon Viewer for 80 days for free. For the evaluation of vTools in the pylon Data Processing API, a free of charge evaluation license for 180 days can be obtained via Basler Sales. The use of vTools in your production environment is possible by means of runtime licenses for single vTools or combinations of vTools. For more information refer to Basler Sales.

The vTools come in small smart license packages that fit your needs:

- BLOB Analysis - Image segmentation using greyscale thresholding
- Color BLOB Analysis - Image segmentation using GMM classifier
- Geometric Pattern Matching - Detection of objects by geometric shapes
- Measurements- Measure distances along a single line
- Calibration- Rectification and real-world coordinate transformation
- Barcode Reader - 1D code reading
- Data Matrix Code Reader- 2D code reading
- QR Code Reader - 2D code reading

## Identify regions and objects by structure (BLOB Analysis and Color BLOB Analysis):

With our BLOB Analysis vTools you are able to distinct consistent image regions or objects from the background. For gray value images our BLOB Analysis license package contains three different Thresholding vTools, that allow an easy segmentation of your region of interest. For Color BLOB analysis Basler offers a Color Classifier vTool that is based on a statistical approach and thus complements the classical thresholding approaches. Both BLOB license packages come with a set of convenient postprocessing and information extraction tools as Region Morphology, Region Selection and Region Feature Extraction.

## Identify regions by shape (Geometric Pattern Matching Pro):

The Geometric Pattern Matching Pro vTool allows easy detection of geometrical shapes. With just a few mouse-clicks the geometrical shape can be taught and executed. With further scaling and execution settings the search range can be adapted to e.g., find even distorted versions of the shape or limit the maximum number of matches.

## Rectify, calibrate and measure (Calibration and Measurements)

The Calibration license package offers a simple way to correct the perspective distortions in your image. You can choose from different sized calibration plates, with which the distortion will be automatically computed and corrected. To gain pose information, the Calibration license offers a machine calibration, which allows to define a machine coordinate system in real world coordinates - automatically or manually, for maximum flexibility. The coordinate transformation can be used as input information for other vTools, e.g Measurements, to gain information in metric units. The Measurements license package allows easy measurement along a line with automatic edge detection

## Code Reading (Barcode Reader, Data Matrix Code Reader and QR Code Reader):

The Code Reader vTools are structured into three license packages. The Barcode Reader covers multiple groups of barcodes e.g., EAN, UPC, GS1 and others. All Basic license packages limit the maximum number of codes per image to two or three codes at maximum, while the Pro license packages allow the detection of unlimited number of codes per image. The Timeout and Number of Codes settings allow to improve the performance.

## Software Development Kit

The pylon Camera Software Suite also contains a **powerful SDK** and helps to develop any kind of camera application for Windows, Linux, macOS or Android on desktop as well as on embedded systems.

With the **well-designed** and **user-friendly** API you will need just a few lines of code to configure the camera and to grab and process images. The Instant Camera Class takes care of device lifetime and buffer management, as well as setting up a grab loop and handling camera events.

## Documentation and Samples

Comprehensive documentation, plus a collection of programming samples for C ++, C, .NET languages (C#, VB.NET, etc.), illustrate various use cases for different grab strategies, multi-camera applications, recording video files, apply image processing, and many more.

**The pylon Camera Software Suite operates with all Basler line scan and area scan cameras - no matter what interface they use. It offers stable, reliable and flexible data exchange between Basler cameras and PCs, for Windows, macOS, Linux and Android on on x86 and ARM based systems – at a very low CPU load.**

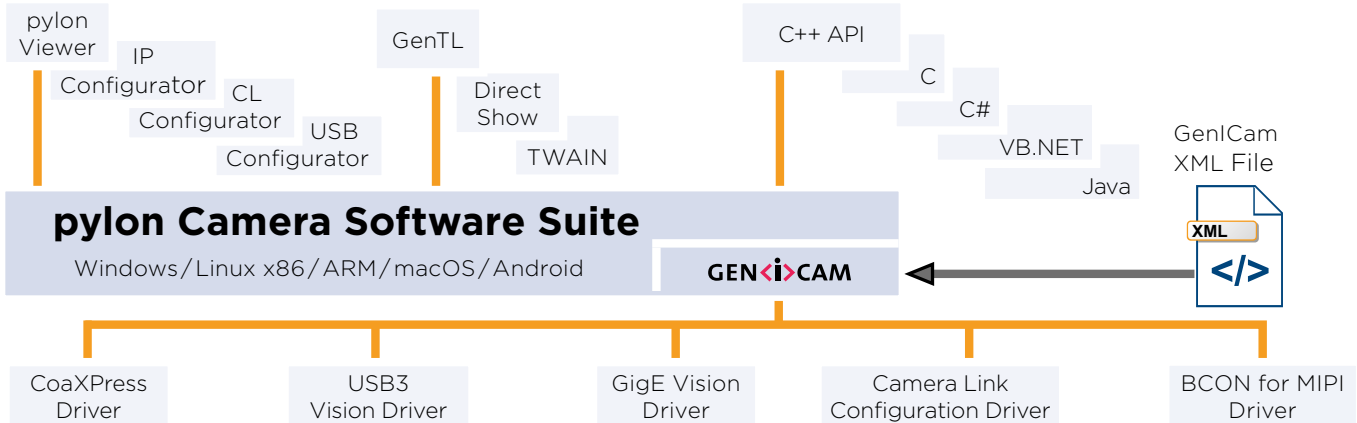
## The GenICam Concept

The pylon SDK is based on the concept of GenICam. This means that the camera itself describes its features and parameters (name, data type, value range etc.) through an XML file which is part of the camera firmware.

When pylon opens the camera, it loads and processes the camera XML file and creates a generic API which provides access to all camera parameters and functions.

This approach allows the creation of **generic** camera applications compatible with all kinds of Basler cameras, no matter what interface they use.

You can easily provide generic GUI feature controls which are generated dynamically when processing the camera XML, and which provide access to all camera features without having any prior knowledge about the existence of these features – the pylon Viewer's feature tree is a good example of these kinds of controls.



5/10 GigE Support

Starting with pylon 7.1, Basler introduces new GigE Vision Filter and Socket drivers especially designed for Basler's new 5 GigE cameras and 10 GigE network adapters. The new drivers come with robust resend mechanisms and guarantee stable and reliable image acquisition.

The new pylon GigE Configurator tool helps to configure the complete setup, e.g., any PC operating system settings, any related NIC parameters, the IP addresses of NICs and cameras, and camera parameters. By that, your complete setup can be easily optimized with a single mouse click.

CoaXPress 2.0



Starting with pylon 6, Basler provides support for the new CoaXPress 2.0 standard for a first time. It takes just a few clicks to install all necessary drivers and libraries and get your Basler CXP-12 interface card and Basler boost camera set up and running.

Thanks to the easy-to-use and generic pylon SDK you can easily adapt your existing pylon application to support the new CoaXPress cameras, too.

With the integrated GenTL support in pylon, Basler CoaX-Press cameras can also be used in any GenICam GenTL compatible 3rd party libraries, e.g. MVTec HALCON or Matrox MIL.

Compression Beyond

Since pylon 6.1, Basler provides support for the new Compression Beyond feature of Basler's ace 2 Pro GigE and USB 3.0 cameras. Choose between lossless or lossy data compression to reach up to three times higher frame rates and throughput.

The pylon Viewer allows for intuitive and easy evaluation of the Compression Beyond feature while the pylon APIs enable its seamless integration into your own applications.

Thanks to the integrated decompression in pylon's GenTL producers, Basler ace 2 Pro cameras can also be used in any GenICam GenTL compatible 3rd party libraries.

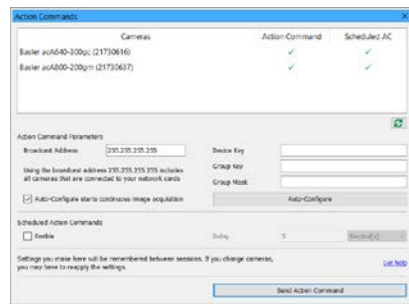
Sharpness Indicator



With the new Sharpness Indicator in the pylon Viewer, focusing your lens becomes a piece of cake! Simply define the area of interest you want to focus

your lens on. Cycle through the entire focus range of your lens by turning the focus ring to its minimum and maximum positions. And eventually find the perfect focus for your lens based on the sharpness measurement of the pylon Sharpness Indicator.

GigE Action Commands evaluation tool



With the Action Command and Scheduled Action Command (PTP, IEEE1588) camera features and the pylon Camera Software Suite this task can be completed with ease. The new Action Command

pane in the pylon Viewer is designed to help beginners as well as experienced developers to easily evaluate Action Commands and Scheduled Action Commands and implement them in their own application.

Vignetting Correction

With the new Vignetting Correction camera feature and the pylon Camera Software Suite you can make use of smaller size and low-cost lenses and still avoid vignetting artefacts. Simply let the pylon Viewer calculate the correction values and save them in the camera. The camera will then apply the correction values to every image while maintaining its real-time functionality and still providing maximum performance to your application. In this way, you can make use of cost-effective lenses and thus decrease your total project costs.

pylon Open Source Projects: Be Part of It!

**ROS 2** "pypylon" and "pylon camera driver for ROS" are two new products from which you can benefit, particularly while programming in the Python programming language and when creating robot applications. Basler is making both available as open source projects for the first time. [baslerweb.com/pylon-open-source-projects](http://baslerweb.com/pylon-open-source-projects)

## pylon Camera Software Suite for Windows

The pylon Camera Software Suite for Windows contains the following main modules. Each one can be individually selected/unselected during the installation process, preventing the installation of unneeded modules on your system:

- CoaXPress 2.0 Driver
- USB3 Vision Driver
- GigE Vision Filter and Socket Drivers
- Camera Link Serial Communication Driver
- pylon Viewer and Workbench
- Configuration tools for GigE Vision, USB3 Vision, CoaXPress and Camera Link and Camera Link

## Standard Interface Adapter for 3rd Party Software

pylon for Windows provides a number of adapters to interface with other 3rd party software:

- pylon GenICam **GenTL producers** for CoaxPress, GigE and USB 3.0 cameras with third-party software libraries Matrox MIL, MVTec HALCON or STEMMER IMAGING Common Vision Blox
- pylon DirectShow adapter – interfaces with any Direct Show-compliant software (e.g. other Machine Vision software, video editing software).
- pylon TWAIN adapter – interfaces with any TWAIN-compliant software (most commonly scanner or microscopy software).
- pylon Neurocheck Driver – interfaces Basler cameras with Neurocheck 6.1 or higher.

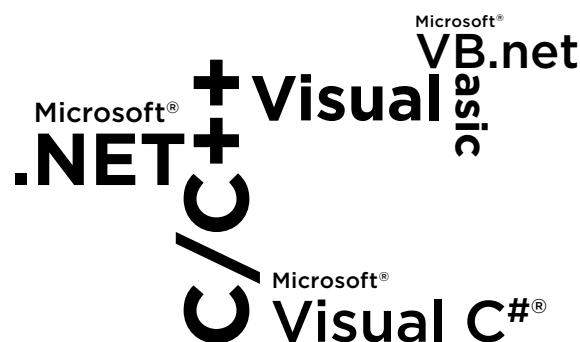
## Easy Software Deployment

pylon offers two methods to redistribute pylon based applications to the end user:

- A dedicated “pylon **redistributable**” includes the pylon runtime environment and drivers for USB 3.0, GigE, CoaXPress – It simply needs to be installed along with the actual end user application
- With the **Copy Deployment** option it is possible to simply copy the needed pylon files to the target system – this helps to keep the end user application as lean as possible.

## Support for Various Programming Languages

The pylon SDK for Windows supports all Basler cameras with the major programming languages: C, C++, and the .NET languages (C#, VB.NET).



## pylon for Windows System Requirements

- Windows 10 and Windows 11 64 bit

The pylon Camera Software Suite for Windows can be downloaded for free at:

[baslerweb.com/pylon-windows](https://baslerweb.com/pylon-windows).

For more information on the installation process, refer to the pylon Installation Guide. The helpful pylon Release Notes contain all improvements and bug fixes since the first pylon version.

## pylon Camera Software Suite for Linux

The pylon Camera Software Suite is also available for Linux on x86 and ARM architectures. pylon for Linux offers:

- Design for standard PC applications as well as for embedded systems
- User friendly, well-designed C and C++ APIs
- pylon Viewer, Workbench, IP Configuration and Bandwidth Manager tools
- BCON for MIPI I2C Driver Adapter
- Full support of Basler CoaxPress 2.0 (Linux 64-bit x86 architectures), GigE and USB 3.0 cameras
- pylon GenICam GenTL producers for GigE, CoaXPress, and USB3.0 cameras with third-party software libraries Matrox MIL, MVTec HALCON (only option for Linux ARM), STEMMER IMAGING Common Vision Blox
- Support for 64-bit x86 architectures
- Support for ARM 64-bit hard-float options: pylon for Linux was successfully tested on several systems including the following ARM systems: NVIDIA Jetson TK1, TX1, TX2, Nano and AGX Xavier and others. An application note about “pylon on ARM systems” is available on our website.

## Easier Software Development for Embedded Systems

Because of their significant cost advantages (compared to standard Desktop PCs) embedded systems – quite often based on low cost ARM processors – are getting more and more attractive for computer vision applications. However in contrast to classic PCs software development for embedded systems is typically much more complex and hence costly.

pylon eases software development for embedded platforms and can help to reduce the development costs:

- Because pylon offers the same API for different operating systems, application development can be started on a standard PC (Windows, Mac, Linux) and later easily migrated to an embedded target e.g. Linux (ARM). Already existing code can simply be ported from a desktop to an embedded target.
- Since pylon can easily be ported from one camera interface technology to another (e.g. from USB 3.0 to BCON) without any significant code changes, an application can be prototyped with an easy-to-integrate, plug and play camera interface (like USB3.0) before switching to a more complex camera interface technology.
- pylon’s modular concept and the Copy Deployment option allow users to redistribute applications with the necessary pylon runtime files only. This keeps the application lean and reduces memory consumption.

## pylon for Linux System Requirements

pylon for Linux is built with the Ubuntu 18.04 toolchain and supports all relevant Linux distributions.

The pylon Camera Software Suite can be downloaded for free at:

[baslerweb.com/pylon-Linux-x86](http://baslerweb.com/pylon-Linux-x86)  
or [baslerweb.com/pylon-Linux-ARM](http://baslerweb.com/pylon-Linux-ARM).

For more information on the installation process, refer to the pylon README and INSTALL file.



*pylon has been successfully tested on several embedded boards*

## pylon Camera Software Suite for macOS

The pylon Camera Software Suite is also available for macOS. It offers:

- User friendly, well-designed C++ API
- Recent GenICam technology technology
- pylon Viewer, IP Configuration and Bandwidth Manager tools
- Full support of Basler GigE and USB 3.0 cameras
- Support for 64-bit x86 architectures

## Easy Software Deployment

With the Copy Deployment option it is possible to simply copy the needed pylon files to the target system – this helps to keep the end user application as lean as possible.

## pylon for macOS System Requirements

- pylon for macOS requires macOS Version 10.14 (Mojave), 10.15 (Catalina) or 11 (Big Sur)

The pylon Camera Software Suite can be downloaded for free at [baslerweb.com/pylon-macos](https://baslerweb.com/pylon-macos).

For more information on the installation process, refer to the pylon README and INSTALL file. The helpful pylon Release Notes contain all improvements and bug fixes since the first pylon version.

## pylon Camera Software Suite for Android

The pylon Camera Software Suite is also available for Android. It offers:

- Support for Android 8 and newer
- User friendly, well-designed C++ and Java APIs
- Recent GenICam technology
- pylon Viewer Demo Application for quick start
- Full support of Basler USB 3.0 cameras
- Support for arm64-v8a architectures

The pylon Camera Software Suite can be downloaded or free at [baslerweb.com/pylon-android](https://baslerweb.com/pylon-android). For more information on the installation process, refer to the pylon README and INSTALL file. The helpful pylon Release Notes contain all related details on supported features.

