

EN54 FireProtect (Smoke/Sounder) Jeweller user manual

Updated March 23, 2026

Revision 4



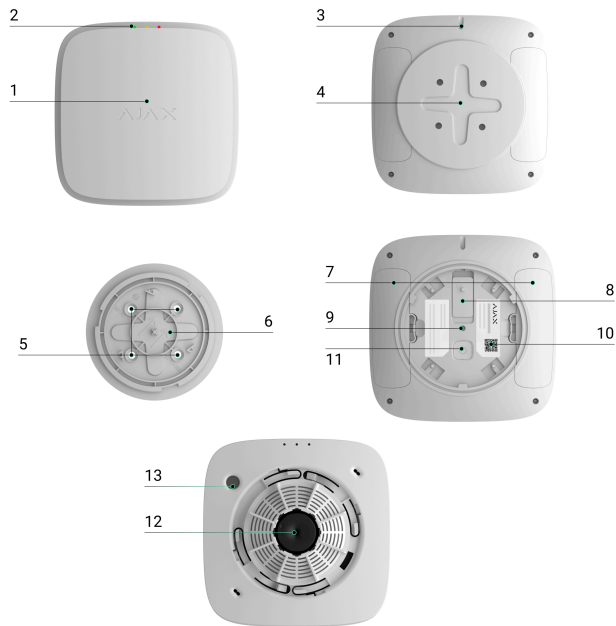
EN54 FireProtect (Smoke/Sounder) Jeweller is a wireless addressable point smoke detector combined with a fire alarm sounder. The device complies with EN 54 requirements and ensures smoke detection and audible alarm annunciation when a fire alarm is triggered at the facility.

EN54 FireProtect (Smoke/Sounder) Jeweller operates as part of an Ajax system and communicates with control and indicating equipment (CIE) via secure Jeweller radio protocol. The communication range with the CIE is up to 1,700 m in an open space.



[Buy EN54 FireProtect \(Smoke/Sounder\) Jeweller](#)

Functional elements



1. Front panel of the detector.
2. LED indicators: green, yellow, and red.
3. Hole for a special tool used to unlock the lock.
4. SmartBracket mounting panel. To remove the panel, insert the special tool into the corresponding hole and turn SmartBracket counterclockwise. If the device is unlocked, simply turn SmartBracket counterclockwise.
5. Fixing points to attach SmartBracket to the surface.
6. ↑↑ sign on SmartBracket. You can use it as a reference point to align the device properly when attaching the mounting panel to the surface.
7. Battery compartment lids. To replace the batteries, open the lids.
8. Lock to secure the device on SmartBracket (optionally).
9. Tamper button. It triggers in case of an attempt to remove the device from the mounting panel.
10. QR code with the device ID. It is used to add the device to the CIE.
11. Power button.

12. Smoke chamber lid.

13. Sounder.



The smoke chamber lid can be removed only after the enclosure is fully disassembled. The system identifies this action as a fault and responds accordingly. Both users and the monitoring company receive a fault notification.

Compatible CIEs and range extenders

The device requires the Ajax CIE with an up-to-date [OS Malevich](#) version.



[Check device compatibility](#)

Operating principle

EN54 FireProtect (Smoke/Sounder) Jeweller is a wireless fire detector with a built-in [smoke sensor](#) and sounder, designed for indoor installation. The detector is always active and responds to a fire 24/7, regardless of the system's security mode.

The **sounder** emits a high-volume alarm signal using a temporal pattern compliant with EN 54-3.

Audible alerts are synchronized across all devices in the system to ensure simultaneous activation. EN54 FireProtect (Smoke/Sounder) Jeweller is powered by pre-installed batteries and does not require an external power supply. The device monitors its operational state and informs the system of faults if any occur.

EN54 FireProtect (Smoke/Sounder) Jeweller is protected by two tamper buttons: one to detect the device removal from the SmartBracket mounting panel, and the other to signal removal of the smoke chamber lid located under the front panel of the detector.

Smoke sensor

EN54 FireProtect (Smoke/Sounder) Jeweller detects smoke using a dual-spectrum optical sensor. Inside the smoke chamber, blue and infrared LEDs emit light at different wavelengths. This technology enables the detector to assess the size of volatile particles inside the chamber and identify the presence of smoke.

The smoke chamber is protected from dust, dirt, and insects. Even if some dust settles inside, it does not compromise fire detection. The optical system is designed to prevent non-volatile particles from getting within the field of both blue and infrared LEDs at the same time, reducing the risk of false alarms.

The HazeFlow 2 software algorithm also helps prevent false alarms. When smoke is detected, the algorithm additionally processes the data received from the detector and confirms the alarm.

Jeweller data transfer protocols

Jeweller is a wireless data transfer protocol that provides fast and reliable two-way communication between the CIE and devices. The device uses Jeweller to transmit commands, alarms, and events.



[Learn more](#)

Sending events to the monitoring station

An Ajax system can transmit alarms to both the [Ajax PRO Desktop](#) app and the monitoring station in the formats of **SurGard (Contact ID)**, **SIA (DC-09)**, **ADEMCO 685**, and [other protocols](#).

The system with EN54 FireProtect (Smoke/Sounder) Jeweller installed can transmit the following events:

1. Fire alarm / recovery after the alarm.

2. Smoke sensor hardware fault/recovery.
3. Smoke chamber is dirty/clean.
4. Sounder hardware fault/recovery.
5. Battery charge is low/OK.
6. Tamper alarm/recovery.
7. Loss/recovery of communication between EN54 FireProtect (Smoke/Sounder) Jeweller and the CIE.



The system allows disabling fault indication and notifications of Jeweller connection loss for EN54 devices used in mobile environments, such as fire engines.

[How to disable Jeweller connection loss notifications for EN54 devices](#)

When an alarm is received, the operator at the monitoring station knows precisely what happened and where. The addressability of Ajax devices allows sending events to Ajax PRO Desktop or the monitoring software, including the device type, its name, fire zone, virtual room, and location description. Please note that the list of transmitted parameters may vary depending on the monitoring software and the selected communication protocol for the monitoring station.



You can find the device ID and zone number in the device [states](#)

Selecting the installation site



The detector is designed for indoor installation only.



Follow your local fire safety regulations when selecting the device installation site.

When choosing where to place the detector, consider the parameters that affect its operation:

- Jeweller signal strength.
- Distance between the device and the CIE.
- Presence of obstacles to radio signal or sound transmission.

Consider the placement recommendations when developing a system project. Only specialists may design and install Ajax systems. A list of recommended partners is [available here](#).

Signal strength

The signal strength is determined by the number of undelivered or corrupted data packages over a certain period of time. The icon  in the **Devices**  tab in Ajax apps indicates the signal strength:

- **three bars** – excellent signal strength;
- **two bars** – good signal strength;
- **one bar** – low signal strength, stable operation is not guaranteed;
- **crossed-out icon** – no signal.

Note that if the signal strength is excellent, the device can automatically adjust the radio transmission power to reduce power consumption and radio interference.



Run the Jeweller signal strength test before final installation. The test checks the signal strength at the device's maximum transmission power. **To comply with EN 54 requirements, the signal strength between the device and the CIE must be at least two bars.**

If the test shows the signal strength of one or zero bars, we do not guarantee the device will operate stably. Consider relocating the detector, as adjusting its position even by 20 cm or rotating it relative to the CIE can significantly improve the signal strength. If the signal remains poor or unstable after relocation, consider using an [Ajax radio signal range extender](#)

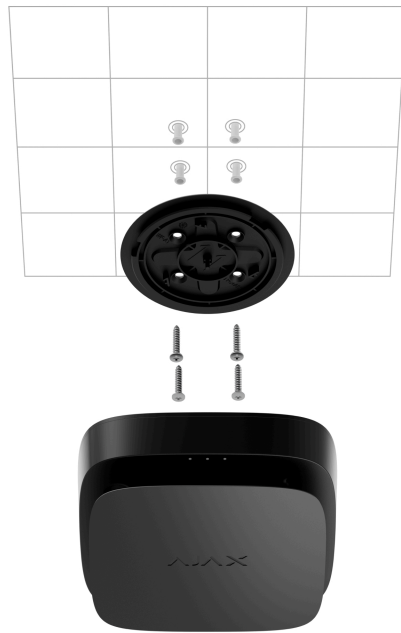
Refer to the [Functionality testing](#) section to learn how to run the Jeweller signal strength test.

Where not to install the device

- Outdoors. This can lead to the detector failure.
- Indoors, where the temperature and humidity are outside the permissible limits. This may damage the detector.
- In places with fast air circulation. For example, near fans, vents, open windows, or doors. This may interfere with fire detection.
- In the corners of the room. This may interfere with fire detection.
- In premises where the generation of gases, vapors, or smoke is part of normal operations. For example, a garage, where exhaust fumes may trigger a false alarm. For such environments, we recommend using a detector with a heat sensor.
- In very dusty areas or places with an abundance of insects. Dust, insects, and other contaminants may settle on the smoke chamber lid and prevent fire detection.
- Near lighting fixtures, decorations, and other interior items that may interfere with the circulation of air on the premises. This may interfere with fire detection.

- In places with low or unstable Jeweller signal strength. This may result in losing connection with the CIE.
- Closer than 1 m to the CIE or radio signal range extender.

Installation



Before installing EN54 FireProtect (Smoke/Sounder) Jeweller, ensure that you have selected the optimal location that complies with the requirements of this manual.

Do not remove the smoke chamber lid during installation. It can only be removed when the enclosure is fully disassembled. The system identifies this action as a fault and responds accordingly.

Only a professional must install this device.

To install the device:

1. Remove the SmartBracket mounting panel from the device. To remove the panel, turn it counterclockwise.




Use the device only with FP.54H.J-000-EU, FP.54HA.J-000-EU, FP.54S.J-000-EU, or FP.54SA.J-000-EU SmartBracket mounting panels.

2. Secure the SmartBracket panel to a surface using double-sided adhesive tape or other temporary fasteners. The ↑↑ sign on SmartBracket is for informational purposes only. It can help you align the device properly.



Use double-sided adhesive tape for temporary fixation only. The device secured by the adhesive tape can detach from the surface at any time, which may result in damage if it falls.

3. Add EN54 FireProtect (Smoke/Sounder) Jeweller to the CIE.
4. Place the device on the SmartBracket mounting panel.
5. Run the device functionality testing.
6. Remove the device from the mounting panel.
7. Attach the SmartBracket panel to the surface using the bundled screws for all fixing points. When using other fasteners, make sure they do not damage or deform the mounting panel.
8. To additionally secure the device on SmartBracket with the lock, move the locking mechanism to  position. In this case, you will need to insert a special tool into the corresponding hole to remove the mounting panel.



9. Place the device on the SmartBracket mounting panel.
10. Adjust the device position if necessary. The SmartBracket mounting panel allows the detector to be rotated up to 90°.

Adding to the system



The CIE and the device must operate at the same radio frequency; otherwise, they are incompatible. The radio frequency range of the device may vary based on the region. We recommend purchasing and using Ajax devices in the same region. You can verify the range of operating radio frequencies with the [technical support service](#).

Before adding the device

1. Install an [Ajax app](#).
2. Log in to your [account](#) or create a new one.
3. Select a [space](#) or create a new one.
4. Add at least one [virtual room](#).
5. Add a [compatible CIE](#) to the space. Ensure the CIE is switched on and has internet access via Ethernet, Wi-Fi, and/or mobile network.
6. Check the states in the Ajax app to ensure the space is disarmed and the CIE is not starting an update.




Only a PRO or a space admin with the rights to configure the system can add the device to the CIE.



Types of accounts and their rights

Adding to the CIE

1. Open an Ajax app. Select a space to which you want to add the device.
2. Go to the **Devices**  tab and tap **Add device**.
3. Scan the QR code or enter the device ID manually. A QR code with the ID is placed on the device under the SmartBracket mounting panel. Also, it is duplicated on the device packaging.



4. Assign a name to the device.
5. Select a fire zone and a virtual room.
6. If necessary, specify the device location in the **Location** field.
7. Select **Add device**, and the countdown will begin.
8. Switch on the device by holding the power button for 3 seconds.



Once added to the CIE, the device will appear in the list of CIE devices in the Ajax app. The update frequency for device states in the list depends on the **Jeweller** settings and is 36 seconds by default.

If the connection fails, try again in 5 seconds. If the maximum number of devices has already been added to the CIE, you will receive an error notification when you try to add more.





EN54 FireProtect (Smoke/Sounder) Jeweller works with only one CIE. When added to a new CIE, the device stops sending events to the old one. After the device is added to a new CIE, it will not be automatically removed from the device list of the old CIE. This must be done through the Ajax app.

Functionality testing

An Ajax system provides several types of tests to help select the correct installation place for the devices. For EN54 FireProtect (Smoke/Sounder) Jeweller, the following tests are available:

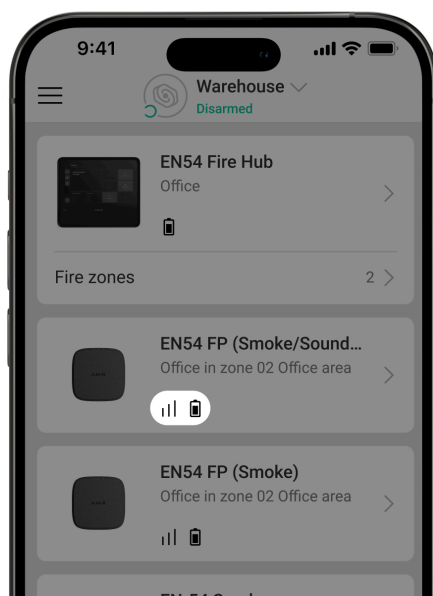
- **Jeweller signal strength test** – to determine the signal strength and stability between the CIE (or the radio signal range extender) and the device via the wireless Jeweller data transfer protocol at the device installation site.
- **Alarm annunciation test** – to check the audible alert and ensure that the fire alarm signal is clearly heard throughout the premises.


To run the test:

1. Open an Ajax app. Select a space with the added device.
2. Go to the **Devices**  tab.
3. Select **EN54 FireProtect (Smoke/Sounder) Jeweller**.
4. Go to **Settings** .
5. Select **Jeweller signal strength test** or **Alarm annunciation test**.












Additionally, the **Alarm annunciation test** can be run on the CIE touch screen.

Icons

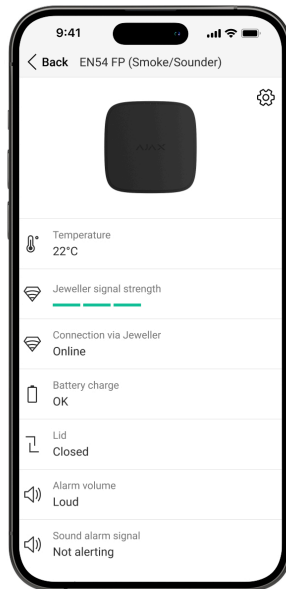


Icons in an Ajax app display some of the EN54 FireProtect (Smoke/Sounder) Jeweller states. You can check the icons in the **Devices**  tab.

Icon	Meaning
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	<p>Jeweller signal strength. It displays the signal strength between the CIE or the range extender and the device. The recommended value is 3 bars.</p> <p>Learn more</p>
	<p>Battery charge level of the device.</p> <p>Learn more</p>
	<p>The device operates via the radio signal range extender.</p> <p>Learn more</p>
	<p>The device has detected signs of smoke.</p>
	<p>The device is emitting a sound.</p>
	<p>The device is silenced.</p>
	<p>EN54 FireProtect (Smoke/Sounder) Jeweller has a fault. The list of faults is available in the device states.</p>
	<p>The device test is in progress.</p>
	<p>EN54 FireProtect (Smoke/Sounder) Jeweller is completely or partially disabled.</p>
	<p>The device has lost connection with the CIE, or the CIE has lost connection with the Ajax Cloud server.</p>
	<p>The device has not been transferred to the new CIE.</p> <p>Learn more</p>

States



The states include information about the device and its operating parameters. You can find the states of EN54 FireProtect (Smoke/Sounder) Jeweller in Ajax apps:

1. Go to the **Devices**  tab.
2. Select **EN54 FireProtect (Smoke/Sounder) Jeweller** from the list.

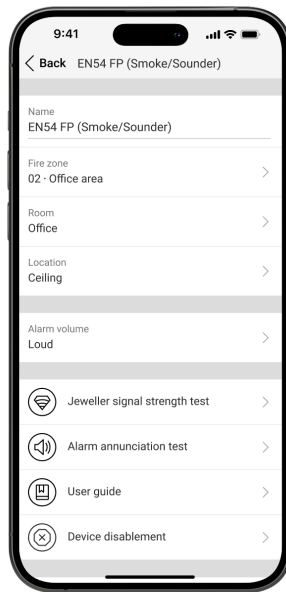
Parameter	Meaning
Alarm	<p>The device has detected a fire.</p> <p>Tapping on  opens detailed information about the fire location.</p> <p>The field is displayed only if a fire is detected.</p>
Data import	<p>Displays the error when the data is being transferred to the new CIE:</p> <ul style="list-style-type: none"> • Failed – the device has not been transferred to the new CIE. <p><u>Learn more</u></p>

<p>Fault</p>	<p>The device has faults.</p> <p>Tapping on ⓘ opens the list of EN54 FireProtect (Smoke/Sounder) Jeweller faults.</p> <p>The field is displayed only if a fault is detected.</p>
<p>Disabled</p>	<p>The device or some of its functions are disabled. It does not respond to the alarm or notify users and the monitoring station. Tapping on ⓘ opens a list of disabled device functions.</p> <p>The field is displayed only if the device is completely or partially disabled.</p>
<p>Temperature</p>	<p>The device temperature. It is measured by EN54 FireProtect (Smoke/Sounder) Jeweller and changes depending on the ambient temperature.</p>
<p>Jeweller signal strength</p>	<p>Jeweller signal strength between the device and the CIE (or the radio signal range extender). The recommended value is 3 bars.</p> <p>Jeweller is a protocol for transmitting commands, events, and alarms.</p>
<p>Connection via Jeweller</p>	<p>The connection state via the Jeweller channel between the device and the CIE (or the range extender):</p> <ul style="list-style-type: none"> • Online – the device is connected to the CIE (or the range extender). Normal state. • Offline – the device is not connected to the CIE (or the range extender). Check the device connection.



<p><Range extender name></p>	<p>The connection state between the device and the <u>radio signal range extender</u>.</p> <ul style="list-style-type: none">• Online – the device is connected to the range extender.• Offline – the device is not connected to the range extender. <p>The field is displayed if the device operates via the radio signal range extender.</p>
<p>Battery charge</p>	<p>The device's battery charge level. Three states are available:</p> <ul style="list-style-type: none">• OK.• Battery low.• Error. <p>When the batteries need to be replaced, users and the monitoring company will receive appropriate notifications.</p> <p><u>Learn more</u></p>
<p>Lid</p>	<p>The state of the device's tamper button that responds to the detachment or opening of the device enclosure:</p> <ul style="list-style-type: none">• Open – the device is removed from the SmartBracket mounting panel or its integrity is compromised. Check the device mounting.• Closed – the device is installed on the SmartBracket mounting panel. The integrity of the device enclosure and the mounting panel is not compromised. Normal state. <p><u>Learn more</u></p>

Alarm volume	<p>Volume level in case of alarm:</p> <ul style="list-style-type: none"> • Quiet • Loud • Very loud
Sound alarm signal	<p>State of the device's audible alert:</p> <ul style="list-style-type: none"> • Not alerting – the system is not in alarm mode. The device is not emitting a sound. • Alerting – the system is in alarm mode. The device is emitting a sound. • Silenced – the system is in alarm mode. The device is silenced.
Smoke	<p>State of the smoke detection by the device:</p> <ul style="list-style-type: none"> • Clear – No signs of smoke detected. The device is operating normally. • Detected – the device has detected signs of smoke. The system is in fire alarm mode.
Fire zone	The number and name of the fire zone to which the device is assigned.
Room	The name of the room to which the device is assigned.
Location	The detailed device location description.
Firmware	Device firmware version.
Device ID	The EN54 FireProtect (Smoke/Sounder) Jeweller ID. It is also available on the QR code on the device enclosure and on its packaging.
Device No.	Number of the device loop (zone).

Settings



To change EN54 FireProtect (Smoke/Sounder) Jeweller settings, in an Ajax app:

1. Go to the **Devices**  tab.
2. Select **EN54 FireProtect (Smoke/Sounder) Jeweller** from the list.
3. Go to **Settings** .
4. Set the required settings.
5. Tap **Back** to save the new settings.

Settings	Meaning
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<p>Name</p>	<p>Name of the device. It is displayed in the list of CIE devices, SMS text, and notifications in the event feed.</p> <p>To change the device name, tap on the text field.</p> <p>The name can contain up to 24 Latin characters or up to 12 Cyrillic characters.</p>
<p>Fire zone</p>	<p>Selecting the fire zone to which EN54 FireProtect (Smoke/Sounder) Jeweller is assigned.</p> <p>The fire zone is displayed in the text of SMS and notifications in the event feed.</p>
<p>Room</p>	<p>Selecting the virtual room to which EN54 FireProtect (Smoke/Sounder) Jeweller is assigned.</p> <p>The room name is displayed in the text of SMS and notifications in the event feed.</p>
<p>Location</p>	<p>The detailed location of the device. It is displayed next to the room in the event feed notifications.</p> <p>The location text can contain up to 24 Latin or Cyrillic characters.</p>
<p>Alarm volume</p>	<p>The device responds to system alarms with the selected volume level:</p> <ul style="list-style-type: none"> • Quiet • Loud • Very loud
<p>Jeweller signal strength test</p>	<p>Switching the device to the Jeweller signal strength test mode.</p>

	<p>The test allows you to check the signal strength between the CIE (or the radio signal range extender) and the device via the wireless Jeweller data transfer protocol to select the optimal installation site.</p> <p>Learn more</p>
Alarm annunciation test	<p>Switching the device to the Alarm annunciation test mode.</p> <p>The test allows you to check audible alerts and ensure that fire alarm signals are clearly heard throughout the premises.</p> <p>The test lasts up to 10 minutes and can be stopped manually at any time.</p>
User guide	<p>Opening the EN54 FireProtect (Smoke/Sounder) Jeweller user manual in an Ajax app.</p>
Device disablement	<p>The option allows for deactivating the device or its specific functions.</p> <p>The device remains within the system, but will no longer detect signs of fire or raise an alarm.</p>
Delete device	<p>Unpairing the device, disconnecting it from the CIE, and deleting its settings.</p>

Indication


The EN54 FireProtect (Smoke/Sounder) Jeweller sounder and LED indicators inform about alarms, faults, and other device states.








Event	Sound indication	System LED indication	Note
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Alarm.	The sounder beeps according to the selected tone type.	The red LED lights up for 1 second, then goes off for 1 second constantly.	The device stops alarming as soon as the fire alarm is reset. Also, you can mute the alarm by tapping the Silence alarm button on the CIE touch screen or in an Ajax app.
Turning on the device.	No.	The green, yellow, and red LEDs light up in turn and then go off.	Press the power button until the green LED lights up.
Turning off the device.	No.	The green, yellow, and red LEDs light up simultaneously and then go off in reverse order.	Press the power button until the red LED goes off.
Adding to the CIE is in progress.	No.	The green LED is permanently on.	The indication turns off after the detector is added to the CIE.
The device has been removed from the CIE.	No.	The green LED flashes 6 times in a row.	The indication turns on when the detector receives information that it has been removed from the CIE.
The battery is completely discharged.	No.	The yellow LED constantly flashes.	The battery needs to be replaced.
Turning off the device when the battery is completely discharged.	No.	The green, yellow, and red LEDs light up simultaneously and then go off in reverse order.	The battery needs to be replaced.
Tamper alarm. The device has been removed from the	No.	The yellow LED lights up for 1 second.	








SmartBracket mounting panel.			
The device is installed on the SmartBracket mounting panel.	No.	The green LED lights up for 1 second.	
Performing the Jeweller signal strength test.	No.	<p>The indication depends on the signal strength:</p> <ul style="list-style-type: none"> • 3 bars – the green LED lights up continuously; • 2 bars – the yellow LED lights up continuously; • 1 bar – the red LED lights up continuously; • 0 bar – the red LED flashes rapidly. 	








Sound patterns




Tone	Tone type	Tone description
1		970 Hz


2		800 Hz / 970 Hz @ 2 Hz
3		800–970 Hz @ 1 Hz
4		970 Hz, 1 s OFF / 1 s ON
5		970 Hz, 0.5 s / 630 Hz, 0.5 s
6		554 Hz, 0.1 s / 440 Hz, 0.4 s (AFNOR NF S 32 001)
7		500–1200 Hz, 3.5 s / 0.5 s OFF (NEN 2575:2000 Dutch Slow Whoop)
8		420 Hz, 0.6 s ON / 0.6 s OFF (Australia AS1670 Alert tone)

9		1000–2500 Hz, 0.5 s / 0.5 s OFF × 3 / 1.5 s OFF (AS1670 Evacuation)
10		550 Hz / 440 Hz @ 0.5 Hz
11		970 Hz, 0.5 s ON / 0.5 s OFF × 3 / 1.5 s OFF (ISO 8201)
12		2850 Hz, 0.5 s ON / 0.5 s OFF × 3 / 1.5 s OFF (ISO 8201)
13		1200–500 Hz @ 1 Hz (DIN 33 404)
14		400 Hz
15		550 Hz, 0.7 s / 1000 Hz, 0.33 s

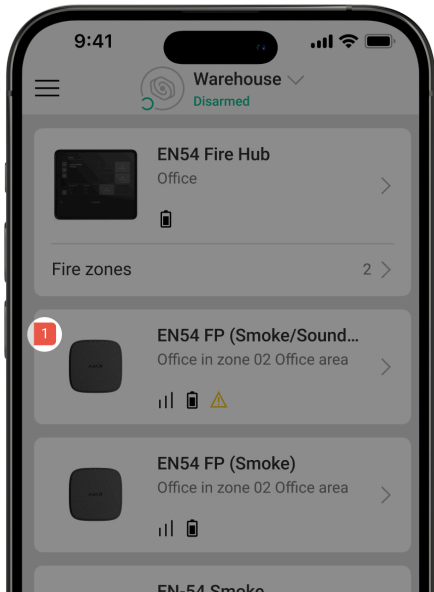
16		1500–2700 Hz @ 3 Hz
17		750 Hz
18		2400 Hz
19		660 Hz
20		660 Hz, 1.8 s ON / 1.8 s OFF
21		660 Hz, 0.15 s ON / 0.15 s OFF
22		510 Hz, 0.25 s / 610 Hz, 0.25 s

23		800 Hz / 1000 Hz, 0.5 s each (1 Hz)
24		250–1200 Hz @ 12 Hz
25		500–1200 Hz @ 0.33 Hz
26		2400–2900 Hz @ 9 Hz
27		2400–2900 Hz @ 3 Hz
28		500–1200 Hz, 0.5 s / 0.5 s OFF × 3 / 1.5 s OFF (AS1670 Evacuation)
29		800–970 Hz @ 9 Hz

30		800–970 Hz @ 3 Hz
31		800 Hz, 0.25 s ON / 1 s OFF
32		500–1200 Hz, 3.75 s / 0.25 s OFF (AS2220)

 The sound patterns 1, 2, 3, 6, 7, and 13 meet the requirements of EN 54-3.

Faults



When an EN54 FireProtect (Smoke/Sounder) Jeweller fault is detected, an Ajax app displays a fault counter on the device icon. All faults are indicated in the device states. Fields with faults are highlighted in yellow. Also, faults are displayed in the **Control** tab of the CIE display. More details about the fault can be found in the **Event center** or **Fire zones** tabs of the CIE.

A fault of the EN54 FireProtect (Smoke/Sounder) Jeweller is displayed if:

- The device is removed from the SmartBracket mounting panel, or its integrity is compromised (a tamper button has been triggered).
- There is no connection with the CIE or radio signal range extender via Jeweller.
- The device battery is low.
- The device has a hardware fault (failure of one or more device components).

An admin or a user with **access level 2** can disable the notifications of Jeweller connection loss. The **Deactivate notifications** feature allows disabling fault indication and notifications of Jeweller connection loss for EN54 devices used in mobile environments, such as fire engines.



[How to disable Jeweller connection loss notifications for EN54 devices](#)

Maintenance

Regularly check the device operation. Clean the device enclosure from dust, cobwebs, and other contaminants as they emerge. Use soft, dry wipes suitable for equipment maintenance. Do not use substances that contain alcohol, acetone, gasoline, and other active solvents to clean the device.

The smoke chamber is protected from dust and insects, so it requires no cleaning.

The pre-installed batteries provide up to 6 years of autonomous operation with the standard Jeweller settings (the polling interval is 36 seconds). If the batteries are low, the system will send an appropriate notification.

We recommend replacing the batteries immediately upon receiving the notification. It is advisable to use **Huiderui CR123A, 3 V, 1,600 mAh, LiMnO₂** batteries.



Ensure the batteries are installed with the correct polarity. The polarity is marked inside the enclosure. After replacing the batteries, run the [functionality test](#) to ensure the device operates properly.



[How long Ajax devices operate on batteries, and what affects this](#)

Technical specifications



[All technical specifications](#)



[Compliance with standards](#)

Warranty

Warranty for the Limited Liability Company “Ajax Systems Manufacturing” products is valid for 2 years after the purchase.

If the device does not operate properly, we recommend contacting Ajax Technical Support first. In most cases, technical issues can be resolved remotely.



[Warranty obligations](#)



[User agreement](#)

Contact Technical Support:

- [e-mail](#)
- [Telegram](#)

Manufactured by "AS Manufacturing" LLC