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NI Smart Cameras for Machine Vision

Overview

This page gives a brief introduction to the NI Smart Camera product family. Smart cameras are all-in-one solutions for machine vision that not only acquire images but also process them on the camera.

Visit ni.com/smartcamera to view and purchase these cameras.

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The NI Smart Camera Family



The NI 17xx Smart Cameras integrate an image sensor and high-performance processing unit to create an all-in-one embedded device ideal for automated inspection applications. While a typical industrial camera acquires and transmits images through a standard camera bus, such as Camera Link or GigE Vision, to a host PC or vision system that processes the images, a smart camera performs all of these operations directly on the camera.

A smart camera performs a multitude of tasks to handle entire inspection applications including image acquisition and processing, making on-board decisions based on inspection results, and communicating these results to drive sorting mechanisms or to integrate with automation devices such as PLCs and robots. Smart cameras can be deployed as stand-alone embedded devices or be connected to larger automation networks.

NI Smart Cameras are ideally suited for industrial vision applications including packaging inspection, assembly verification, 1D and 2D code reading, and vision-guided motion and robotics. NI Smart Cameras reduce the cost and time of inspection by processing images on the camera with a processor capable of running NI Vision Builder for Automated Inspection (AI) software, which is included with the NI Smart Cameras, or the NI LabVIEW Real-Time Module and the entire suite of NI vision algorithms in the NI Vision Development Module.

Specifications of the NI Smart Cameras



Figure 1 - *Left: Low-Cost & Best Value Smart Camera pictured with LabVIEW;*
Right: NI 177x High-Performance Smart Cameras pictured with Vision Builder for Automated Inspection

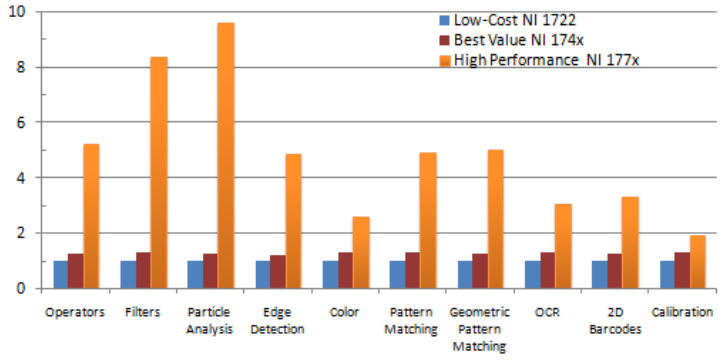
With the combination of a high-performance PowerPC processor, a high-quality CCD image sensor, and NI vision software tools, you can easily create distributed machine vision systems that transmit inspection results. NI Smart Cameras are designed to tightly integrate with the NI family of programmable automation controllers and human machine interfaces. A single LabVIEW project can contain NI Smart Camera inspections along with code for motion control, data acquisition, and operator interfaces.

NI Smart Cameras are available in sensor resolutions from VGA to 5MP, with select resolutions also available in color.

	Low-Cost (PowerPC 400 MHz)	Best Value (PowerPC 533 MHz)	High Performance (1.6 GHz Intel ATOM)
VGA 640 x 480	NI 1722	NI 1742	NI 1772 NI 1772C
SXGA (1.3MP) 1280 x 1024		NI 1744	NI 1774 NI 1774C
UXGA (2MP) 1600 x 1200			NI 1776 NI 1776C
5MP 2500 x 2000			NI 1778

Real-Time Operating System and Onboard Processing

All NI Smart Cameras use a real-time operating system for added reliability and determinism. The low-cost NI 1722 features a 400 MHz PowerPC processor while the best value NI 174x offerings feature a 533 MHz version. The high-performance NI 177x models feature a 1.6 GHz Intel Atom processor that runs on average 4 times faster than the PowerPC models. The chart below shows the relative performance of the models based on the performance of the NI 1722 model.



I/O and Industrial Connectivity

The NI Smart Cameras also have onboard industrial I/O and support for a number of industrial communications protocols to dynamically control your lighting or cameras, synchronize with a conveyor belt, drive mechanisms for sorting parts, or integrate the smart cameras with PLCs.

The low-cost and best value models each have two opto-isolated digital inputs and two opto-isolated digital outputs, while the high-performance models have four inputs, four outputs and one dedicated opto-coupled trigger. These are 24 V I/O lines designed for communication and control in industrial environments. These outputs are capable of generating pulse trains, expanding their ability beyond simple actuator control. One example of the more advanced control you can perform with these cameras is simple stepper motor control, which can be done by sending "step" out on one of the outputs and "direction" out on the other.

Every NI Smart Camera also includes Gigabit Ethernet ports for communication to the local network and expansion I/O. These Ethernet ports also have support for EtherNet/IP and Modbus TCP for communication to PLCs. For customers needing a serial interface, the NI Smart Cameras all feature an RS232 port with support for Modbus as well. The NI Smart Cameras also have support for quadrature encoders for connectivity to linear and rotary drive-based systems (this feature is not available on the NI 1722).

Direct Drive Lighting

The direct-drive lighting controller found on most models of the NI Smart Camera (excluding the NI 1722) is a very useful feature that can greatly decrease system cost and complexity. With this controller, you can source out up to 500 mA of DC current or up to 1 A strobed current directly from the smart camera to a current-driven LED light head. By doing this, you can control lighting directly from the image acquisition API within the NI vision software as well as remove the necessity for an external strobe controller.

If you require current or timing for lighting beyond what you can produce from the NI Smart Camera, there is also a 24 V strobe output on all NI Smart Cameras (and 5V output on low-cost and best value models) that you can use to control an external lighting controller.

IP67 Rating for High-Performance Models

The NI 177x High-Performance Smart Cameras are the first products from National Instruments with an IP67 rating, indicating that the cameras are resistant to ingress from dust and water (up to 1 m submersion). The rugged design of these models can be attributed to the robust mechanical housing, M12 connectors, and lens cover. The IP67 rating makes the camera suitable for washdowns and dusty environments, while the strength and ruggedness of the M12 connectors makes them suitable for robot-mounted use cases.

NI Vision Software

NI Smart Cameras include NI Vision Builder for Automated Inspection (AI), the stand-alone menu-driven environment for building, benchmarking and deploying complete vision applications. The smart cameras can also be programmed using NI LabVIEW software and the NI Vision Development Module imaging library for more advanced customization. Both options feature hundreds of image processing functions, and work across NI's complete line of vision hardware.

Visit ni.com/vision/software to learn more about the options.

Features of the NI Smart Camera Family

	Low-Cost	Best Value	High-Performance

	NI 1722	NI 174x	NI 177x
Real-Time Operating System	•	•	•
High-quality CCD image sensors from Sony	•	•	•
Powerful embedded processors	•	•	•
Built-in isolated industrial digital I/O	•	•	•
Gigabit Ethernet ports with EtherNet/IP and Modbus TCP support	•	•	•
RS232 port with support for Modbus Serial	•	•	•
Vision Builder AI development software	•	•	•
Quadrature encoder support to synchronize timing in inspections with linear and rotary drive systems		•	•
Built-in direct drive controller for LED lighting		•	•
IP67 design with M12 connectors and lens cover			•
Color sensor options			•
High-resolution sensor options			•
VGA video out			•

NI Smart Cameras

Low-Cost NI 1722

Webcasts:

- Out-of-the-Box Video
- Smart Camera Overview (PowerPC Models)

Pricing & Details: NI 1722 Smart Camera – 640x480 (VGA), 60 fps, Monochrome

Best Value NI 174x models

Webcasts:

- Out-of-the-Box Video
- Smart Camera Overview (PowerPC Models)

Pricing and Details:

- NI 1742 Smart Camera – 640x480 (VGA), 60 fps, Monochrome
- NI 1744 Smart Camera – 1280x1024, 13 fps, Monochrome

High-Performance NI 177x models

Webcast:

- NI 177x High-Performance Smart Camera Overview

Pricing & Details:

- NI 1772 Smart Camera - 640x480 (VGA), 110 fps, Monochrome
- NI 1772C Smart Camera - 640x480 (VGA), 65 fps, Color
- NI 1774 Smart Camera - 1280x960 (SXGA), 22.5 fps, Monochrome
- NI 1774C Smart Camera - 1280x960 (SXGA), 17 fps, Color
- NI 1776 Smart Camera - 1600x1200 (2 MP), 15 fps, Monochrome
- NI 1776C Smart Camera - 1600x1200 (2 MP), 10 fps, Color
- NI 1778 Smart Camera - 2448x2050 (5 MP), 15 fps, Monochrome

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