

AXIS Q1800-LE-3 License Plate Verifier Kit

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Installation

Preview mode

Preview mode is ideal for installers when fine tuning the camera view during the installation. No login is required to access the camera view in preview mode. It is available only in factory defaulted state for a limited time from powering up the device.



To watch this video, go to the web version of this document.

This video demonstrates how to use preview mode.

Get started

Find the device on the network

To find Axis devices on the network and assign them IP addresses in Windows®, use AXIS IP Utility or AXIS Device Manager. Both applications are free and can be downloaded from axis.com/support.

For more information about how to find and assign IP addresses, go to *How to assign an IP address and access your device*.

Browser support

You can use the device with the following browsers:

	Chrome™	Edge™	Firefox®	Safari®
Windows®	✓	✓	*	*
macOS®	✓	✓	*	*
Linux®	✓	✓	*	*
Other operating systems	*	*	*	*

✓: Recommended

*: Supported with limitations

Open the device's web interface

1. Open a browser and type the IP address or host name of the Axis device.
If you don't know the IP address, use AXIS IP Utility or AXIS Device Manager to find the device on the network.
2. Type the username and password. If you access the device for the first time, you must create an administrator account. See *Create an administrator account, on page 6*.

For descriptions of all features and settings in the web interface of devices with AXIS OS, see *AXIS OS web interface help*.

Create an administrator account

The first time you log in to your device, you must create an administrator account.

1. Enter a username.
2. Enter a password. See *Secure passwords, on page 7*.
3. Re-enter the password.
4. Accept the license agreement.
5. Click **Add account**.

Important

The device has no default account. If you lose the password for your administrator account, you must reset the device. See *Reset to factory default settings, on page 51*.

Secure passwords

Important

Use HTTPS (which is enabled by default) to set your password or other sensitive configurations over the network. HTTPS enables secure and encrypted network connections, thereby protecting sensitive data, such as passwords.

The device password is the primary protection for your data and services. Axis devices do not impose a password policy as they may be used in various types of installations.

To protect your data we strongly recommend that you:

- Use a password with at least 8 characters, preferably created by a password generator.
- Don't expose the password.
- Change the password at a recurring interval, at least once a year.

Make sure that no one has tampered with the device software

To make sure that the device has its original AXIS OS, or to take full control of the device after a security attack:

1. Reset to factory default settings. See *Reset to factory default settings, on page 51*.
After the reset, secure boot guarantees the state of the device.
2. Configure and install the device.

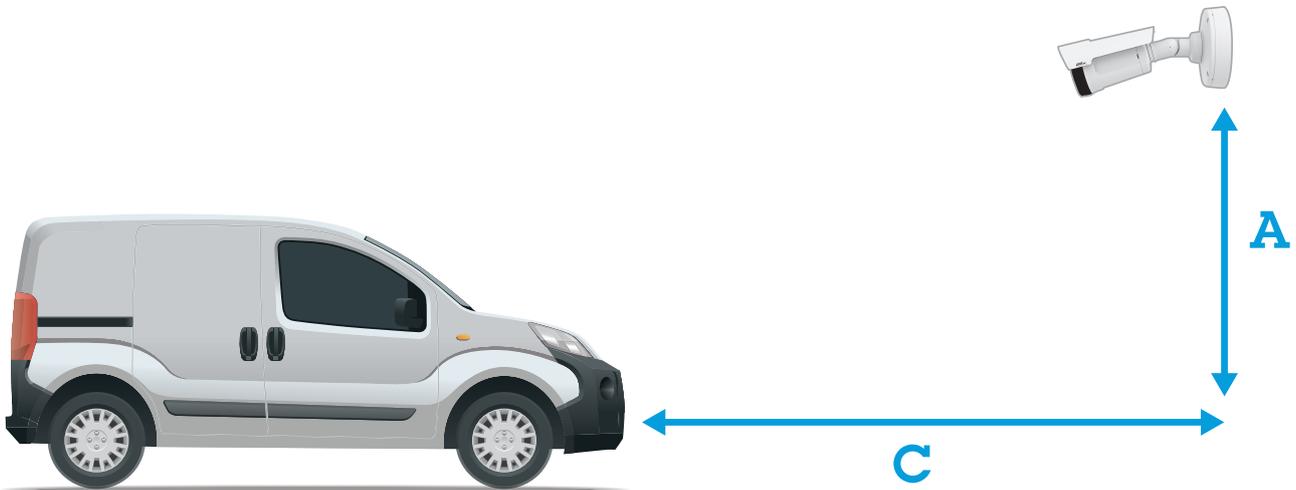
Basic setup

These setup instructions are valid for all scenarios:

1. *Camera mounting recommendations, on page 8*
2. *Set up AXIS License Plate Verifier, on page 10*
3. *Adjust the area of interest, on page 11*
4. *Select region, on page 12*
5. *Set up event storage, on page 12*

Camera mounting recommendations

- When you select the mounting location, remember that direct sunlight can distort the image, for example, during sunrise and sunset.
- The mounting height for camera in a **Free flow** (slow traffic license plate recognition) scenario should be less than half of the distance of that between the vehicle and the camera.



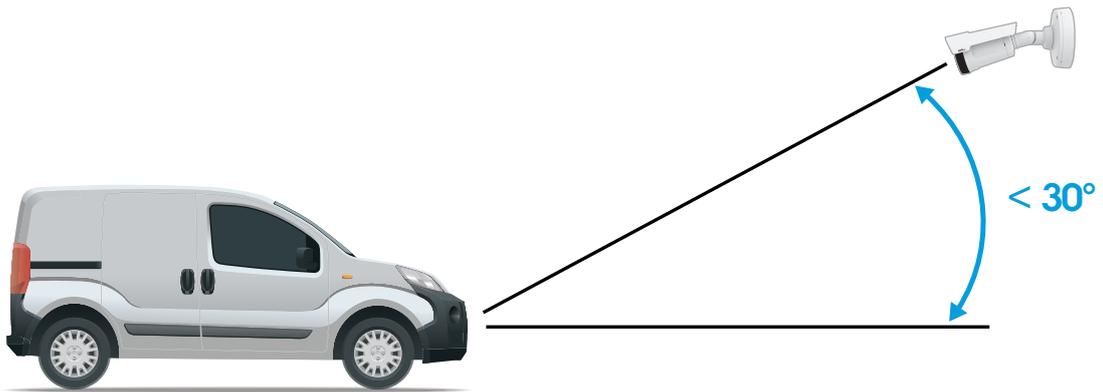
Free flow with built-in IR

Capture distance (C)	Mounting height (A)	Max vehicle speed
20–50 m (65–164 ft)	4 m (13 ft)	90 km/h (56 mph)
30–50 m (98–164 ft)	6 m (19.5 ft)	90 km/h (56 mph)
35–50 m (115–164 ft)	8 m (26.2 ft)	90 km/h (56 mph)
25–50 m (82–164 ft)	4 m (13 ft)	130 km/h (80 mph)
40–50 m (131–164 ft)	6 m (19.5 ft)	130 km/h (80 mph)
N/A	8 m (26.2 ft)	130 km/h (80 mph)
40–50 m (131–164 ft)	4 m (13 ft)	200 km/h (124 mph) (*)
N/A	6 m (19.5 ft)	200 km/h (124 mph)
N/A	8 m (26.2 ft)	200 km/h (124 mph)

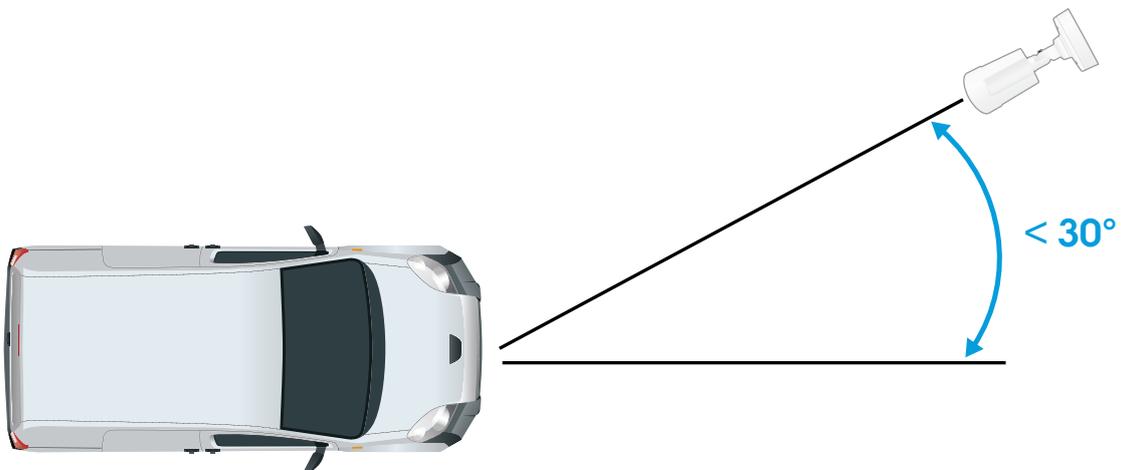
(*) For best detection rate, we recommend using an external IR light
Free flow with external IR light

Capture distance (C)	Mounting height (A)	Max vehicle speed
20–100 m (65–328 ft)	4 m (13 ft)	90 km/h (56 mph)
30–100 m (98–328 ft)	6 m (19.5 ft)	90 km/h (56 mph)
35–100 m (115–328 ft)	8 m (26.2 ft)	90 km/h (56 mph)
25–100 m (82–328 ft)	4 m (13 ft)	130 km/h (80 mph)
40–100 m (131–328 ft)	6 m (19.5 ft)	130 km/h (80 mph)
50–100 m (164–328 ft)	8 m (26.2 ft)	130 km/h (80 mph)
40–100 m (131–328 ft)	4 m (13 ft)	200 km/h (124 mph)
60–100 m (197–328 ft)	6 m (19.5 ft)	200 km/h (124 mph)
80–100 m (262–328 ft)	8 m (26.2 ft)	200 km/h (124 mph)

- The camera's mounting angle should not be larger than 30° in any direction.

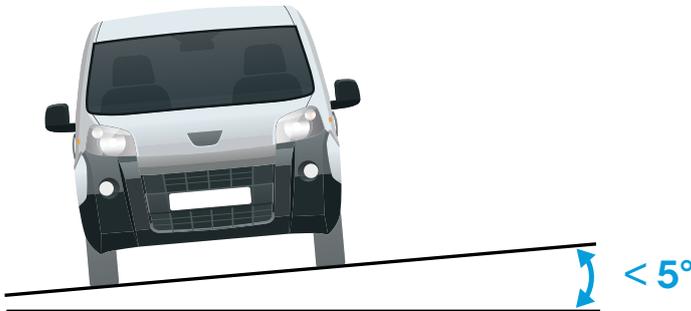


Mounting angle from the side.



Mounting angle from above.

- The image of the license plate should not tilt more than 5° horizontally. If the image is tilted more than 5°, we recommended that you adjust the camera so that the license plate is displayed horizontally in the live stream.



Roll angle.

Set up AXIS License Plate Verifier

1. In the device's web interface, go to **Apps**.
2. Toggle the switch next to **AXIS License Plate Verifier** to start the app.
3. Click **Open** to open the app's web interface.
4. Follow the instructions to set up **AXIS License Plate Verifier**.
 - Set up **Free flow**. See *Free flow*, on page 10.

When you first run the application, set up **Free flow** using the setup assistant. If you want to make changes later on, it can be found in the **Settings** tab under **Setup assistant**.

Free flow

In **Free flow**, the application can detect and read license plates in slow speed traffic on larger access roads, city centers and enclosed areas like campuses, ports or airports. This allows for **LPR-forensic search** and **LPR triggered events** in a **VMS**.

1. Select **Free flow** and click **Next**.
2. Select the image rotation that corresponds to how your camera is mounted.
3. Select the number of areas of interest. Note that one area can detect plates in both directions.
4. Select the region where the camera is located.
5. Select capture type.
 - **License plate crop** saves only the license plate.
 - **Vehicle crop** saves the entire captured vehicle.
 - **Frame downsized 480x270** saves the entire image and reduces the resolution to 480x270.
 - **Full frame** saves the entire image at full resolution.
6. Drag the anchor points to adjust the area of interest. See *Adjust the area of interest*, on page 11.
7. Adjust the direction of the area of interest. Click the arrow and rotate to set the direction. The direction determines how the application registers vehicles entering or exiting the area.
8. Click **Next**
9. In the **Protocol** drop-down list, select one of the following protocols:

- TCP
 - HTTP POST
10. In the **Server URL** field, type the server address and port in the following format: 127.0.0.1:8080
 11. In the **Device ID** field, type the name of the device or leave as is.
 12. Under **Event types**, select one or more of the following options:
 - **New** means the first detection of a license plate.
 - **Update** is either a correction of a character on a previously detected license plate, or when a direction is detected as the plate moves and is tracked across the image.
 - **Lost** is the last tracked event of the license plate before it exits the image. It also contains the direction of the license plate.
 13. To turn on the feature, select **Send event data to server**.
 14. To reduce bandwidth when using HTTP POST, you can select **Do not to send images through HTTP POST**.
 15. Click **Next**.
 16. If you already have a list of registered plates, choose to import as either a **blocklist** or **allowlist**.
 17. Click **Finish**.

Access the application settings

1. In the camera's web interface, go to **Apps**, start the application and click **Open**.

Adjust the area of interest

The area of interest is the area in the live view where the application looks for license plates. For optimal performance, keep the area of interest as small as possible. To adjust the area of interest, do the following:

1. Go to **Settings**.
2. Click **Image**.
3. Click on 1:1 to zoom in where you want monitor traffic or manage access control.
4. To improve verification and captured images, click on **AF**.
5. To have the camera automatically focus on the vehicles, click **AF**. To set the focus manually, adjust it with the slider.
6. Click on **Area of interest** to see it displayed in the view area.
7. To move the area of interest, click anywhere in the area to select it and drag it to where the license plates are most visible. Make sure the region of interest stays in position after you have saved the settings.
8. To adjust the area of interest, click anywhere in the area to select it and drag the anchor points highlighted in blue.
 - To reset the area of interest, click on the reset button on the lower left corner next to the number icon.
 - To add anchor points, click the on one of the dark anchor points. The anchor point will turn yellow, showing it can be manipulated. New dark points are automatically added next to the yellow anchor point. The maximum amount of yellow anchor points is eight.
9. Click anywhere outside the area of interest to save your changes.
10. To get the correct direction feedback in the **Event log**, you need to turn the arrow to match the driving direction.
 - 10.1. Click the arrow icon.
 - 10.2. Select the anchor point and rotate the arrow so it aligns with the driving direction.
 - 10.3. Click outside the area of interest to save the changes.

Note that one area can detect plates in both directions. The direction feedback shows up in the **Direction** column.

11. To check if your area of interest is large enough for the best results, use the pixel counter.
 - To show the pixel counter, click on the calculator icon.
 - To adjust the full size pixel counter area, drag the lower right corner of the area highlighted in yellow.
 - To move the pixel counter area, click anywhere in the area and drag it where you want.
- To add a second area of interest, click on **+** next to 1.
- If you are using a standalone camera, you can have the app set the recommended settings for license plate recognition.
 1. Click on the magic wand icon and the settings will be optimized for license plate recognition.
 2. Click on the menu button next to the magic wand to see the set values.

Select region

1. Go to **Settings > Recognition**.
2. In the **Region** drop-down list, select your region.

Adjust the image capture settings

1. Go to **Settings > Image**.
2. To change the resolution of captured images, go to **Image resolution**
3. To change the rotation of the captured image, go to **Rotation**

Set up event storage

An event consists of the captured image, the license plate, the area of interest number, vehicle direction, access, and the date and time.

This example use case explains how to store events of allowlisted license plate numbers for 30 days.

Requirements:

- Camera physically installed and connected to the network.
 - AXIS License Plate Verifier up and running on the camera.
 - Internal storage or an SD card installed in the camera.
1. Go to **Settings > Storage**.
 2. Under **Retain events**, select **Allowlisted**.
 3. Under **Retention period**, select **30 days**.
 4. To change how you save your captured images, go to **Save full frame**:
 - **License plate crop** saves only the license plate.
 - **Vehicle crop** saves the entire captured vehicle.
 - **Frame downsized 480x270** saves the entire image and reduces the resolution to 480x270.
 - **Full frame** saves the entire image at full resolution.

Note

To detect an inserted SD card when the app is running, you need to restart the app. If an SD card is installed in the camera, the app will automatically choose the SD card as the default storage.

AXIS License Plate Verifier uses the cameras internal memory to save up to 1,000 events, using license plate crops as the frame. If you use larger frames, it will vary the amount of events you can save.

An SD card can save up to 100,000 events using any type of frame.

Configure your device

This section covers all the important configurations that an installer needs to do to get the product up and running after the hardware installation has been completed.

Basic settings

Set the capture mode

1. Go to **Video > Installation > Capture mode**.
2. Click **Change**.
3. Select a capture mode and click **Save and restart**.
See also *Capture modes, on page 41*.

Set the power line frequency

1. Go to **Video > Installation > Power line frequency**.
2. Select a power line frequency and click **Save and restart**.

Set the orientation

1. Go to **Video > Installation > Rotate**.
2. Select **0**, **90**, **180** or **270** degrees.
See also .

Adjust the image

This section includes instructions about configuring your device. If you want to learn more about how certain features work, go to *Learn more, on page 41*.

Level the camera

To adjust the view in relation to a reference area or an object, use the level grid in combination with a mechanical adjustment of the camera.

1. Go to **Video > Image >** and click  **A**.
2. Click  to show the level grid.
3. Adjust the camera mechanically until the position of the reference area or the object is aligned with the level grid.

Benefit from IR light in low-light conditions by using night mode

Your camera uses visible light to deliver color images during the day. But as the visible light diminishes, color images become less bright and clear. If you switch to night mode when this happens, the camera uses both visible and near-infrared light to deliver bright and detailed black-and-white images instead. You can set the camera to switch to night mode automatically.

1. Go to **Video > Image > Day-night mode**, and make sure that the **IR-cut filter** is set to **Auto**.
2. To set at what light level you want the camera to switch to night mode, move the **Threshold** slider toward **Bright** or **Dark**.
3. To use the built-in IR light when the camera is in night mode, turn on **Allow illumination** and **Synchronize illumination**.

Note

If you set the switch to night mode to occur when it's brighter, the image remains sharper as there is less low-light noise. If you set the switch to occur when it's darker, the image colors are maintained for longer, but there is more image blur due to low-light noise.

Optimize IR illumination

Depending on the installation environment and the conditions around the camera, for example external light sources in the scene, you can sometimes improve the image quality if you manually adjust the intensity of the LEDs. If you have problems with reflections from the LEDs, you can try to reduce the intensity.

1. Go to **Video > Image > Day-night mode**.
2. Turn on **Allow illumination**.
3. Click  in the live view and select **Manual**.
4. Adjust the intensity.

You can also reduce the reflections by changing the illumination angle.

1. Go to **Video > Image > Day-night mode**.
2. Turn off **Automatic illumination angle**.
3. Adjust the illumination angle slider.

Stabilize a shaky image with image stabilization

Image stabilization is suitable in environments where the product is mounted in an exposed location where vibrations can occur, for example, due to wind or passing traffic.

The feature makes the image smoother, steadier, and less blurry. It also reduces the file size of the compressed image and lowers the bitrate of the video stream.

Note

When you turn on image stabilization, the image is slightly cropped, which lowers the maximum resolution.

1. Go to **Video > Installation > Image correction**.
2. Turn on **Image stabilization**.

Compensate for barrel distortion

Barrel distortion is a phenomenon where straight lines appear increasingly bent closer to the edges of the frame. A wide field of view often creates barrel distortion in an image. Barrel distortion correction compensates for this distortion.

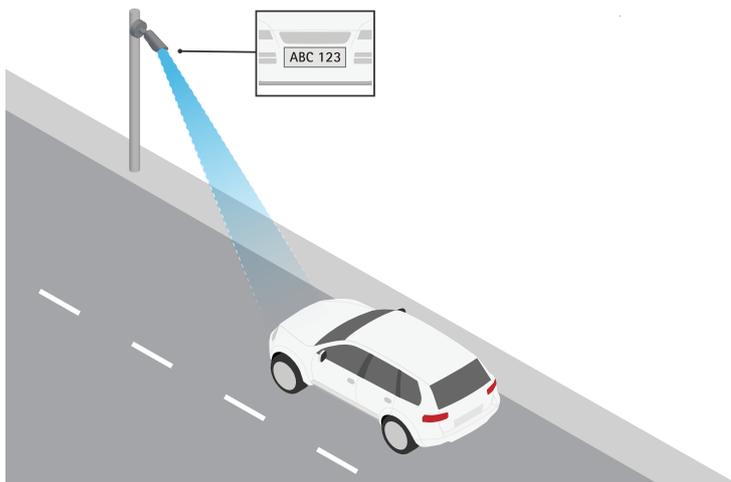
Note

Barrel distortion correction affects the image resolution and field of view.

1. Go to **Video > Installation > Image correction**.
2. Turn on **Barrel distortion correction (BDC)**.

Verify the pixel resolution

To verify that a defined part of the image contains enough pixels to, for example, recognize license plates, you can use the pixel counter.



1. Go to **Video > Image**.
2. Click .
3. Click  for **Pixel counter**.
4. In the camera's live view, adjust the size and position of the rectangle around the area of interest, for example where you expect license plates to appear.
5. You can see the number of pixels for each of the rectangle's sides, and decide if the values are enough for your needs.

Hide parts of the image with privacy masks

You can create one or several privacy masks to hide parts of the image.

1. Go to **Video > Privacy masks**.
2. Click .
3. Click the new mask and type a name.
4. Adjust the size and placement of the privacy mask according to your needs.
5. To change the color for all privacy masks, click **Privacy masks** and select a color.

See also *Privacy masks, on page 41*

Show an image overlay

You can add an image as an overlay in the video stream.

1. Go to **Video > Overlays**.
2. Click **Manage images**.
3. Upload or drag and drop an image.
4. Click **Upload**.
5. Select **Image** from the drop-down list and click .
6. Select the image and a position. You can also drag the overlay image in the live view to change the position.

Show a text overlay

You can add a text field as an overlay in the video stream. This is useful for example when you want to display the date, time or a company name in the video stream.

1. Go to **Video > Overlays**.
2. Select **Text** and click .
3. Type the text you want to display, or select modifiers to show for example the current date.
4. Select a position. You can also click-and-drag the overlay in the live view to change the position.

Show license plate overlays

License plate overlays are available with the application *AXIS License Plate Verifier*.

1. Go to **Video > Image**.
2. Click  in the live view to access the device's onscreen controls.
3. Expand **Predefined controls**.
4. Turn on **License plate overlay**.
5. Click **Show overlay**.
6. To move the overlay, click **Move overlay**.

Add street names and compass direction to the image

Note

The street name and compass direction will be visible on all video streams and recordings.

1. Go to **Apps**.
2. Select **axis-orientationaid**.
3. Click **Open**.
4. To add a street name, click **Add text** and modify the text to fit the street.
5. To add a compass, click **Add compass** and modify the compass to fit the image.

View and record video

This section includes instructions about configuring your device. To learn more about how streaming and storage works, go to *Streaming and storage, on page 41*.

Reduce bandwidth and storage

Important

Reducing the bandwidth can lead to loss of detail in the image.

1. Go to **Video > Stream**.
2. Click  in the live view.
3. Select **Video format AV1** if your device supports it. Otherwise select **H.264**.
4. Go to **Video > Stream > General** and increase **Compression**.
5. Go to **Video > Stream > Zipstream** and do one or more of the following:

Note

The **Zipstream** settings are used for all video encodings except MJPEG.

- Select the **Zipstream Strength** that you want to use.
- Turn on **Optimize for storage**. This can only be used if the video management software supports B-frames.
- Turn on **Dynamic FPS**.
- Turn on **Dynamic GOP** and set a high **Upper limit GOP length** value.

Note

Most web browsers don't support H.265 decoding and because of this the device doesn't support it in its web interface. Instead you can use a video management system or application that supports H.265 decoding.

Set up network storage

To store recordings on the network, you need to set up your network storage.

1. Go to **System > Storage**.
2. Click  **Add network storage** under **Network storage**.
3. Type the IP address of the host server.
4. Type the name of the shared location on the host server under **Network share**.
5. Type the username and password.
6. Select the SMB version or leave it on **Auto**.
7. Select **Add share without testing** if you experience temporary connection issues, or if the share is not yet configured.
8. Click **Add**.

Record and watch video

Record video directly from the camera

1. Go to **Video > Stream**.
2. To start a recording, click .

If you haven't set up any storage, click  and . For instructions on how to set up network storage, see *Set up network storage, on page 18*

3. To stop recording, click  again.

Watch video

1. Go to **Recordings**.
2. Click  for your recording in the list.

Verify that no one has tampered with the video

With signed video, you can make sure that no one has tampered with the video recorded by the camera.

1. Go to **Video > Stream > General** and turn on **Signed video**.
2. Use AXIS Camera Station (5.46 or later) or another compatible video management software to record video. For instructions, see the *AXIS Camera Station user manual*.
3. Export the recorded video.
4. Use AXIS File Player to play the video. *Download AXIS File Player*.

 indicates that no one has tampered with the video.

Note

To get more information about the video, right-click the video and select **Show digital signature**.

Pair the camera with a radar

Radar pairing is a one-way setup where you pair a camera with a radar and use the camera to configure and maintain both devices. The camera has an allocated channel for the radar stream, and after pairing the radar stream will be automatically assigned to this channel.

To learn more about edge-to-edge, see *Edge-to-edge technology, on page 44*.

Before you start:

- Make sure the camera and radar are directed towards the same area of interest.
- Make sure the camera and radar are synced to the same time source. To check the time sync status, go to **Installation > Time sync status** in each device.

Pair the camera with the radar:

1. In the camera's web interface, go to **System > Edge-to-edge > Pairing**.
2. Click  **Add**.
3. In the list of pairing types, select **Radar**.
4. Enter the host name, username, and password for the radar.
5. Click **Connect** to pair the devices.
When the connection is established, the radar settings become available in the camera's web interface.

Note

The default resolution of the paired radar is 1280x720. Keep the radar's default resolution in the camera's web interface, and if you add it to a VMS.

Configure the radar:

1. In the camera's web interface, go to **Radar > Scenarios**.
2. Configure the radar according to your needs.
For more information about how to configure your radar, see the user manual at help.axis.com.

Note

When you upgrade the AXIS OS version for the camera, make sure to also upgrade AXIS OS for the radar to keep your system up-to-date. We recommend using a device management system like AXIS Device Manager.

Set up rules for events

You can create rules to make your device perform an action when certain events occur. A rule consists of conditions and actions. The conditions can be used to trigger the actions. For example, the device can start a recording or send an email when it detects motion, or show an overlay text while the device is recording.

To learn more, see *Get started with rules for events*.

Trigger an action

1. Go to **System > Events** and add a rule. The rule defines when the device will perform certain actions. You can set up rules as scheduled, recurring, or manually triggered.
2. Enter a **Name**.
3. Select the **Condition** that must be met to trigger the action. If you specify more than one condition for the rule, all of the conditions must be met to trigger the action.
4. Select which **Action** to perform when the conditions are met.

Note

- If you make changes to an active rule, the rule must be turned on again for the changes to take effect.
- If you change the definition of a stream profile that is used in a rule, you need to restart all the rules that use that stream profile.

Save power when no motion is detected

This example explains how to turn on power saving mode when no motion is detected in the scene.

Note

When you turn on power saving mode, the IR illumination range is reduced.

Make sure that AXIS Video Motion Detection is running:

1. Go to **Apps > AXIS Video Motion Detection**.
2. Start the application if it is not already running.
3. Make sure you have set up the application according to your needs.

Create a rule:

1. Go to **System > Events** and add a rule.
2. Type a name for the rule.
3. In the list of conditions, under **Application**, select **VMD4**.
4. Select **Invert this condition**.
5. In the list of actions, under **Power saving mode**, select **Use power saving mode while the rule is active**.
6. Click **Save**.

Record video when the camera detects an object

This example explains how to set up the camera to start recording to the SD card when the camera detects an object. The recording will include five seconds before detection and one minute after detection ends.

Before you start:

- Make sure you have an SD card installed.

Make sure that AXIS Video Motion Detection is running:

1. Go to **Apps > AXIS Video Motion Detection**.
2. Start the application if it is not already running.
3. Make sure you have set up the application according to your needs.

Create a rule:

1. Go to **System > Events** and add a rule.
2. Type a name for the rule.
3. In the list of conditions, under **Application**, select **VMD4**.
4. In the list of actions, under **Recordings**, select **Record video while the rule is active**.
5. In the list of storage options, select **SD_DISK**.
6. Select a camera and a stream profile.
7. Set the prebuffer time to 5 seconds.
8. Set the postbuffer time to 1 minute.
9. Click **Save**.

Show a text overlay in the video stream when the device detects an object

This example explains how to display the text "Motion detected" when the device detects an object.

Make sure that AXIS Video Motion Detection is running:

1. Go to **Apps > AXIS Video Motion Detection**.
2. Start the application if it is not already running.
3. Make sure you have set up the application according to your needs.

Add the overlay text:

1. Go to **Video > Overlays**.
2. Under **Overlays**, select **Text** and click .
3. Enter #D in the text field.
4. Choose text size and appearance.
5. To position the text overlay, click  and select an option.

Create a rule:

1. Go to **System > Events** and add a rule.
2. Type a name for the rule.
3. In the list of conditions, under **Application**, select **VMD4**.
4. In the list of actions, under **Overlay text**, select **Use overlay text**.
5. Select a video channel.
6. In **Text**, type "Motion detected".
7. Set the duration.
8. Click **Save**.

Note

If you update the overlay text it will be automatically updated on all video streams dynamically.

Provide visual indication of an ongoing event

You have the option to connect the AXIS I/O Indication LED to your network camera. This LED can be configured to turn on whenever certain events occur in the camera. For example, to let people know that video recording is in progress.

Required hardware

- AXIS I/O Indication LED
- An Axis network video camera

Note

For instructions on how to connect the AXIS I/O Indication LED, see the installation guide provided with the product.

The following example shows how to configure a rule that turns on the AXIS I/O Indication LED to indicate that camera is recording.

1. Go to **System > Accessories > I/O ports**.
2. For the port that you connected the AXIS I/O Indication LED to, click  to set the direction to **Output**, and click  to set the normal state to **Circuit open**.
3. Go to **System > Events**.
4. Create a new rule.
5. Select the **Condition** that must be met to trigger the camera to start recording. It can, for example, be a time schedule or motion detection.

6. In the list of actions, select **Record video**. Select a storage space. Select a stream profile or create a new. Also set the **Prebuffer** and **Postbuffer** as required.
7. Save the rule.
8. Create a second rule and select the same **Condition** as in the first rule.
9. In the list of actions, select **Toggle I/O while the rule is active**, and then select the port the AXIS I/O Indication LED is connected to. Set the state to **Active**.
10. Save the rule.

Other scenarios where AXIS I/O Indication LED can be used are for example:

- Configure the LED to turn on when the camera starts, to indicate the presence of the camera. Select **System ready** as a condition.
- Configure the LED to turn on when live stream is active to indicate that a person or a program is accessing a stream from the camera. Select **Live stream accessed** as a condition.

Record video when the camera detects loud noises

This example explains how to set up the camera to start recording to the SD card five seconds before it detects loud noise and to stop two minutes after.

Note

The following instructions require that a microphone is connected to audio-in.

Turn on audio:

1. Set up the stream profile to include audio, see *Add audio to your recording, on page 24*.

Turn on audio detection:

1. Go to **System > Detectors > Audio detection**.
2. Adjust the sound level according to your needs.

Create a rule:

1. Go to **System > Events** and add a rule.
2. Type a name for the rule.
3. In the list of conditions, under **Audio**, select **Audio Detection**.
4. In the list of actions, under **Recordings**, select **Record video**.
5. In the list of storage options, select **SD_DISK**.
6. Select the stream profile where audio has been turned on.
7. Set the prebuffer time to 5 seconds.
8. Set the postbuffer time to 2 minutes.
9. Click **Save**.

Record video when the camera detects impact

Shock detection allows the camera to detect tampering caused by vibrations or shock. Vibrations due to the environment or to an object can trigger an action depending on the shock sensitivity range, which can be set from 0 to 100. In this scenario, someone is throwing rocks at the camera after hours and you would like to get a video clip of the event.

Turn on shock detection:

1. Go to **System > Detectors > Shock detection**.
2. Turn on shock detection, and adjust the shock sensitivity.

Create a rule:

3. Go to **System > Events > Rules** and add a rule.
4. Type a name for the rule.

5. In the list of conditions, under **Device status**, select **Shock detected**.
6. Click **+** to add a second condition.
7. In the list of conditions, under **Scheduled and recurring**, select **Schedule**.
8. In the list of schedules, select **After hours**.
9. In the list of actions, under **Recordings**, select **Record video while the rule is active**.
10. Select where to save the recordings.
11. Select a **Camera**.
12. Set the prebuffer time to 5 seconds.
13. Set the postbuffer time to 50 seconds.
14. Click **Save**.

Detect tampering with input signal

This example explains how to send an email when the input signal is cut or short-circuited. For more information about the I/O connector, see *page 48*.

1. Go to **System > Accessories > I/O ports** and turn on **Supervised** for the relevant port.

Add an email recipient:

1. Go to **System > Events > Recipients** and add a recipient.
2. Type a name for the recipient.
3. Select **Email** as the notification type.
4. Type the recipient's email address.
5. Type the email address that you want the camera to send notifications from.
6. Provide the login details for the sending email account, along with the SMTP hostname and port number.
7. To test your email setup, click **Test**.
8. Click **Save**.

Create a rule:

1. Go to **System > Events > Rules** and add a rule.
2. Type a name for the rule.
3. In the list of conditions, under **I/O**, select **Supervised input tampering is active**.
4. Select the relevant port.
5. In the list of actions, under **Notifications**, select **Send notification to email** and then select the recipient from the list.
6. Type a subject line and message for the email.
7. Click **Save**.

Send an email automatically if someone spray paints the lens

This example explains how to set up a rule in the camera's web interface that sends an email when the image has been blocked for more than 40 seconds, for example by a spray painted lens.

Before you start:

- Create an email recipient in the camera's web interface.

In AXIS Image Health Analytics:

1. Turn on **Blocked image**.
2. Set **Validation period** to 40 seconds.

In the camera's web interface:

3. Go to **System > Events** and add a rule.
4. Type a name for the rule.
5. In the list of conditions, under **Applications**, select **Image Health Analytics – Block**.
6. In the list of actions, under **Notifications**, select **Send notification to email**.
7. Select the recipient from the list.
8. Type a subject and message for the email.
9. Click **Save**.

Audio

Add audio to your recording

Turn on audio:

1. Go to **Video > Stream > Audio** and include audio.
2. If the device has more than one input source, select the correct one in **Source**.
3. Go to **Audio > Device settings** and turn on the correct input source.
4. If you make any changes to the input source, click **Apply changes**.

Edit the stream profile that is used for the recording:

5. Go to **System > Stream profiles** and select the stream profile.
6. Select **Include audio** and turn it on.
7. Click **Save**.

Connect to a network speaker

Network speaker pairing allows you to use a compatible Axis network speaker as if it is connected directly to the camera. Once paired, the speaker acts as an audio out device where you can play audio clips and transmit sound through the camera.

Important

For this feature to work with a video management software (VMS), you must first pair the camera with the network speaker, then add the camera to your VMS.

Pair camera with network speaker

1. Go to **System > Edge-to-edge > Pairing**.
2. Click  **Add** and select the pairing type **Audio** from the drop-down list.
3. Select **Speaker pairing**.
4. Type the network speaker's IP address, username and password.
5. Click **Connect**. A confirmation message appears.

Connect to a network microphone

Network microphone pairing allows you to use a compatible Axis network microphone as if it is connected directly to the camera. Once paired, the microphone will take up sounds from the surrounding area and make it available as an audio input device, usable in media streams and recordings.

Important

For this feature to work with a video management software (VMS), you must first pair the camera with the network microphone, then add the camera to your VMS.

Pair camera with network microphone

1. Go to **System > Edge-to-edge > Pairing**.

2. Click  **Add** and select the pairing type **Audio** from the drop-down list.
3. Select **Microphone pairing**.
4. Type the network microphone's IP address, username and password.
5. Click **Connect**. A confirmation message appears.

Manage lists

Add detected license plate to list

A license plate can be added directly to a list after being detected by the application.

1. Click on **Home**.
2. Go to **Live**.
3. Click on the arrow icon on the registered plate in the list.
4. Click on **Append plate to list**.
5. Select the list you would like to add the license plate in the dialog.
6. Click **Append**.

Note

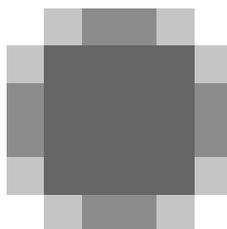
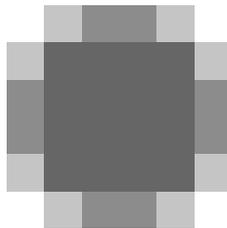
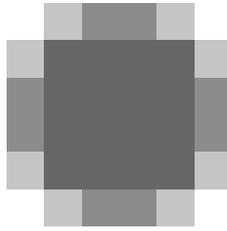
Make sure the symbols <, > and & aren't used in either the license plate or description.

Add descriptions to license plates

To add a description to a license plate in the list:

- Go to **List management**.

- Select the license plate and click



then select **Edit** in the drop-down menu.

- Type the relevant information in the **Description** field.
- Click **Save**.

Note

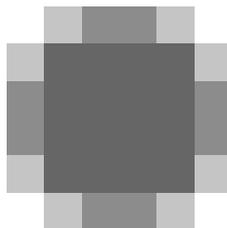
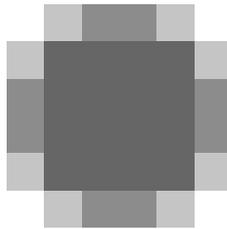
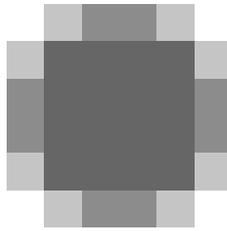
Make sure the symbols **<**, **>** and **&** aren't used in either license plates or descriptions.

Customize list names

You can change the name of any of the lists to fit your specific use case.

1. Go to **List management**.

2. Click



next to the list you want to change.

3. Select **Edit**.
4. Type the name of the list.
5. Click **Submit**.

The new list name will be updated in any existing configurations.

Import allowlisted license plate numbers

You can import allowlisted license plate numbers from a .csv file on the computer. In addition to the license plate number, you can also add comments for each license plate number in the .csv file.

The structure of the .csv file must look like this: `license plate, date, description`

Example:

Only license plate: `AXIS123`

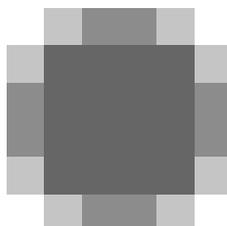
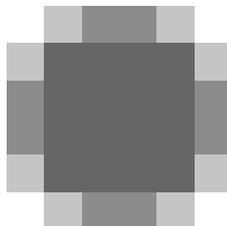
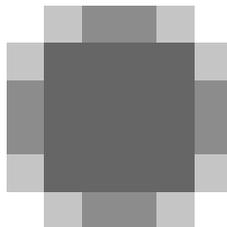
License plate + description: `AXIS123, , John Smith`

License plate + date + description: `AXIS123, 2022-06-08, John Smith`

Note

Make sure the symbols <, > and & aren't used in either license plates or descriptions.

1. Go to List management
2. Click on



next to Allowlist and select **Import** in the drop-down menu.

3. Browse to select a .csv file on the computer.
4. Click **OK**.
5. Check that the imported license plate numbers appear in the **Allowlist**.

Share license plate lists with other cameras

You can share the license plate lists with other cameras on the network. The synchronization will override all current license plate lists in the other cameras.

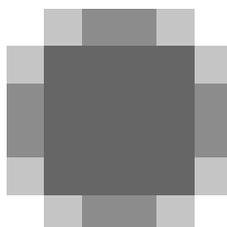
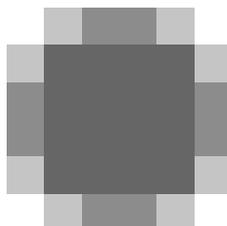
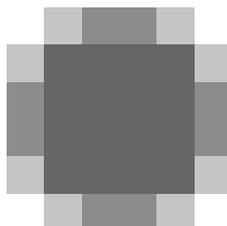
1. Go to List management > List synchronization.
2. Under Remote connected devices, type the IP address, username and password.
3. Click **Add**.
4. Click **Synchronize list**.

5. Check that the date and time under Last sync updates accordingly.

Schedule lists

Lists can be scheduled to only be active during certain times during certain days of the week. To schedule a list:

- Go to List management.
- Click



next to the list you want to change.

- Select **Schedule** in the drop-down menu.
- Select the start and end time, and the day when the list should be active.
- Click the button next to **Enabled**.
- Click **Save**.

Additional settings

Configure text overlay

A text overlay shows the following event information in the live view: *weekday, month, time, year, license plate number*.

1. Go to **Settings > Image**.
2. Activate **Text overlay**.
3. Select either **Timestamp and license plate** or **License plate only**.
4. Set **Overlay duration** to a value between 1 and 9 seconds.
5. Check that the overlay appears in the live view.

Detect license plates in low-light conditions

Each detection gets a score by the algorithm, this is called the confidence threshold. Detections that have a lower score than the selected level will not show up in the list of events.

For scenes with low lighting you can set a lower confidence threshold, which will allow for detection of more plates.

1. Go to **Settings > Recognition**.
2. Adjust the slider under **Confidence threshold**.
3. Check that the algorithm detects the license plates as expected.

Allow fewer characters on license plates

The application has a default minimum number of characters for a license plate to be detected. The default minimum number of characters is five. You can configure the application to detect license plates with fewer characters.

1. Go to **Settings > Recognition**.
2. Under **Number of characters**, adjust the slider to set the minimum number of characters you want to allow.
3. Check that the application detects license plates as expected.

Allow only exact matches of license plates

The matching algorithm automatically allows a deviation of one character when matching the detected license plate against the allowlist or blacklist. However, some scenarios need an exact match of all characters of the license plate.

1. Go to **List management**.
2. Click to activate **Strict matching**.
3. Check that the application matches the license plates as expected.

Allow more than one character deviation when matching license plates

The matching algorithm automatically allows a deviation of one character when matching the detected license plate against the allowlist or blacklist. However, you can allow more than one character deviation.

1. Go to **Settings > Recognition**.
2. Under **Allowed character deviation**, select the number of characters that are allowed to be different.
3. Check that the application matches the license plates as expected.

Give limited access to operators

Operators can be given a limited access to the app using an URL. This way they only have access to the Event log and List management. The URL can be found under **Settings > User rights**.

Set up secure connection

To protect communication and data between devices, for example between the camera and the door controller, set up a secure connection with HTTPS using certificates.

1. Go to **Settings > Security**.
2. Under HTTPS, select either **Self-signed** or **CA-signed**.

Note

Find out more about HTTPS and how to use it at .

Backup and restore app settings

You can backup and restore settings made in the app related to image capture, security, detection and integration. If something should go wrong, you can now restore the settings you have backed up.

To backup app settings:

- Go to **Settings > Maintenance**.
- Click **Download backup configuration**.

A JSON file will be downloaded to you downloads folder.

To restore app settings:

- Go to **Settings > Maintenance**.
- Click **Restore configuration**.

Select the JSON file containing the backup.

The setting are restored automatically.

Clear all events

After you set up the app, it can be a good idea to clear the records of any images or captured plates from the setup process.

To clear all images and plates from the database:

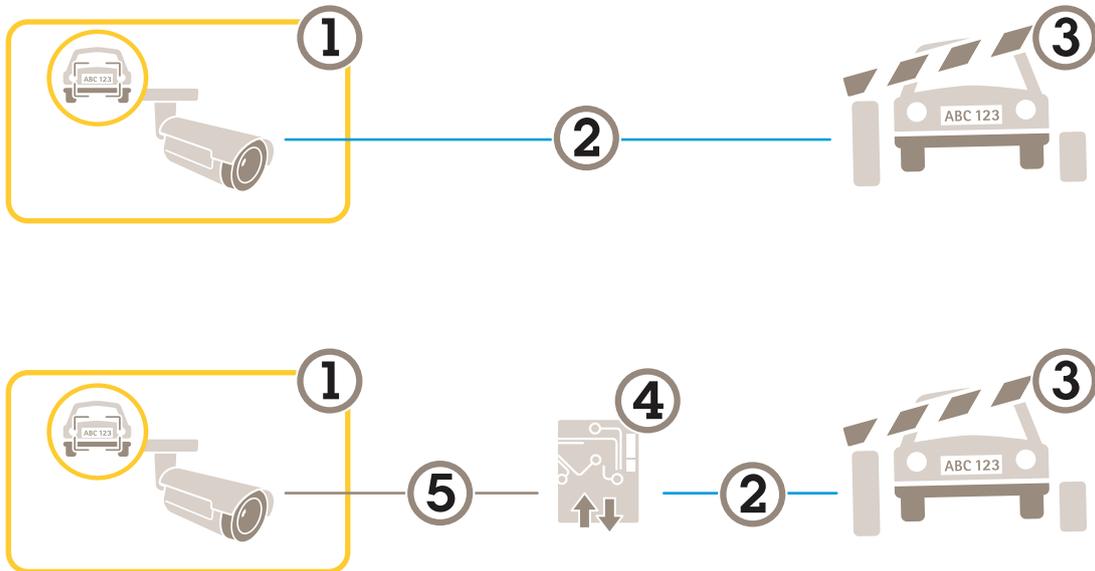
Go to **Settings > Maintenance**.

- Click **Clear all recognition results**.
- Click **Yes**.

Vehicle entry and exit scenario

In the scenario for vehicle entry and exit, the application reads the vehicle license plate captured by the camera and verifies the license plate against a list of authorized or unauthorized license plate numbers stored in the camera.

This scenario requires the application embedded in a camera with I/O support or a connected I/O relay module to open and close the barrier.



Two possible setups for the vehicle entry and exit scenario.

- 1 Axis camera with AXIS License Plate Verifier
- 2 I/O communication
- 3 Barrier
- 4 Axis I/O relay module
- 5 IP communication

Get notified about an unauthorized vehicle

This example explains how to set up the application so that an event that triggers a notification can be created in the camera.

Requirements:

- Basic setup done. See *Basic setup, on page 8*.
1. Go to List management.
 2. Enter the license plate number in the Blocklist field.
 3. Go to the camera's webpage.
 4. Go to Settings > Events and set up an action rule with the application as a condition and with a notification as an action.
 5. Check that the application identifies the added license plate number as an unauthorized vehicle and that the action rule runs as expected.

Free flow scenario with speed measurement

In a free flow scenario with speed measurement, the camera is paired with an Axis radar through the edge-to-edge technology. The camera covers two lanes and reads the license plates of the passing vehicles, and the paired radar covers the same two lanes to measure the speed of the vehicles. Additionally, the application *AXIS Speed Monitor* can visualize the maximum speed in each lane through overlays in the camera's live view.

To find out more about edge-to-edge, see *Edge-to-edge technology, on page 44*.

Requirements:

- An Axis license plate verifier camera kit and *AXIS D2210-VE Radar* installed and connected to the network

Set up the scenario

Set up the scenario in four steps: first configure the camera, then pair and configure the radar, and finally use *AXIS Speed Monitor* to add overlays.

Before you start:

- Make sure that the camera and radar are directed towards the same area of interest.
- Make sure that the camera and radar are time synced. To check the status, go to **Installation > Time sync status** in each device.

Configure the camera:

1. Set up the camera according to the instructions in *Basic setup, on page 8*.
2. Make sure to select free flow when you follow the setup assistant. For more information, see *Free flow, on page 10*.

Pair the camera with a radar:

1. In the camera's web interface, go to **System > Edge-to-edge > Radar pairing**.
2. Enter the host name, user name, and password of the radar.
3. Click **Connect** to pair the devices.
When the connection is established, the radar settings will be available in the camera's web interface.

Note

The default resolution of the paired radar is 1280x720. Keep the default resolution of the radar in the camera's web interface, and if you add it to a VMS.

Configure the radar:

1. In the camera's web interface, go to **Radar > Scenarios**.
2. Add one radar scenario that covers one lane, and another radar scenario that covers the other lane.
3. For both scenarios, select **Movement in area**, trigger on **Vehicles**, and set a **Speed limit**.
For more information, go to *Add scenarios* in *AXIS D2210-VE Radar user manual*.

Note

If you want to add overlays containing license plate information through *AXIS License Plate Verifier*, make sure to add these before you add any overlays in *AXIS Speed Monitor*.

Use *AXIS Speed Monitor* to add speed overlays:

1. Download and install *AXIS Speed Monitor* on your camera.
2. Add one overlay for each lane, which will show the maximum speed in the camera's live view.
For installation and configuration instructions, go to *AXIS Speed Monitor user manual*.

Search for specific events

Use the search feature to search for events using a number of criteria.

1. Go to the application's webpage and select the **Search** page.
2. Select the date in the **From** and **To** calendar menus.
3. Click the **AOI** drop down menu to select which area of interest should be included in the search.
4. select **Direction** to filter by entry or exit.
5. Enter the license plate in the **Plate** field, if you want to search for a plate.
6. To find license plates that belong to a specific country, select a country in the **Country** drop-down list..
7. To filter out images based on the view of the vehicle, select **Front** or **Rear** in the **Vehicle view** drop-down list.
8. To filter the search results based on the make, model, type or color of the vehicle, select what you are looking for in the **Vehicle details** drop-down menus.
9. Click **Apply filters** to view the search results.

Export and share search results

To export any search result as a CSV file with the statistics at that time, click **Export** to save the results as a CSV file

To copy the API as a link which can be used to export data to third party systems, click **Copy search link**.

Integration

Use profiles to push events to multiple servers

With profiles, you can push an event to different servers using different protocols at the same time. To use profiles:

1. Go to **Integration** and the **Push events** page.
2. Select **Profile 1**.
3. Configure the rule. See *Push event information to third-party software, on page 36*.
4. Test the rule.
5. Select a new profile tab to configure a new rule.

Push event information to third-party software

Note

The application sends the event information in JSON format. For more information, *log in using your MyAxis account*, go to the *AXIS VAPIX Library* and select **AXIS License Plate Verifier**

With this feature you can integrate third-party software by pushing the event data through TCP or HTTP POST.

Before you start:

- The camera must be physically installed and connected to the network.
 - AXIS License Plate Verifier must be up and running on the camera.
1. Go to **Integration > Push events**.
 2. Select an empty profile
 3. In the **Protocol** drop-down list, select **HTTP POST**.
 4. In the **Server URL** field, type the server address and port in the following format: `127.0.0.1:8080`
 5. Type the user name and password.
 6. If you are using a proxy, turn the proxy on and type the hostname, username and password.
 7. In the **Device ID** field, type the name of the device or leave as is.
 8. Select which direction to trigger push events under **Push conditions**.
 9. Under **LPR Event types**, select one or more of the following options:
 - **New** means the first detection of a license plate.
 - **Update** is either a correction of a character on a previously detected license plate, or when a direction is detected as the plate moves and is tracked across the image.
 - **Lost** is the last tracked event of the license plate before it exits the image. It also contains the direction of the license plate.
 - **Conditional** pushes one event for one object when conditions are met.
 10. To reduce bandwidth when using HTTP POST, you can select **Do not to send images**.
 11. Enable **Event buffer** to buffer events if the server goes down, and send them when the server becomes available.
 12. To include the license plate crop in addition to the image if you've chosen under **Retention settings** select **Send two images**.
 13. To send the events in multipart format instead of base64, select **Multipart**.
 14. Click **Test** to test the integration with a virtual license plate.
 15. To turn on the feature, select **Activate**.

Note

To push events using HTTP POST, you can use an authorization header instead of a user name and password, go to **Auth-Header** , and add a path to an authentication API.

Send images of license plates to a server

With this feature you can push images of the license plates to a server through FTP.

Before you start:

- The camera must be physically installed and connected to the network.
 - AXIS License Plate Verifier must up and running on the camera.
1. Go to **Integration > Push events**.
 2. In the **Protocol** drop-down list, select **FTP**.
 3. In the **Server URL** field, type the server address in the following format: `ftp://10.21.65.77/LPR`.
 4. Type the username and password for the FTP server.
 5. Select the path and name modifiers for the filenames.
 6. In the **Device ID** field, type the name of the device. A folder with this name will be created for the images. Images are created using the following format: `timestamp_area of interest_direction_carID_license plate text_country.jpg`.
 7. Select which direction to trigger push events under **Push conditions**.
 8. Under **Event types**, select one or more of the following options:
 - **New** means the first detection of a license plate.
 - **Update** is either a correction of a character on a previously detected license plate, or when a direction is detected as the plate moves and is tracked across the image.
 - **Lost** is the last tracked event of the license plate before it exits the image. It also contains the direction of the license plate.
 - **Conditional** pushes one event for one object when conditions are met.

Note

Direction is only included in the filename when **Lost** or **Update** is selected.

9. Click **Test** to test the integration with a virtual license plate.
10. To turn on the feature, click **Activate**.

Note

Note that the image varies depending on what type of capture mode you have selected, see *Adjust the image capture settings, on page 12*.

Note

If push events fail, the app will resend up to the first 100 failed events to the server. When using FTP in push events to a Windows server, do not use %c for naming of images that gives you date and time. This is due to the fact that Windows does not accept the naming set by the function %c for date and time. Note that this is not an issue when using a Linux server.

Direct integration with 2N

This example describes direct integration with a 2N IP device.

Set up an account in your 2N device:

1. Go to **2N IP Verso**.
2. Go to **Services > HTTP API > Account 1**.
3. Select **Enable account**.
4. Select **Camera access**.

5. Select **License plate recognition**.
6. Copy the IP address.

In the AXIS License Plate Verifier app:

1. Go to **Integration > Direct integration**.
2. Select **2N IP Device**.
3. Add the IP address or URL to the 2N device.
4. Type your username and password.
5. Select **Connection type**.
6. Select what the **Barrier is used for**.
7. Click **Enable integration**.
8. Select the direction of the vehicles..
9. To turn on the feature, select **Activate**.

To check in the integration is working:

1. Go to **2N IP Verso**.
2. Go to **Status > Events**.

Integrate with Genetec Security Center

This example describes setting up a direct integration with Genetec Security Center.

In Genetec Security Center:

1. Go to **Overview**.
2. Make sure that **Database, Directory and License** are online. If they're not, run all Genetec and SQLEXPRESS services in Windows.
3. Go to **Genetec Config Tool > Plugins**.
4. Click **Add an entity**.
5. Go to **Plugin** and select **LPR plugin**.
6. Click **Next**.
7. Click **Next**.
8. Click **Next**.
9. Select the LPR plugin you've added and go to **Data sources** .

Under **ALPR reads API**:

10. Check **Enabled**.
11. In **Name**, type: **Plugin REST API**.
12. In **API path prefix**, type: **lpr**.
13. In **REST port**, select **443**.
14. In **WebSDK host**, type: **localhost**.
15. In **WebSDK port**, select **443**.
16. Check **Allow self signed certificates**.

Under **Security Center events data source**:

17. Check **Enabled**.
18. In **Name**, type **Security Center Lpr Events**.
19. In **Processing frequency**, select **5 sec** in the drop-down menu.

20. Go to the **Data sinks** tab.
21. Click **+**.
22. In **Type**, select **Database**.
23. **Select and configure the database:**
 - Check **Enabled**.
 - In **Source**, check **Plugin REST API and Native ALPR Events**.
 - In **Name**, type **Reads DB**.
 - In **Include**, check **Reads, Hits and Images**.
 - Go to the **Resources** tab.
 - Click **Delete the database** and then **Create a database**.

Create an API user:

24. Go to **Config Tool > User Management**.
25. Click **Add an entity**.
26. Select **User**.
27. Type a username and password. Leave the other fields unchanged.
28. Select the added user and go to the **Privileges** tab.
29. Check to allow everything under **Application privileges**.
30. Check to allow **Third-party ALPR reads API**.
31. Click **Apply**.

In the AXIS License Plate Verifier app:

1. Go to **Integration > Direct integration**.
2. Select **Genetec Security Center**.
3. In **URL/IP**, type your address according to this template: `https://server-address/api/V1/lpr/lpringestion/reads`.
4. Type in your Genetec username and password.
5. Select **Connection type**.
6. To turn on the feature, select **Activate**.
7. Click **Test** to test the integration with a virtual license plate.
8. If you've chosen **HTTPS**, go to the **Settings** tab.
9. Under **Security > HTTPS**.
10. Select **Self-signed**, or **CA-signed** depending on the settings in Genetec Security Center.

In Genetec Security Center:

1. Go to **Genetec Security desk**.
2. Under **Investigation**, click **Reads**.
3. Go to the **Reads** tab.
4. Filter the result to your needs.
5. Click **Generate report**.

Note

You can also read Genetec's documentation on integrating third party ALPR plugins. *You can do that here (requires registration).*

The web interface

To read about all the features and settings available in the web interface of devices with AXIS OS, go to *AXIS OS web interface help*.

Learn more

Capture modes

What capture mode to choose depends on the requirements for the frame rate and resolution of the specific surveillance setup. For specifications about available capture modes, see the product's datasheet at axis.com.

Remote focus and zoom

The remote focus and zoom functionality allows you to make focus and zoom adjustments to your camera from a computer. It is a convenient way to ensure that the scene's focus, viewing angle and resolution are optimized without having to visit the camera's installation location.

Privacy masks

A privacy mask is a user-defined area that covers a part of the monitored area. In the video stream, privacy masks appear either as blocks of solid color or with a mosaic pattern.

The privacy mask is relative to the pan, tilt, and zoom coordinates, so regardless of where you point the camera, the privacy mask covers the same place or object.

You'll see the privacy mask on all snapshots, recorded video, and live streams.

You can use the VAPIX® application programming interface (API) to hide the privacy masks.

Important

If you use multiple privacy masks it may affect the product's performance.

You can create several privacy masks. Each mask can have 3 to 10 anchor points.

Overlays

Overlays are superimposed over the video stream. They are used to provide extra information during recordings, such as a timestamp, or during product installation and configuration. You can add either text or an image.

Streaming and storage

Video compression formats

Decide which compression method to use based on your viewing requirements, and on the properties of your network. The available options are:

Motion JPEG

Motion JPEG, or MJPEG, is a digital video sequence that is made up of a series of individual JPEG images. These images are then displayed and updated at a rate sufficient to create a stream that shows constantly updated motion. For the viewer to perceive motion video the rate must be at least 16 image frames per second. Full motion video is perceived at 30 (NTSC) or 25 (PAL) frames per second.

The Motion JPEG stream uses considerable amounts of bandwidth, but provides excellent image quality and access to every image contained in the stream.

H.264 or MPEG-4 Part 10/AVC

Note

H.264 is a licensed technology. The Axis product includes one H.264 viewing client license. To install additional unlicensed copies of the client is prohibited. To purchase additional licenses, contact your Axis reseller.

H.264 can, without compromising image quality, reduce the size of a digital video file by more than 80% compared to the Motion JPEG format and by as much as 50% compared to older MPEG formats. This means that

less network bandwidth and storage space are required for a video file. Or seen another way, higher video quality can be achieved for a given bitrate.

H.265 or MPEG-H Part 2/HEVC

H.265 can, without compromising image quality, reduce the size of a digital video file by more than 25% compared to H.264.

Note

- H.265 is licensed technology. The Axis product includes one H.265 viewing client license. Installing additional unlicensed copies of the client is prohibited. To purchase additional licenses, contact your Axis reseller.
- Most web browsers don't support H.265 decoding and because of this the camera doesn't support it in its web interface. Instead you can use a video management system or application supporting H.265 decoding.

How do Image, Stream, and Stream profile settings relate to each other?

The **Image** tab contains camera settings that affect all video streams from the product. If you change something in this tab, it immediately affects all video streams and recordings.

The **Stream** tab contains settings for video streams. You get these settings if you request a video stream from the product and don't specify for example resolution, or frame rate. When you change the settings in the **Stream** tab, it doesn't affect ongoing streams, but it will take effect when you start a new stream.

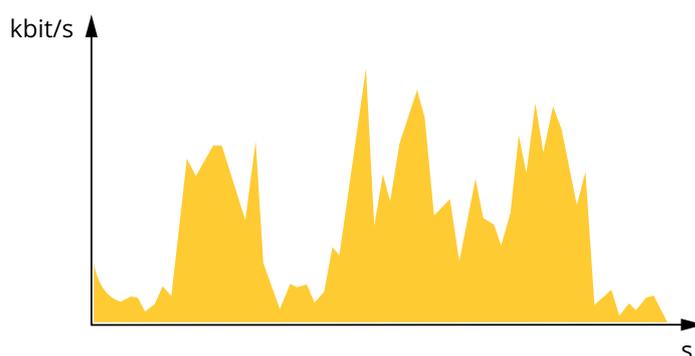
The **Stream profiles** settings override the settings from the **Stream** tab. If you request a stream with a specific stream profile, the stream contains the settings of that profile. If you request a stream without specifying a stream profile, or request a stream profile that doesn't exist in the product, the stream contains the settings from the **Stream** tab.

Bitrate control

Bitrate control helps you to manage the bandwidth consumption of your video stream.

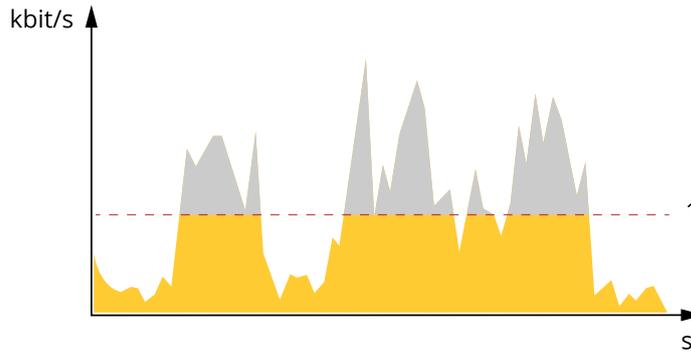
Variable bitrate (VBR)

Variable bitrate allows the bandwidth consumption to vary depending on the level of activity in the scene. The more activity, the more bandwidth you need. With variable bitrate you are guaranteed constant image quality, but you need to make sure you have storage margins.



Maximum bitrate (MBR)

Maximum bitrate lets you set a target bitrate to handle bitrate limitations in your system. You might see a decline in image quality or frame rate as the instantaneous bitrate is kept below the specified target bitrate. You can choose to prioritize either image quality or frame rate. We recommend that you configure the target bitrate to a higher value than the expected bitrate. This gives you a margin in case there is a high level of activity in the scene.

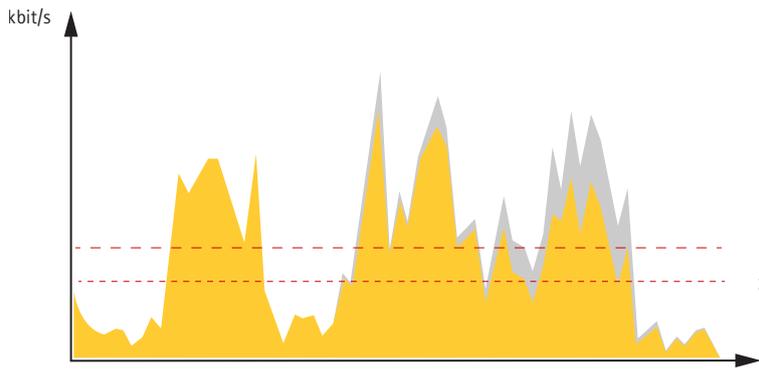


1 Target bitrate

Average bitrate (ABR)

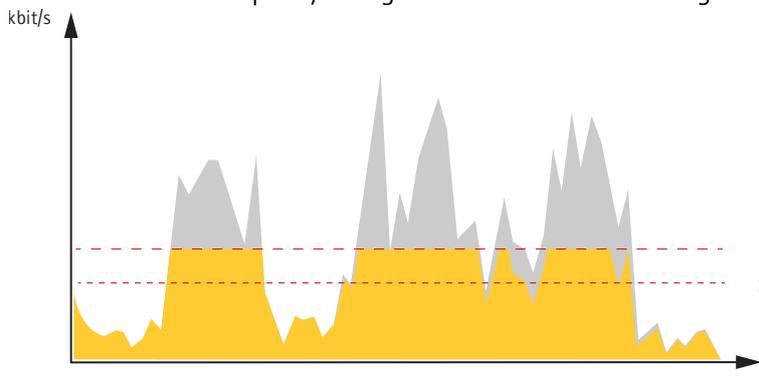
With average bitrate, the bitrate is automatically adjusted over a longer period of time. This is so you can meet the specified target and provide the best video quality based on your available storage. Bitrate is higher in scenes with a lot of activity, compared to static scenes. You are more likely to get better image quality when in scenes with a lot of activity if you use the average bitrate option. You can define the total storage required to store the video stream for a specified amount of time (retention time) when image quality is adjusted to meet the specified target bitrate. Specify the average bitrate settings in one of the following ways:

- To calculate the estimated storage need, set the target bitrate and the retention time.
- To calculate the average bitrate, based on available storage and required retention time, use the target bitrate calculator.



1 Target bitrate
2 Actual average bitrate

You can also turn on maximum bitrate and specify a target bitrate within the average bitrate option.



1 Target bitrate
2 Actual average bitrate

Edge-to-edge technology

Edge-to-edge is a technology that makes IP devices communicate directly with each other. It offers smart pairing functionality between, for example, Axis cameras and Axis audio or radar products.

Note

Make sure the paired devices run the same AXIS OS version.

For more information, see the white paper "Edge-to-edge technology" at whitepapers.axis.com/edge-to-edge-technology.

Speaker pairing

Edge-to-edge speaker pairing allows you to use a compatible Axis network speaker as if it's part of your camera. Once paired, the speaker's features are integrated in the camera's web interface and the network speaker acts as an audio out device where you can play audio clips and transmit sound through the camera.

The camera will identify itself to the VMS as a camera with integrated audio output and redirect any played audio to the speaker.

Microphone pairing

Edge-to-edge microphone pairing allows you to use a compatible Axis microphone as if it's part of your camera. Once paired, the microphone will take up sounds from the surrounding area and make it available as an audio input device, usable in media streams and recordings.

Radar pairing

With edge-to-edge radar pairing, you can connect your camera to a compatible Axis radar and benefit from integrated radar features, such as speed detection.

Radar pairing is a one-way setup where you pair one camera with one radar and use the camera to configure and maintain both devices. When paired, you can access the radar's settings and create rules for radar-specific events directly in the camera's web interface. The camera will also identify itself to a VMS as a camera with integrated radar functionality.

The camera has an allocated channel for the radar stream, and after pairing, the radar stream will be assigned automatically to this channel.

Additionally, the radar metadata is available through the camera's metadata producer channels after pairing. If the camera in itself has one channel, the radar metadata is available through the second channel.

Analytics and apps

With analytics and apps you can get more out of your Axis device. AXIS Camera Application Platform (ACAP) is an open platform that makes it possible for third parties to develop analytics and other apps for Axis devices. Apps can be preinstalled on the device, available for download for free, or for a license fee.

To find the user manuals for Axis analytics and apps, go to help.axis.com.

Note

- Several apps can run at the same time but some apps might not be compatible with each other. Certain combinations of apps might require too much processing power or memory resources when run in parallel. Verify that the apps work together before deployment.

AXIS Image Health Analytics

AXIS Image Health Analytics is an AI-based application that can be used to detect image degradations or tampering attempts. The application analyzes and learns the behavior of the scene to detect blurriness or underexposure in the image, or to detect an obstructed or redirected view. You can set up the application to

send events for any of these detections, and trigger actions through the camera's event system or third-party software.

To find out more about how the application works, see *AXIS Image Health Analytics user manual*.

Metadata visualization

Analytics metadata is available for moving objects in the scene. Supported object classes are visualized in the video stream through a bounding box surrounding the object, along with information about the object type and confidence level of the classification. To learn more about how to configure and consume analytics metadata, see *AXIS Scene Metadata integration guide*.

Cybersecurity

For product-specific information about cybersecurity, see the product's datasheet at axis.com.

For in-depth information about cybersecurity in AXIS OS, read the *AXIS OS Hardening guide*.

Axis security notification service

Axis provides a notification service with information about vulnerability and other security related matters for Axis devices. To receive notifications, you can subscribe at axis.com/security-notification-service.

Vulnerability management

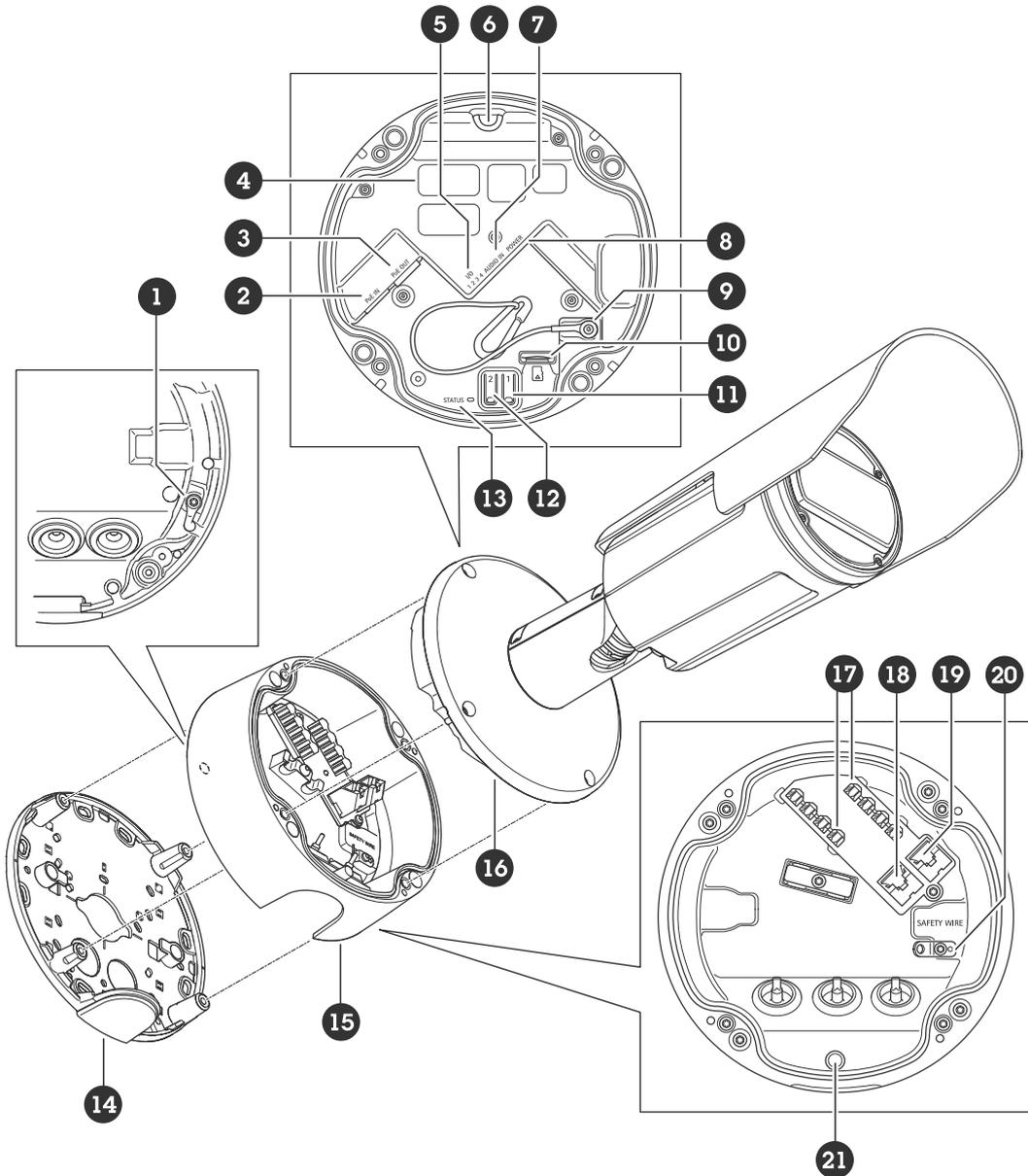
To minimize customers' risk of exposure, Axis, as a **Common Vulnerability and Exposures (CVE) numbering authority (CNA)**, follows industry standards to manage and respond to discovered vulnerabilities in our devices, software, and services. For more information about Axis vulnerability management policy, how to report vulnerabilities, already disclosed vulnerabilities, and corresponding security advisories, see axis.com/vulnerability-management.

Secure operation of Axis devices

Axis devices with factory default settings are pre-configured with secure default protection mechanisms. We recommend using more security configuration when installing the device. To learn more about Axis' approach to cybersecurity, including best practices, resources, and guidelines for securing your devices, go to axis.com/about-axis/cybersecurity.

Specifications

Product overview



- 1 Grounding screw
- 2 RJ45 network connector (PoE IN)
- 3 RJ45 network connector (PoE OUT)
- 4 Part number (P/N) and serial number (S/N)
- 5 I/O connector
- 6 Installation alignment mark
- 7 Audio connector
- 8 Power connector
- 9 Safety wire
- 10 microSD card slot
- 11 Control button
- 12 Function button
- 13 Status LED indicator
- 14 Mounting bracket
- 15 Connection lid
- 16 Camera unit
- 17 2x IDC network connectors (IDC IN, IDC OUT)

- 18 RJ45 network connector (PoE IN)
- 19 RJ45 network connector (PoE OUT)
- 20 Safety wire
- 21 Installation alignment mark

LED indicators

Status LED	Indication
Unlit	Connection and normal operation.
Green	Shows steady green for 10 seconds for normal operation after startup completed.
Amber	Steady during startup. Flashes during device software upgrade or reset to factory default.
Amber/Red	Flashes amber/red if network connection is unavailable or lost.

Status LED behavior and buzzer signal for leveling assistant

For information on the function button used for leveling the image, see *page 47*.

Color	Buzzer	Camera position
Fixed green	Continuous beep	Level
Flashing green	Fast beeps	Almost level
Flashing orange	Medium beeps	Not level
Flashing red	Slow beeps	Far from level

SD card slot

NOTICE

- Risk of damage to SD card. Don't use sharp tools, metal objects, or excessive force when inserting or removing the SD card. Use your fingers to insert and remove the card.
- Risk of data loss and corrupted recordings. Unmount the SD card from the device's web interface before removing it. Don't remove the SD card while the product is running.

This device supports microSD/microSDHC/microSDXC cards.

For SD card recommendations, see *axis.com*.

 microSD, microSDHC, and microSDXC Logos are trademarks of SD-3C LLC. microSD, microSDHC, microSDXC are trademarks or registered trademarks of SD-3C, LLC in the United States, other countries or both.

Buttons

Control button

The control button is used for:

- Resetting the product to factory default settings. See *Reset to factory default settings, on page 51*.
- Connecting to a one-click cloud connection (O3C) service over the internet. To connect, press and release the button, then wait for the status LED to flash green three times.

Function button

The function button:

- As leveling assistant – This function helps to ensure the image is level. Press the button for about 2 seconds to start the leveling assistant and press again to stop.

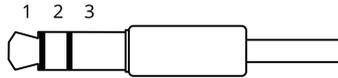
Connectors

Network connector

RJ45 Ethernet connector with Power over Ethernet Plus (PoE+).

Audio connector

- Audio in – 3.5 mm input for a mono microphone, or a line-in mono signal (left channel is used from a stereo signal).



Audio input

1 Tip	2 Ring	3 Sleeve
Unbalanced microphone (with or without electret power) or line-in	Electret power if selected	Ground
Balanced microphone (with or without phantom power) or line-in, "hot" signal	Balanced microphone (with or without phantom power) or line-in, "cold" signal	Ground

I/O connector

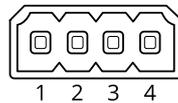
Use the I/O connector with external devices in combination with, for example, motion detection, event triggering, and alarm notifications. In addition to the 0 VDC reference point and power (12 V DC output), the I/O connector provides the interface to:

Digital input – For connecting devices that can toggle between an open and closed circuit, for example PIR sensors, door/window contacts, and glass break detectors.

Supervised input – Enables possibility to detect tampering on a digital input.

Digital output – For connecting external devices such as relays and LEDs. Connected devices can be activated by the VAPIX® Application Programming Interface, through an event or from the device's web interface.

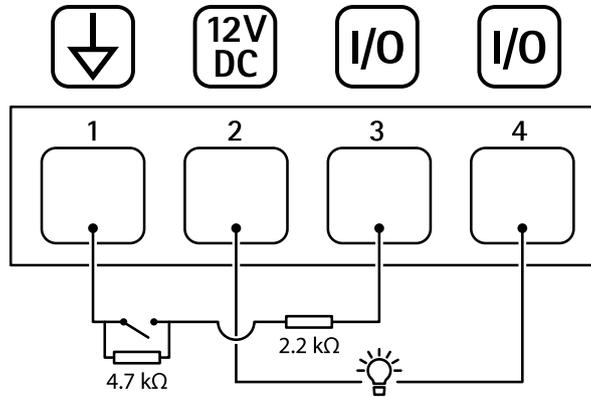
4-pin terminal block



Function	Pin	Notes	Specifications
DC ground	1		0 VDC
DC output	2	 Can be used to power auxiliary equipment. Note: This pin can only be used as power out.	12 VDC Max load = 50 mA
Configurable (Input or Output)	3–4	Digital input or Supervised input – Connect to pin 1 to activate, or leave floating (unconnected) to deactivate. To use supervised input, install end-of-line resistors. See connection diagram for information about how to connect the resistors.	0 to max 30 VDC

	<p>Digital output – Internally connected to pin 1 (DC ground) when active, and floating (unconnected) when inactive. If used with an inductive load, e.g., a relay, connect a diode in parallel with the load, to protect against voltage transients.</p>	<p>0 to max 30 VDC, open drain, 100 mA</p>
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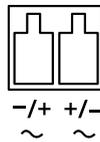
Example:



- 1 DC ground
- 2 DC output 12 V, max 50 mA
- 3 I/O configured as supervised input
- 4 I/O configured as output

Power connector

2-pin terminal block for AC/DC power input. Use a Safety Extra Low Voltage (SELV) compliant limited power source (LPS) with either a rated output power limited to ≤ 100 W or a rated output current limited to ≤ 5 A.



Clean your device

You can clean your device with lukewarm water and mild, nonabrasive soap.

NOTICE

- Harsh chemicals can damage the device. Don't use chemicals such as window cleaner or acetone to clean your device.
 - Don't spray detergent directly on the device. Instead, spray detergent on a nonabrasive cloth and use that to clean the device.
 - Avoid cleaning in direct sunlight or elevated temperatures, since this can cause stains.
1. Use a can of compressed air to remove dust and loose dirt from the device.
 2. If necessary, clean the device with a soft microfiber cloth dampened with lukewarm water and mild, nonabrasive soap.
 3. To avoid stains, dry the device with a clean, nonabrasive cloth.

Troubleshooting

Reset to factory default settings

▲ WARNING

⚠ Possibly hazardous optical radiation is emitted from this product. It can be harmful to the eyes. Do not stare at the operating lamp.

Important

Reset to factory default should be used with caution. A reset to factory default resets all settings, including the IP address, to the factory default values.

Note

The camera has been preconfigured with AXIS License Plate Verifier. If you reset to factory default, you will keep the license key. You will not need to reinstall the application after a factory reset.

To reset the product to the factory default settings:

1. Disconnect power from the product.
2. Press and hold the control button while reconnecting power. See *Product overview*, on page 46.
3. Keep the control button pressed for 15–30 seconds until the status LED indicator flashes amber.
4. Release the control button. The process is complete when the status LED indicator turns green. The product has been reset to the factory default settings. If no DHCP server is available on the network, the default IP address is 192.168.0.90.
5. Use the installation and management software tools to assign an IP address, set the password, and access the device.
The installation and management software tools are available from the support pages on axis.com/support.

You can also reset parameters to factory default through the device's webpage. Go to **Maintenance > Factory default** and click **Default**.

AXIS OS options

Axis offers device software management according to either the active track or the long-term support (LTS) tracks. Being on the active track means continuously getting access to all the latest product features, while the LTS tracks provide a fixed platform with periodic releases focused mainly on bug fixes and security updates.

Using AXIS OS from the active track is recommended if you want to access the newest features, or if you use Axis end-to-end system offerings. The LTS tracks are recommended if you use third-party integrations, which are not continuously validated against the latest active track. With LTS, the products can maintain cybersecurity without introducing any significant functional changes or affecting any existing integrations. For more detailed information about Axis device software strategy, go to axis.com/support/device-software.

Check the current AXIS OS version

AXIS OS determines the functionality of our devices. When you troubleshoot a problem, we recommend that you to start by checking the current AXIS OS version. The latest version might contain a correction that fixes your particular problem.

To check the current AXIS OS version:

1. Go to the device's web interface > **Status**.
2. Under **Device info**, see the AXIS OS version.

Upgrade AXIS OS

Important

- When you upgrade the device software, your preconfigured and customized settings are saved. Axis Communications AB can't guarantee that the settings are saved, even if the features are available in the new AXIS OS version.
- Starting from AXIS OS 12.6, you must install every LTS version between your device's current version and the target version. For example, if the currently installed device software version is AXIS OS 11.2, you have to install the LTS version AXIS OS 11.11 before you can upgrade the device to AXIS OS 12.6. For more information, see *AXIS OS Portal: Upgrade path*.
- Make sure the device remains connected to the power source throughout the upgrade process.

Note

- When you upgrade the device with the latest AXIS OS version in the active track, the product receives the latest functionality available. Always read the upgrade instructions and release notes available with each new release before you upgrade. To find the latest AXIS OS version and the release notes, go to axis.com/support/device-software.
1. Download the AXIS OS file to your computer, available free of charge at axis.com/support/device-software.
 2. Log in to the device as an administrator.
 3. Go to **Maintenance > AXIS OS upgrade** and click **Upgrade**.

When the upgrade has finished, the product restarts automatically.

You can use AXIS Device Manager to upgrade multiple devices at the same time. Find out more at axis.com/products/axis-device-manager.

Technical problems and possible solutions

Problems upgrading AXIS OS

AXIS OS upgrade failed

If the upgrade fails, the device reloads the previous version. The most common reason is that the wrong AXIS OS file has been uploaded. Check that the name of the AXIS OS file corresponds to your device and try again.

Problems after AXIS OS upgrade

If you experience problems after the upgrade, roll back to the previously installed version from the **Maintenance** page.

Problems setting the IP address

Can't set the IP address

- If the IP address intended for the device and the IP address of the computer used to access the device are located on different subnets, you can't set the IP address. Contact your network administrator to obtain an IP address.
- The IP address could be in use by another device. To check:
 1. Disconnect the Axis device from the network.
 2. In a Command/DOS window, type `ping` and the IP address of the device.
 3. If you receive: `Reply from <IP address>: bytes=32; time=10...` this means that the IP address might already be in use by another device on the network. Obtain a new IP address from the network administrator and reinstall the device.
 4. If you receive: `Request timed out`, this means that the IP address is available for use with the Axis device. Check all cabling and reinstall the device.
- There could be a possible IP address conflict with another device on the same subnet. The static IP address in the Axis device is used before the DHCP server sets a dynamic address. This means that if the same default static IP address is also used by another device, there could be problems accessing the device.

Problems accessing the device

Can't log in when accessing the device from a browser

When HTTPS is enabled, make sure that you use the correct protocol (HTTP or HTTPS) when you try to log in. You might need to manually type `http` or `https` in the browser's address field.

If you've lost the password for the root account, you must reset the device to the factory default settings. For instructions, see *Reset to factory default settings, on page 51*.

The IP address has been changed by DHCP

IP addresses obtained from a DHCP server are dynamic and could change. If the IP address has been changed, use AXIS IP Utility or AXIS Device Manager to locate the device on the network. Identify the device using its model or serial number, or by the DNS name (if the name has been configured).

If required, you can assign a static IP address manually. For instructions, go to axis.com/support.

Certificate error when using IEEE 802.1X

For authentication to work properly, the date and time settings in the Axis device must be synchronized with an NTP server. Go to **System > Date and time**.

The browser isn't supported

For a list of recommended browsers, see *Browser support, on page 6*.

Can't access the device externally

To access the device externally, we recommend you to use one of the following applications for Windows®:

- AXIS Camera Station Edge: free of charge, ideal for small systems with basic surveillance needs.
- AXIS Camera Station Pro: 90-day trial version free of charge, ideal for small to mid-size systems.

For instructions and download, go to axis.com/vms.

Problems with streaming

Multicast H.264 only accessible by local clients

Check if your router supports multicasting, or if you need to configure the router settings between the client and the device. You might need to increase the TTL (Time To Live) value.

No multicast H.264 displayed in the client

Check with your network administrator that the multicast addresses used by the Axis device are valid for your network.

Check with your network administrator to see if there is a firewall that prevents viewing.

Poor rendering of H.264 images

Ensure that your graphics card uses the latest driver. You can usually download the latest drivers from the manufacturer's website.

Color saturation is different in H.264 and Motion JPEG

Modify the settings for your graphics adapter. Check the adapter's documentation for more information.

Lower frame rate than expected

- See *Performance considerations, on page 55*.
- Reduce the number of applications running on the client computer.
- Limit the number of simultaneous viewers.
- Check with the network administrator that there is enough bandwidth available.
- Lower the image resolution.

Can't select H.265 encoding in live view

Web browsers don't support H.265 decoding. Use a video management system or application that supports H.265 decoding.

Problems with MQTT

Can't connect over port 8883 with MQTT over SSL

The firewall blocks traffic that uses port 8883 since it's regarded insecure.

In some cases the server/broker might not provide a specific port for MQTT communication. It might still be possible to use MQTT over a port normally used for HTTP/HTTPS traffic.

- If the server/broker supports WebSocket/WebSocket Secure (WS/WSS), typically on port 443, use this protocol instead. Check with the server/broker provider to see if WS/WSS is supported and which port and basepath to use.
- If the server/broker supports ALPN, the use of MQTT can be negotiated over an open port, such as 443. Check with your server/broker provider to see if ALPN is supported and which ALPN protocol and port to use.

Problems with operating the device

Front heater and wiper aren't working

If the front heater or wiper are not turning on, confirm that the top cover is properly fastened to the bottom of the housing unit.

If you can't find what you're looking for here, try the troubleshooting section at axis.com/support.

Unknown vehicles are marked as accepted

If the application lets in vehicles with license plates that are not in the allowlist, one probable reason is that the comparison allows a deviation of one character.

For example, if AXI S1234 is in the allowlist the application accepts AXI SI234.

Similarly, if AXIS 1234 is in the allowlist the application accepts AXI 1234.

Go to *Additional settings*, on page 31 to set the characters allowed.

The connection between the application and controller or relay module doesn't work

Make sure the controller, or relay module, allows data traffic through HTTP. To find out how to change this setting, go to the user manual for the corresponding device.

Problems with radar pairing

The radar stream appears on top of the video stream after radar pairing.	Make sure the camera's image isn't rotated to 180°. Go to Video > Installation > Rotation and set the orientation to 0°.
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Performance considerations

When you set up your system, it's important to consider how different settings and situations affect performance. Some factors affect bandwidth (bitrate), others affect frame rate, and some affect both.

The most important factors to consider:

- High image resolution or lower compression levels result in images containing more data which in turn affects the bandwidth.
- Rotating the image in the GUI can increase the product's CPU load.
- Access by large numbers of Motion JPEG clients or unicast H.264/H.265/AV1 clients affects the bandwidth.
- Simultaneous viewing of different streams (resolution, compression) by different clients affects both frame rate and bandwidth.
Use identical streams wherever possible to maintain a high frame rate. Stream profiles can be used to ensure that streams are identical.
- Accessing video streams with different codecs simultaneously affects both frame rate and bandwidth. For optimal performance, use streams with the same codec.
- Heavy usage of event settings affects the product's CPU load which in turn affects the frame rate.
- Using HTTPS may reduce frame rate, in particular if streaming Motion JPEG.
- Heavy network utilization due to poor infrastructure affects the bandwidth.
- Viewing on poorly performing client computers lowers perceived performance and affects frame rate.

- Running multiple AXIS Camera Application Platform (ACAP) applications simultaneously may affect the frame rate and the general performance.

Contact support

If you need more help, go to axis.com/support.

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