

APPLICATION NOTE

Longwatch Network Camera Selection Guide

Summary

The Longwatch family of products supports both analog (NTSC) and IP Cameras. The Longwatch Remote Video Engine (RVE) uniquely has the ability to support both types while the Longwatch Video Engine (LVE) and Micro Video Engine (Micro) can connect directly to IP Cameras. All Longwatch products have the ability to connect to any and all analog cameras in conjunction with an Axis video server. This application note is intended to assist in the selection of the best-fit Axis IP camera or Axis video server for your application.

Details

Compression

To transport video over a network, video must be compressed. Video compression can be done either in a lossless or lossy approach. In lossless compression, each and every pixel is kept unchanged resulting in an identical image after decompression. The downside is that the amount of data that the video is comprised of stays about the same resulting in greater disk and network usage. Since the compression efficiency of lossless is so limited, these formats are impractical for use in network video and video recording solutions.

Therefore, several “lossy” compression methods and standards have been developed. The fundamental idea is to reduce things that appear invisible to the human eye. By doing so, you will tremendously decrease the amount of data in the image and ultimately the amount of disk space and network bandwidth that is used. The compression ratio of the lossy method is much more efficient and results in smaller video size but at the expense of lower image quality. Motion JPEG and MPEG4 are two very widely accepted and efficient lossy compression methods that maintain quality while minimizing bandwidth and disk space requirements.

Motion JPEG (MJPG) – MJPEG offers video as a sequence of JPEG format images and is the most common streaming format for network video systems. IP cameras can capture and compress up to 30 individual images, or frames, per second (30 fps) and then streamed over a network to be viewed as a continuous video. Each individual image is a complete JPEG compressed picture and they all have the same guaranteed quality.

MPEG4 – MPEG4 uses a technique where consecutive frames are compared before compression and streaming and separated into “key frames” and “update frames.” Key frames include

the entire image, similar to each MJPEG frame, and update frames only include information that has changed from the previous frame. While MPEG4 is much more efficient than MJPEG, the video is easily corrupted with the loss of any of the frames during network transport. On healthy networks, MPEG4 is considered to be of equal quality as MJPEG.

Longwatch V4.0 requires **both MJPEG and MPEG-4 compression methods**. Longwatch uses the MPEG4 stream from an Axis device to create DVR files and uses the MJPEG stream to create event clips and provide access to live video. The quality level is a function of the amount of compression the Axis device is configured to use.

Frames per second

Frame rate is the frequency at which a video device creates consecutive images and is measured in frames per second (fps.) Video is perceived to be more fluid as the frame rate increases; however, higher frame rates require more network bandwidth and more hard drive storage. Longwatch recommends that you set the camera’s frames per second setting to 2 times that of your Longwatch fps setting. Currently, Longwatch supports up to 30 fps. Please see Longwatch User’s Guide for bandwidth and disk space requirements when setting the frame rate.

Audio

Some of the Axis video products include support for audio allowing one-way or bidirectional transport of sound. Devices with one-way audio support include a microphone port and, in some cases, a built in microphone. Bidirectional or two-way, audio support is facilitated with the addition of a speaker output port. Longwatch does not require this feature but can use the audio as an independent detection method, which triggers video recordings and alarms when audio levels above a certain threshold are

detected. Currently, the Longwatch DVR capability will include the inbound audio from a camera so that during playback you can see as well as hear audio. The inclusion of audio for Live streams and Event Clips is anticipated in future releases.

Video Motion Detection

Motion can be detected by analyzing the differences between consecutive frames and can be used to trigger Longwatch Event Clips. Because Longwatch has its own motion detection capability, this feature is not required. However, Axis devices with built in motion detection have enhanced capabilities, including “include” and “exclude” zones, allowing specific areas of interest to be clearly defined.

Max. Video Resolution (pixels)

Video Resolution refers to the amount of detail a video image holds. It can be directly related to the number of pixels present in the image itself. For example, a camera with a resolution of “640 x 480” has the ability to capture 640 pixels wide by 480 pixels tall. More detail can be seen in images of higher resolution; however, higher resolutions result in more network bandwidth and video storage requirements and slower video transmission where bandwidth is limited. Please see Longwatch User’s Guide to calculate the estimated disk space requirements for your given resolution.

Longwatch currently supports the following resolutions:

- 320 x 240 (QVGA)
- 640 x 480 (VGA)
- 1280 x 720 (XVGA)
- 1280 x 1024 (SXGA)

Image Sensor

CCD vs. CMOS:

The image sensor of the camera transforms light into electrical signals. The sensor can be either a “charge coupled device” (CCD) or a “complimentary metal-oxide semiconductor” (CMOS.) CCD sensors have been used in cameras for more than 20 years and have better light sensitivity than CMOS sensors, providing better images in low light conditions. However, CCD technology is prone to “smear”, where very bright objects in the scene (such as a lamp or direct sunlight) may cause vertical stripes below and above the object. CMOS technology is less expensive and recent advances in CMOS sensors bring them closer to their CCD counterparts

in terms of image quality, though low light sensitivity is still a far second to CCDs.

Size:

Either sensor type is available in different sizes, including $\frac{1}{4}$ ”, $\frac{1}{3}$ ”, $\frac{1}{2}$ ”, and $\frac{2}{3}$ ”. In most cases, the larger the sensor the higher the resolution and ultimately the price. Longwatch recommends $\frac{1}{3}$ ” for most applications and larger for very critical or secure applications.

Progressive vs. Interlaced:

Sensors are further separated by the method of scanning. Interlaced sensors scan every other line of the image every 60th of a second. Then, a 60th of a second later, the lines in-between the lines that have already appeared are scanned, making up the complete frame. Progressive scanning, as opposed to interlaced, scans the entire picture line by line every 60th of a second. Therefore, progressive scan technology better suits depicting moving objects clearly while interlaced is more economical and generally adequate for indoor environments.

Lens Type

Axis cameras come standard with either fixed, varifocal, or zoom lenses each having different focal length properties. The focal length of a lens is critical in determining your camera’s ability to magnify its image. It assures sufficient area is covered while still maintaining adequate detail of the subject. The actual focal length of a lens should be selected for each specific camera installation. The terms “Wide Angle” and “Telephoto” are common terms to describe focal length.

- **Fixed lens:** The focal length is fixed. Details of the installed camera position and desired image must be known in advance to calculate the appropriate lens focal length.
- **Varifocal lens:** The focal length of the lens can be manually adjusted. Use of a varifocal lens allows for much more variations in camera positioning and image fields of vision. Note that in a varifocal lens, the lens has to be refocused whenever the focal length is changed
- **Zoom lens:** The focal length can be adjusted without affecting the focus. The lens can either be manual or motorized, so that it can be controlled remotely.

It is critical that field measurements for the camera installation be made to select a fixed lens. This is still required for varifocal and zoom lens, but not nearly to the same level of detail due to the ability to make significant changes in the field. To select the

correct focal length, or range for varifocal and zoom lenses, the following steps should be followed:

1. Identify the camera mounting position and measure from this point to the best representative objects in the field of vision. This distance is referred to as the target distance. This might be a door, a piece of equipment, a wall, or in the case of a parking lot or similar open space, the farthest object that needs to be monitored.
2. Determine the width of the field of vision that is desired at the target distance. This is the most commonly misunderstood component in the desired field of vision. In this component more is less. This means that the wider a field of vision one attempts to capture the less detail that will be possible for individual objects in the image. It is best to minimize this to only that which will be of true value upon viewing. For example, if there is interest in determining who enters a door, then a camera pointing at the door only needs to include just the door from about knee height to about seven feet off the ground. There is little value in watching the entire wall in which the door is located and too wide a field of vision will only result in not being able to capture enough detail to identify the individual.
3. Verify the image sensor size of your camera before purchasing it. The image sensor acts like the 'eye' of the camera. The lens of the camera focuses incoming light onto the sensor which then converts it to a video signal using some very fancy circuitry. The focal length is the distance from the lens to the surface of the image sensor.
4. Use the link below to open the Focal Length Calculator. Enter in the information you accrued above and calculate the focal length. You will then have the ability to choose the proper lens or verify that the standard lens is sufficient for your application.

http://www.axis.com/techsup/cam_servers/lens_calculators/index.htm

Lens Changeable

Cameras that have the ability to change lenses are typically more versatile and more expensive. There is nothing inherently wrong with a permanent lens as long as there is no expected need to change it. Changeable lens cameras should always be used in demanding applications due to the ability to match a specialized lens to the application.

Light Sensitivity

A camera's light sensitivity refers to its ability to capture images in low light and is measured in "lux." With too little light, the images will become blurred and dull in color. Examples are shown in the following table:

Luminance	Abbr.	Example
0.00005 lux	50 μ lx	Starlight
0.0001 lux	100 μ lx	Moonless overcast night sky
0.001 lux	1 mlx	Moonless clear night sky
0.01 lux	10 mlx	Quarter Moon
0.25 lux	250 mlx	Full Moon on a clear night ^[2]
1 lux		Moonlight at high altitude at tropical latitudes ^[3]
10 lux		Candle at a distance of 30 cm (1 ft)
50 lux		Family living room ^[4]
400 lux		A brightly lit office or Sunrise/Sunset on a clear day
1000 lux	1 klx	Typical TV studio lighting
32000 lux	32 klx	Sunlight on an average day (min.)

The camera's sensitivity must be matched to the minimum luminance that can reasonably be expected. Most cameras have a minimum sensitivity of between 0.5 lux and 10 lux, so for low light applications, a specialized camera or external lighting is required.

Day/Night Functionality

All Axis color cameras are equipped with an IR-cut filter. This is a piece of optical glass that is placed between the lens and the image sensor. Its purpose is to filter out IR light so that the camera can produce a fully recognizable color image. If cameras lacked this filter, color images would tend to appear blurry and colors would smear.

Axis cameras with Day/Night functionality have a mechanism to automatically remove the IR-cut filter during low light conditions. This allows the camera to "see" in a very dark environment using IR light. To avoid color distortions, Day/Night cameras will also switch to black and white mode to generate high quality black and white images. Day/Night cameras cannot see in the dark, but simply have better light sensitivity in low light than "day only"

cameras. When the ambient lighting drops below the Day/Night camera's minimum sensitivity, additional lighting, either white or IR light must be used to allow the camera to "see" again.

Infrared Illumination

Certain environments or situations restrict the use of artificial white light, making infrared (IR) illumination particularly useful. Artificial IR lighting is appropriate for:

- Areas sensitive to light pollution such as residential neighborhoods
- Discrete or Covert surveillance
- License Plate Capture

An Infrared Illuminator may come built into the camera, such as in the Axis 213, or they can be supplied as a separate component similar to a floodlight. In most cases, illuminators that are integrated into the camera offer far less range than that of external illuminators. Similar to the factors that go into the selection of a camera lens focal length, the selection of an appropriate infrared illuminator is based on the distance from the illuminator and the width of the scene that requires illumination. The camera lens and illuminator should be well matched to effectively work together. As a general rule of thumb, divide the maximum distance specification for an infrared illuminator by two, to determine the point at which the illuminator has the best coverage over the maximum width it is capable of. To adjust for the width of a subject scene, illuminators can be purchased in narrow ($20^{\circ}\pm$), standard ($40^{\circ}\pm$), and wide ($60^{\circ}\pm$) beam variations.

Memory/Ethernet Networks

The cameras will have wired, wireless, or both networking capabilities.

- "**10/100**" indicates that the camera has a built in port for wired connection to 10 or 100 Mbps Ethernet networks.
- "**802.11 b/g**" indicates that the camera has built in wireless Ethernet capability for connection to either 802.11b or 802.11g wireless networks.

Power-over-Ethernet (PoE)

PoE is a technology that combines power for the camera using the same cable as that which is used for the Ethernet network connection. It eliminates the need for power outlets at the camera locations and enables centralized application of uninterruptible

power sources (UPS) to ensure 24 hours a day, 7 days a week operation.

PoE essentially provides 48VDC power on two of the unused wires in a standard (cat 5) Ethernet Cable. Many Ethernet switch manufacturers now offer network switches with built-in PoE support. Some cameras, that do not support PoE can still benefit from PoE through the use of an active splitter that separates the power from the Ethernet cable and feeds it to the camera using a standard power connector. The power provided through PoE is limited to certain maximum currents or classes so the camera must be specified to be PoE compatible, whether that support is built in or through the use of an active splitter.

Serial Connectors

Most of the Axis Video Servers and some of the cameras have DB9 style or terminal screw style RS-485, RS-422, and/or RS-232 serial ports. The ports serve multiple functions such as third party PTZ control, digital inputs/outputs as well as alternate power for the device.

Alarm Input/Output

Devices with this feature offer integrated digital input and output connectors, which enable the integration of devices such as doorbells, initiating devices (e.g. smoke, movement, sound, temperature and humidity sensors), lights (including infrared lamps), switches and alarm relays. These devices can be managed over the network either from a remote PC or automatically using the camera's built-in logic.

Longwatch has the ability to use camera and video server I/O as event triggers for alarms and video event clips. Instead of running I/O connectors directly to the Longwatch system or your PLC, you can simply connect them to the camera or video server. This is especially useful and cost efficient when cameras are located in remote areas away from buildings or control hardware.

Pre-/Post-alarm Buffer

This feature allows the camera or device to capture video before an actual event or alarm condition occurs. This is made possible by a buffer within the camera or video server which constantly stores video using the FIFO (First-In, First-Out) methodology. The size of the buffer determines how much before/after video can be stored. For example, a 4 MB buffer can store around 300 images each of which around 13 kB in size. Longwatch does not require this feature and has its

own Pre-/Post-alarm buffer with much greater capacity for storage.

Security

The Axis cameras support a range of security capabilities including:

- **Password:** The camera or device's video feed and configuration webpage can be secured with a password,
- **IP-filtering:** This security option allows you to filter IP Address ranges from accessing the video feed or configuration webpage of your camera or device.
- **HTTPS:** This option enables the device to encrypt all data sent over the network. A certificate on the client node which can be distributed by an administrator is then necessary in order to view the data.
- **IEEE 802.1x authentication:** This feature provides authentication to devices attached to a LAN port, establishing a point-to-point connection or preventing access from that port if authentication fails.
- **WEP:** WEP was designed together with 802.11b, and exists in all wireless equipment. Unfortunately, it has several inherent weaknesses, one of them being that the encryption key is frequently reused, making it possible to break the encryption in a matter of minutes on a wireless network with a lot of traffic.
- **WPA:** WPA overcame the design flaw of WEP by introducing TKIP (Temporal Key Integrity Protocol) and is considered to be a superior method of encrypting data over wireless networks..
- **WPA2:** WPA2 has a different, more secure encryption method than that of WPA.

Both WPA and WPA2 come in two versions: enterprise and personal. In the enterprise version, users are authenticated with a RADIUS server (Remote Authentication Dial-In User Service) using the 802.1X authentication framework.

The personal version does not require user authentication with a RADIUS server. Devices are authenticated using a pre-shared key (PSK), which is used to configure all network units. This version is also called WPA-PSK (or WPA2-PSK). As with any password, the pre-shared key must be chosen wisely (e.g. through the use of a combination of letters and numbers) so it cannot be cracked.

Both versions offer similar levels of security; however, the enterprise version scales better in larger organizations where it is impractical to set the PSK in each network unit.

Users should always consult with their local IT professional for security questions regarding specific network requirements.

PTZ (Pan Tilt Zoom)

PTZ cameras allow you to pan an area, tilt up and down and zoom in on anything or anyone within the sight of the camera. They make a great supplement to standard fixed cameras which may be dedicated to areas such as entry and exit points. They also allow for an unparalleled ability to monitor multiple locations with only one camera.

PTZ cameras can be set to automatic, manual mode or both. In automatic mode, dozens of points or presets can be set for the camera to pan to. The duration that the camera stays at a given set point (called the dwell time) can be adjusted from less than a second to as long as you would like. In manual mode, presets can be assigned to certain points of interest such as doors, fence lines or equipment. This gives the camera the ability to automatically focus in on a given preset when an event occurs.

PTZ-capable cameras can be controlled directly from the Longwatch system or any remote workstation on the network. This allows users to not only control the camera directly but to also set presets and motion controls.

Environmental Considerations

When selecting a camera to fit your environment, there are two main components that need to be considered; the camera and the camera's enclosure. Both will have weather and temperature specifications that must be adhered to. If the desired camera does not have the required environmental specifications, as is the case with most outdoor installations, the camera can be housed inside an enclosure that will have the ability to function in the target environment and provide an environment inside the enclosure which does not exceed the camera's own requirements.

For example, your camera application may reside in an environment where the lowest temperature is -10°C. The camera that you have chosen is only rated to 5°C. Therefore you must choose an enclosure that:

1. Is designed to fit your camera
2. Is rated to function at a temperature of at least -10°C.
3. Provides an ambient inside temperature of at least 5°C.

The following are enclosures that can extend the operating range of standard cameras:





Camera	Temperature Rating	Enclosure	Temperature Rating	Combined Temperature Rating
Axis 214	5 to 40°C	DotWorkz D2 Ring of Fire	Down to -40 °C	-40 to 40°C
Axis 214	5 to 40°C	DotWorkz D2 Cooldome	Up to 68°C	5 to 68°C
Axis 214	5 to 40°C	DotWorkz D2 Heater/Blower	-1 to 40°C	-1 to 40°C

Camera Enclosures







For as many cameras there are on the market, there are just as many enclosures to choose from. To narrow down your selection, determine which enclosure qualities are important to your camera solution. The main benefits that camera enclosures can provide for your application are:

- **Environmental:** Extreme environment provisions like internally mounted heaters and blowers. For applications in conditions of high humidity, completely sealed enclosures may be needed to avoid condensation inside the camera at low temperatures.
- **Surge Protected:** In regions frequently subjected to lightning, enclosures may contain a lightning rod or external/internal surge protection.
- **Vandal Resistant:** These enclosures offer an increased level of protection against human attack. This could range from anything from rocks, bottles, guns, paintballs and even theft. Please note that it has been found that the key to minimizing vandalism is to mount your camera and enclosure at least 16 feet from the ground.
- **Covert:** Those enclosures considered covert offer your camera solution various degrees of camouflage. This is ideal for a situation that calls for the camera application to go unnoticed. On one end, an enclosure can be completely obscured from view. Others such as those with opaque domes are also considered covert since they obscure the direction in which a camera is pointed.
- **Wireless:** These enclosures offer the ability to make a standard IP camera wireless. Within the enclosure may be a wireless access point or bridge with an antenna mounted on the outside.
- **Purged:** For installation in extremely dusty or hazardous areas, these enclosures are provided with a pressurized gas source to ensure that there is always positive pressure inside the enclosure.
- **Submersible:** These enclosures allow cameras to be placed underwater. There are different depth ratings for these enclosures. Also, when placing cameras under water, specialized lighting is often also required.
- **Hazardous Area Rated:** Enclosures are available that will allow non hazardous rated cameras to be installed in NEC Class I, Division 1 or Division 2 locations as well as Zone 1 and Zone 2 classified areas.








Camera Selection Matrix – Indoor Fixed Cameras

	Indoor	Indoor	Indoor	Indoor
Product Name	AXIS 207/AXIS 207W	AXIS 207MW	AXIS 210	AXIS 210A
				
Compression	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4
Frames per second	Up to 30 for all resolutions	Up to 14 in res up to 1280x720, up to 12 in res up to 1280x1024	Up to 30 for all resolutions	Up to 30 for all resolutions
Audio support	One-way	One-way	-	Two-way
Motion detection	Yes	Yes	Yes	Yes
Max video resolution (pixels)	640 x 480	1280 x 1024	640 x 480	640 x 480
Image sensor	1/4" Micron progressive scan RGB2) CMOS	1/3" Micron progressive scan RGB CMOS, 1.3 Megapixel	1/4" Sony Wfine progressive scan RGB CCD	1/4" Sony Wfine progressive scan RGB CCD
Lens type	4.0 mm/F 2.0 fixed iris	3.6 mm/F1.8 fixed iris	4.0 mm/F 1.2 fixed iris CS mount	4.0 mm/F 1.2 fixed iris CS mount
Lens changeable	-	-	Yes	Yes
Light sensitivity (Lux)	1 - 10,000	2 - 10,000	1 - 10,000	1 - 10,000
Day and night functionality	-	-	-	-
Ethernet Networks	10/100BaseT / Wireless 802.11g/b2)	10/100BaseT / Wireless 802.11g/b	10/100BaseT	10/100BaseT
Power-over-Ethernet (Class)	IEEE 802.3af with Active Splitter # 5008-0013)	-	IEEE 802.3af with Active Splitter # 0227-001	IEEE 802.3af (Class 2)
Serial connectors	-	-	-	-
Alarm input/output	1/1	1/1	1/1	1/1
Pre-/Post-alarm buffer	Up to 4 MB	Up to 2 MB	1.2 MB	9 MB
Security	Password, IP-filtering2), HTTPS2), WEP, WPA/WPA2-PSK2)	Password, IP-filtering, HTTPS, WEP, WPA/WPA2-PSK	Password, IP-filtering	Password, IP-filtering, HTTPS, IEEE 802.1X







Camera Selection Matrix – Indoor/Outdoor Fixed Cameras

	Indoor / Outdoor	Indoor / Outdoor	Indoor / Outdoor	Indoor / Outdoor	Indoor / Outdoor	Indoor / Outdoor
Product Name	AXIS 211	AXIS 211A	AXIS 211W	AXIS 211M	AXIS 221	AXIS 223M
						
Compression	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4
Frames per second	Up to 30 for all resolutions	Up to 30 for all resolutions	Up to 30 for all resolutions	12 (1280 x 1024) 20 (800 x 600)	Up to 45 for all resolutions	12 (16:9) 9 (4:3)
Audio support	-	Two-way	Two-way	Two-way	-	Two-way
Motion detection	Yes	Yes	Yes	Yes	Yes	Yes
Max video resolution (pixels)	640 x 480	640 x 480	640 x 480	1280 x 1024	640 x 480	1600 x 1200
Image sensor	1/4" Sony Wfine progressive scan RGB CCD	1/4" Sony Wfine progressive scan RGB CCD	1/4" progressive scan CMOS	1/3" progressive scan CMOS, 1.3 Megapixel	1/3" Sony Wfine progressive scan CCD	1/2.7" Sony Wfine progressive scan CCD, 2 Megapixel
Lens type	Varifocal 3.0 - 8.0mm/ F1.0 DC-iris, CS mount	Varifocal 3.0 - 8.0mm/ F1.0 DC-iris, CS mount	Varifocal 3.0 - 8.0mm/ F1.0 DC-iris, CS mount	Varifocal 3.0 - 8.0mm/ F1.0 DC-iris, CS mount	Varifocal 3.0 - 8.0mm/ F1.0 DC-iris, CS mount	Varifocal 4.0 - 8.0mm/ F1.4 DC-iris C-mount
Lens changeable	Yes	Yes	Yes	Yes	Yes	Yes
Light sensitivity (Lux)	0.75 - 500,000	0.75 - 500,000	0.75 - 500,000	1.0 - 500,000	0.65 (Color), 0.08 (B/W)	1.5 (Color), 0.2 (B/W)
Day and night functionality	-	-	-	-	Automatic	Automatic
Ethernet networks	10/100BaseT	10/100BaseT	10/100BaseT / Wireless 802.11g/b	10/100BaseT	10/100BaseT	10/100BaseT
Power-over-Ethernet (Class)	IEEE 802.3af (Class 0)	IEEE 802.3af (Class 2)	IEEE 802.3af (Class 0)	IEEE 802.3af (Class 2)	IEEE 802.3af (Class 2)	IEEE 802.3af (Class 2)
Serial connectors	-	-	-	-	RS232, RS485/RS422	RS232, RS485/RS422
Alarm input/output	1/1	1/1	1/1	1/1	2/1	2/1
Pre-/Post-alarm buffer	1.2 MB	9 MB	1.2 MB	9 MB	9 MB	36 MB
Security	Password, IP-filtering	Password, IP-filtering, HTTPS, IEEE802.1X	Password, IP-filtering, HTTPS, IEEE 802.1X, WEP, WPA/WPA2-PSK, WPA/ WPA2-Enterprise	Password, IP-filtering, HTTPS, IEEE802.1X	Password, IP-filtering, HTTPS	Password, IP-filtering, HTTPS, IEEE 802.1X

Camera Selection Matrix – PTZ Cameras

	Indoor	Indoor / Outdoor	Indoor / Outdoor	Indoor / Outdoor	Indoor / Outdoor	Indoor / Outdoor	Indoor / Outdoor
Product Name	AXIS 212 PTZ	AXIS 213 PTZ	AXIS 214 PTZ	AXIS 215 PTZ	AXIS 231D	AXIS 232D	AXIS 233D
							
Compression	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4	Motion JPEG, MPEG-4
Frames per second	Up to 30 for all resolutions	Up to 30 for all resolutions	Up to 30 for all resolutions	Up to 30 for all resolutions	Up to 30 for all resolutions	Up to 30 for all resolutions	30 for all resolutions
Audio support	Two-way	Two-way(5)	Two-way	Two-way	-	-	Two-way
Pan/Tilt/Zoom	20 presets	20 presets	20 presets	20 presets	50 presets	50 presets	100 presets
Pan range / Tilt range	140° / 105°	340° / 100°	340° / 120°	360° / 180°	360° endless / 90°	360° endless / 90°	360° endless / 180°
Max video resolution (pixels)	640 x 480	704 x 480	704 x 480	704 x 480	704 x 480	704 x 480	704 x 480
Image sensor	1/2" progressive scan CMOS 3 Megapixel	1/4" interlaced CCD	1/4" Sony ExView HAD interlaced CCD	1/4" interlaced CCD	1/4" Sony ExView HAD interlaced CCD	1/4" Sony ExView HAD interlaced CCD	1/4" Sony ExView Progressive Scan CCD
Lens type	2.7mm/F1.8 fixed iris 3x instant zoom	3.5-91mm auto iris and auto focus lens, 26x optical zoom 12x digital zoom	4.1-73.8mm auto iris and auto focus lens, 18x optical zoom 12x digital zoom	3.8-46mm auto iris and auto focus lens, 12x optical zoom 4x digital zoom	4.1-73.8mm auto iris and auto focus lens, 18x optical zoom 12x digital zoom	4.1-73.8mm auto iris and auto focus lens, 18x optical zoom 12x digital zoom	3.4-119mm auto iris and auto focus lens, 35x optical zoom 12x digital zoom
Lens changeable	-	-	-	-	-	-	-
Light sensitivity (Lux)	10 (wide mode) 20 (tele mode)	1 normal mode, complete darkness IR mode	0.3 (Color), 0.005 (B/W)	1 (Color), 0.3 (B/W)	Down to 0.3	0.3 (Color), 0.005 (B/W)	0.5 (Color), 0.008 (B/W)
Day and night functionality	-	Configurable Built-in IR lamp	Automatic	Automatic	-	Automatic	Automatic
Ethernet networks	10/100BaseT	10/100 BaseT	10/100 BaseT	10/100 BaseT	10/100 BaseT	10/100 BaseT	10/100 BaseT
Power-over-Ethernet (Class)	IEEE 802.3af (Class 1)	With Active Splitter # 0170-004-01	-	-	-	-	-
Serial connectors	-	RS-232(5)	-	-	-	-	-
Alarm input/output	1/1	2/3(5)	1/1	1/1	4/4	4/4	4/4
Pre-/Post-alarm buffer	9 MB	6 MB	9 MB	9 MB	9 MB	9 MB	36 MB
Security	Password, IP-filtering, HTTPS, IEEE 802.1X	Password, IP-filtering	Password, IP-filtering, HTTPS	Password, IP-filtering, HTTPS, IEEE 802.1X	Password, IP-filtering, HTTPS, IEEE 802.1X	Password, IP-filtering, HTTPS, IEEE 802.1X	Password, IP-filtering, HTTPS, IEEE 802.1X
Other	-	Built-in IR light up to 3 m, Analog video output	-	-	Designed for continuous motion 24/7	Designed for continuous motion 24/7	EIS, E-flip, WDR

Camera Selection Matrix – Video Servers

	1 port	1 port	1 port	4 port	4 port	4 port blade
Product Name	AXIS 247S	AXIS 241S	AXIS 243SA	AXIS 241Q	AXIS 241QA	AXIS 243Q
						
Compression	Motion JPEG MPEG-4	Motion JPEG MPEG-4	Motion JPEG MPEG-4	Motion JPEG MPEG-4	Motion JPEG MPEG-4	Motion JPEG MPEG-4
Frames per second Motion JPEG	30 (4 CIF) 30 (VGA, CIF)	30 (4 CIF), 30 (CIF)	30 (4 CIF), 30 (CIF)	27 (2 CIF), 30 (CIF) per channel	27 (2 CIF), 30 (CIF) per channel	30 (4 CIF), 30 (CIF) per channel
Frames per second MPEG-4	27 (4 CIF), 30 (VGA, CIF)	21 (4 CIF), 30 (2 CIF)	30 (4 CIF), 30 (CIF)	10 (2 CIF), 20 (CIF) per channel	10 (2 CIF), 20 (CIF) per channel	30 (4 CIF), 30 (CIF) per channel
Audio support	One-way	-	Full duplex	-	Full duplex	-
Pan/Tilt/Zoom control	-	Yes1)	Yes1)	Yes1)	Yes1)	Yes1)
Max video resolution (pixels)	704 x 480	704 x 480	704 x 480	704 x 480	704 x 480	704 x 480
Video source	1 Auto Sensing BNC input2)	1 Auto Sensing BNC input2)	1 Auto Sensing BNC input2)	4 Auto Sensing BNC inputs	4 Auto Sensing BNC inputs	4 Auto Sensing BNC inputs
Analog loop-through port	-	Yes	Yes	-	-	-
Power-over-Ethernet	Built-in	802.3af with Active Splitter (# 0227-001)	802.3af with Active Splitter (# 0227-001)	802.3af with Active Splitter (# 0227-001)	802.3af with Active Splitter (# 0227-001)	-
Serial connectors	-	RS422/485 RS232	RS422/485 RS232	RS422/485 RS232	RS422/485 RS232	RS422/485
Alarm input/output	1/1	4/4	4/4	4/4	4/4	4/4
Pre- and post-alarm buffer	9 MB	9 MB	9 MB	9 MB per channel	9 MB per channel	9 MB per channel
Blade version available	-	Yes	-	Yes	-	Blade only
Video motion detection	Yes	Yes	Yes	Yes	Yes	Yes
Security	Password, IP-Filtering, HTTPS, IEEE802.1X	Password, IP-filtering, HTTPS IEEE802.1X	Password, IP-filtering, HTTPS IEEE802.1X	Password, IP-filtering, HTTPS IEEE802.1X	Password, IP-filtering, HTTPS	Password, IP-filtering, HTTPS IEEE802.1X