Intrusion protection guide for at-risk sites
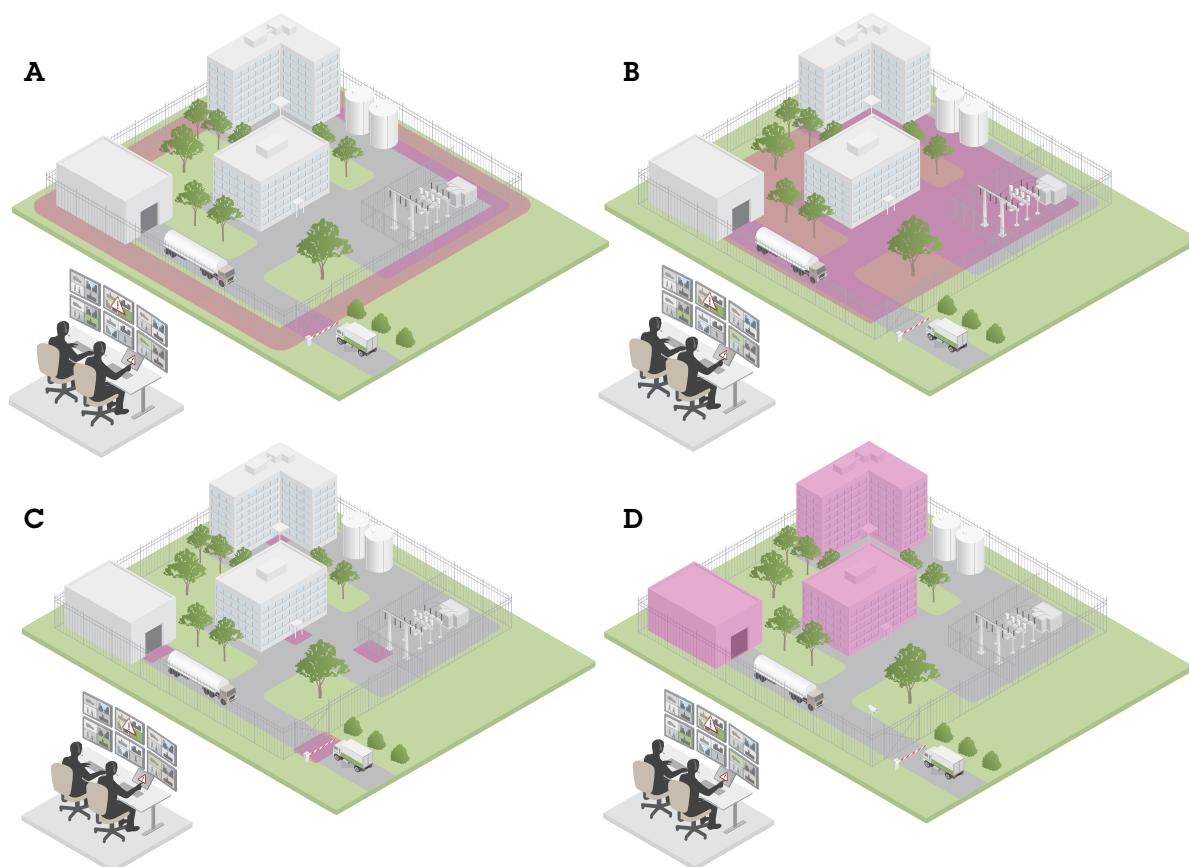
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Philippe has developed his career in security at Axis for more than 20 years. He has successively held positions as a technical support technician, trainer, sales representative, pre-sales manager, and design office manager. He is, among other things, an expert on the protection of critical sites, in connection with which he works in collaboration with design offices, integrators and end customers. His technical skills have helped in developing consulting services for law enforcement.

1. Introduction

Following various attacks on SEVESO sites that took place in 2015, the classification of sites as EIV, OIV (operator/company vital for national integrity), now requires an increased level of protection against intrusions on this type of site. In this guide, we will show you how Axis Communications can help you choose the most appropriate technologies and systems to ensure a high level of security. Our recommendations are based on our expertise, developed over the years by assisting our partners in quotations and recommendations. We have grouped together the common points from the most relevant projects to create this methodology.

A – Perimeter; B – Inner areas; C – Perimeter of restricted areas; D – Building enclosure

To effectively protect a site, several layers of physical protection can be put in place: barriers, concertina wire fences, embankments or ditches to deter and, if necessary, slow down the progression of an individual. Different technologies can be used to detect the individual as they progress. As each area of progression is different, we will study each of these areas individually to determine the most appropriate detection and warning technologies.

2. Perimeter protection

2.1 Definition

This refers to the outer enclosures of the site.
Historically, various technologies have existed to perform the crossing detection function at the site perimeter, such as infrared barriers or sensing cables. Thanks to their low cost, these solutions are still very common today, but they must be combined with video to remove any doubt.
These solutions, which are less expensive to purchase but which ultimately must be combined with video

verification, can represent relatively high infrastructure costs. The use of sensors for detection and verification in the same equipment will reduce installation costs. In this chapter, we describe these solutions.

2.2   Requirement

Deter unauthorized entries, detect boundary crossings, alert, and, if necessary, intervene to stop an intruder's progression.
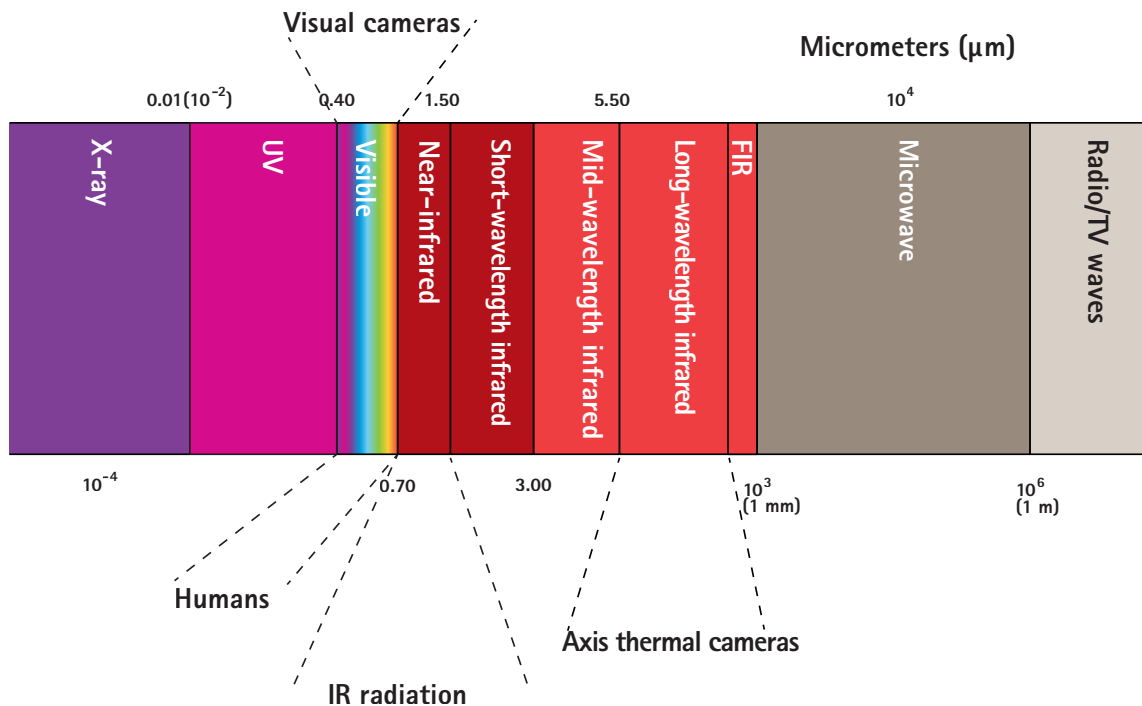
2.3   Recommended solutions

Thermal sensors

Thermal sensors, often mistakenly referred to as "thermal cameras", must be used to protect the site perimeter. As these are sensors and not cameras, there is no regulatory issue involved, and it is possible to view exteriors. Thermal sensor technology has other advantages because it outperforms visible light cameras in dark settings and is a great tool for detecting people and objects during 24/7 surveillance, from pitch dark areas to sunlit parking lots. Thermal cameras create images based on the heat that always radiates from any object, vehicle or person. Thermal cameras are less sensitive to problems with light conditions, such as shadows, backlighting, darkness and even camouflaged objects; they provide images that allow operators to detect and act on suspicious activity 24 hours a day, seven days a week.

The use of optical cameras requires an additional light source at night. This visible or near-infrared light is immediately reflected by the water droplets that form fog, producing a halo effect that disables the system.

On the other hand, thermal sensors are sensitive to the infrared radiation produced by any body whose temperature is greater than -273.15°C; therefore, there is no light emission and no halo phenomenon if it is foggy.

A thermal sensor can generate an image of 16 pixels/meter at a distance of 600 m (AXIS Q1941-E 60 mm Thermal Network Camera) in an undisturbed environment. The infrared radiation detected by a thermal sensor is attenuated in fog by about 30dB, which will reduce the detection distance to 200 m in areas of heavy fog.

On the other hand, an optical camera cannot detect beyond 80 m even in the most favorable scenarios, and does not work at all in a slight fog.

A thermal sensor that costs more than an optical camera reduces civil engineering costs because it has a long detection range and will work in all weather. The return on investment is also ensured by a reduction in false alarms since moving objects are identified more accurately. Moreover, these sensors do not require any maintenance.
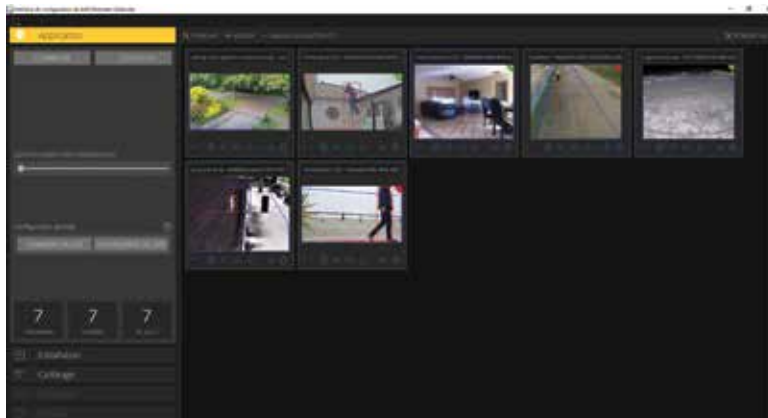
Complementary technologies
The combination of a thermal sensor and an AXIS Perimeter Defender ACAP package will provide effective perimeter protection. The sensor produces an image, and the software installed in its memory analyzes it to detect an individual or/and car crossing the external enclosure.
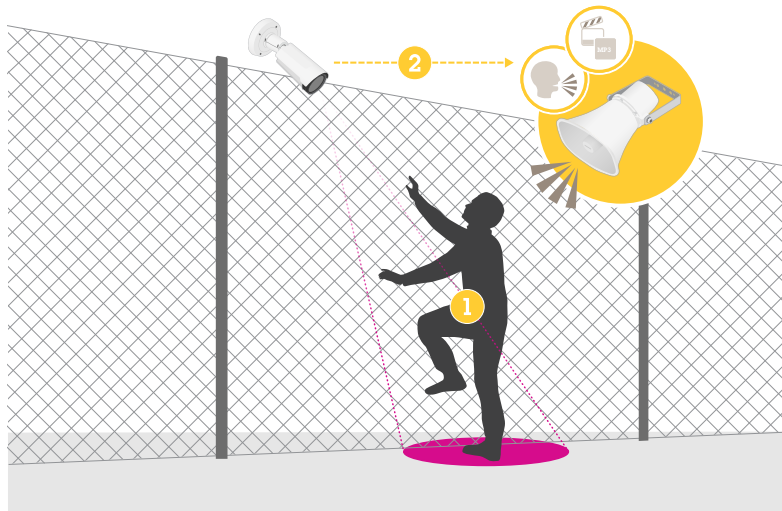
Design

AXIS Perimeter Defender

The ideal companion for thermal sensors, AXIS C1310-E IP Horn Speaker is ideal for deterring a detected intruder. This PoE IP horn speaker is 100% autonomous.

A network audio system is the perfect addition to a video-based security installation. Perimeter protection is a great example of this. Imagine a potential intruder is climbing a fence. The camera alerts a security guard, who warns the intruder using the audio system: "We can see you, you're trespassing." More often than not, this type of warning is sufficient, thus avoiding the need for additional security measures.

When an intruder is detected, a simple http request sent by the thermal sensor to the speaker will allow the automatic broadcasting of messages or sounds stored in its memory.

In addition, it is possible to challenge the individual through the use of a simple SIP phone or a microphone connected to the operator's software.

Detection sensors combined with a drone
Detection sensors supplied by Axis (thermal cameras, radars) effectively detect site intrusions both day and night. If an alarm is triggered, Skeyetech, the autonomous drone supplied by Azur Drones, can take off automatically to ensure rapid and accurate detection. The drone can fly at 50 km/h, and is equipped with optical and thermal HD cameras to identify, assess, and monitor a situation, 24/7. The link between the detection sensors and the Skeyetech autonomous drone is made directly through the security software (video management system). It retrieves the GPS coordinates of the location where the Axis sensors were triggered, and automatically sends the surveillance drone there, under the simple supervision by the security guard. These new perimeter protection devices combining detection sensors and drones enable faster and more effective decision-making. The response time and mobility of the drone make it an unparalleled tool for tracking an intruder, preventing a crisis, or managing a changing situation. From an infrastructure point of view, these devices prove to be very inexpensive because only a few sensors and an autonomous drone are needed to secure a site covering several hundred acres.

General perimeter protection scenario
If the site is already equipped for intruder detection, Axis PTZ cameras can be added to the system for verification purposes. In fact, the sensing cables can indicate the area where a crossing has been detected with relatively high resolution. It is possible to call up a preset camera position in order to aim the camera towards this area to verify the situation and trigger an audio message via the horn speakers. A more cost-effective and reliable solution could be to use thermal imaging cameras to carry out both detection and verification. (As detailed in Part 1)

Parking areas
Panoramic cameras can be used in combination with PTZ cameras to observe the surroundings (characterization of an event) and to obtain a view that enables the individual to be identified.

Recommended products

AXIS Q6135-LE	AXIS Q6100-E
> HDTV 1080p with 31x optical zoom > OptimizedIR (250 m / 820 ft) > Axis Lightfinder 2.0 > Autotracking 2 and orientation aid > AXIS Object Analytics	> 360° camera with one-click PTZ control > 4 x 5 MP sensors, 20 MP resolution > Autopilot

Specific point in underground parking areas. The detection of pedestrians descending the ramp is possible with a camera equipped with AXIS Object Analytics or by the installation of a radar system. The general surveillance cameras also differ because of the low ceiling height for camera installation.

All doors to this parking area and its various levels must have access control and video surveillance.

Recommended products for underground parking areas

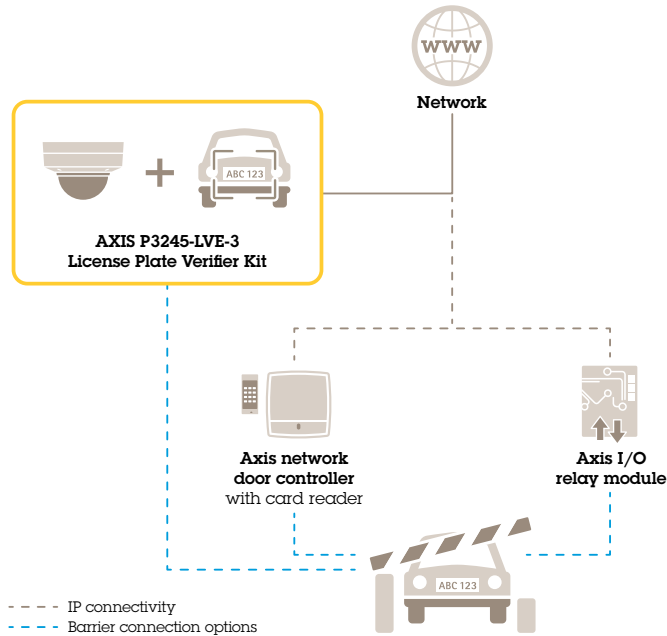| AXIS P3719-PLE	AXIS P3715-PLVE
> 15 MP, 360° multi-directional camera, with one IP address > 360° IR illumination > Remote zoom and focus > Flexible positioning of four varifocal camera heads > Axis Zipstream for reduced bandwidth and storage needs	> 2 x 2 MP multi-directional camera, with one IP address > Pan, tilt and rotation capability > 360° IR illumination > Axis Lightfinder and Forensic WDR > IK10

Protection of openings

Pedestrian entrance gates
Pedestrian entrance gates can also be equipped with access control and videotelephony solutions. Our AXIS A8207-VE Mk II is a PMR-compliant network intercom that is also equipped with a keypad and a 13.56 MHz / 125 kHz dual technology reader. It connects to a network to provide videotelephony functions with RS485 OSDP or Wiegand technology for access control functions via a third-party UTL.

The access control functions can be easily connected to an AXIS A1001 or AXIS A1601 Network Door Controller via RS485 OSDP or Wiegand technology, but also virtually through the single network cable. In addition, it is possible to use the QRcode access functions for visitor management.

Parking entrances

Parking entrances have to be monitored. AXIS P1445-LE-3 License Plate Verifier Kit automatically read the license plate and compare it with an internal database. If the plate number is in the database, the camera actuates the automatic barrier opening control. This solution has no restrictions on use.

To control parking entrances more effectively, AXIS P1445-LE-3 can be virtually connected to an AXIS A1001 or AXIS A1601 Network Door Controller to assign time or day restrictions. In addition, parking area access is recorded in the activity log together with the corresponding image.

Products to remember for perimeter protection

Thermal AXIS Q1941-E + APD	Audio AXIS C1310-E	PTZ AXIS Q6215-LE
> Superb image contrast for greater detail > Built-in analytics for high quality detection > Electronic image stabilization > Axis Zipstream > AXIS Long Range PoE Extender Kit accessory > Extends Ethernet and PoE connections up to 1000 m (3280 ft.) > Supports IEEE 802.3af, IEEE > 802.3at compliant devices > NEMA TS-2 Compliant	> All-in-one speaker system > Simple installation with PoE > Remote health checks > Two input/outputs (GPIO)	> HDTV 1080p resolution and 30x optical zoom > Long-range OptimizedIR (400 m / 1,300 ft) > 1/2" sensor for high dynamic range > MIL-STD-810G and NEMA TS-2 compliant > AXIS Guard Suite analytics included

Network intercom AXIS A8207-VE Mk II	AXIS A1001 Access Control	AXIS P1445-LE-3 License Plate Verifier Kit
> Full-featured 6 MP IP camera > Integrated RFID reader with keypad for use with access control systems > Support for HID® iClass® > Keypad for number entry > Acoustic echo cancellation ∣and noise reduction > Enhanced cybersecurity with Signed firmware and Secure Boot > HDMI output for live streaming to a public monitor	> Based on Axis open platforms > Easy integration with other systems > AXIS Entry Manager or third-party software > ONVIF Profile A and C compliant	> Axis Lightfinder 2.0 and Forensic WDR > OptimizedIR up to 40 m (131 ft) > AXIS Object Analytics > Improved security features > Axis Zipstream with support > H.264/H.265

3. Buffer zones

3.1 Definition

This zone is located between the perimeter barrier and the buildings.

3.2 Requirement

Calls for special attention because the individual is inside the site, and it will be necessary to follow their movements and, if necessary, detect them as they approach strategic areas: pathways, parking areas, storage areas, etc., in order to challenge them. These are often large areas that need wide coverage.

3.3 Solutions

Why use radar?
The areas are very large, but not linear like with perimeter monitoring. Compared to a thermal sensor which will only cover 37,000 ft^2, Doppler radar can perfectly cover a 121,000 ft^2 area. This technology is inexpensive and more efficient than thermal sensors when applied to volumetric detection. It can be used to automatically control an AXIS Q6215-LE or any other Q-Series PTZ camera to automatically track an individual after detection.

In addition to the volume of the area covered, one considerable advantage of this technology is its very attractive price, not to mention its insusceptibility to weather and thermal conditions, small animals, insects, and its day-and-night operation. No maintenance is required because there are no moving parts (it consists of a radio transmitter and antenna in the same device). It detects and classifies any moving person or vehicle using built-in analytics. As the radar also provides the exact position, speed and direction of movement, it can trigger the action of a connected PTZ camera, which can track the detected objects in order to identify them.

Doppler technology is ideally suited to open outdoor areas with moderate activity, such as in fenced areas on warehouse or industrial sites. It also detects individuals attempting to climb the sides of buildings, and detects any intrusion through the roof.

A radar-based motion detector is the perfect complement to your Axis video surveillance system. In addition to triggering an alarm when an intruder is detected, it can also begin recording for visual verification, as well as send a deterring message via the AXIS C1310-E.

The strongest security solutions take advantage of a strategic mix of technologies to achieve the best results.

3.4   Products

AXIS D2110-VE	AXIS Q6135-LE	AXIS C1310-E
> Extensive 180° area coverage > Built-in analytics tools > Low false alarm rate 24/7 > Smart coexistence functionality > PoE out to power additional devices	> HDTV 1080p with 31x optical zoom > OptimizedIR (250 m / 820 ft) > Axis Lightfinder 2.0 > Autotracking 2 and orientation aid > AXIS Object Analytics	> All-in-one speaker system > Simple installation with PoE > Remote health checks > Two input/outputs (GPIO)

4.   Perimeter of buildings

4.1   Definition

The perimeter of a building is the outline of the building, including the roof.

4.2   Requirement

Protecting a building's perimeter is necessary to monitor any attempts to approach it, even by people working on the site when the building is closed. Detect any intrusion attempt through the roof.

4.3 Solution

It is common to use optical or even thermal cameras to protect the perimeter of buildings depending on the distances and weather conditions of the location (the technologies and solutions used are the same as those for the site perimeter: see part 1 of the document), but here AXIS D2110-VE Network Radar Detectors can also be used to meet this requirement.

180° within a 200 ft radius, these characteristics are sufficient to cover nearly 400 ft along the side of a building and over 60,000 ft^2 on the roof. Motorized cameras can be used for verification purposes. Controlled automatically by the radar and/or manually by the operator via a joystick, they make it possible to identify an individual.

4.4 Products

AXIS D2110-VE	AXIS P1445-LE	AXIS Q1941-E	AXIS Q6135-LE
> Extensive 180° coverage > Built-in analytics tools > Low false alarm rate 24/7 > Smart coexistence functionality > PoE out to power additional devices	> Axis Lightfinder 2.0 and Forensic WDR > OptimizedIR up to 40 m (131 ft) > AXIS Object Analytics > Improved security features > Axis Zipstream with support > H.264/H.265	> Superb image contrast for greater detail > Built-in analytics for high quality detection > Electronic image stabilization > Axis Zipstream	> HDTV 1080p with 31x optical zoom > OptimizedIR (250 m / 820 ft) > Axis Lightfinder 2.0 > Autotracking 2 and orientation aid > AXIS Object Analytics

5. Inner layer of buildings

5.1 Definition

This represents all areas inside the building, from the reception area and meeting rooms to the offices, data center and storage areas.

5.2 Requirement

Control access in order to restrict entry of unauthorized persons, and monitor the various entrances and exits as well as the UGIS. Video integration and access control to verify that the badge holder is an authorized individual.. Broadcasting information and PPMS (special security plan) messages through horn speakers.

5.3 Solution

Access control for all doors in these buildings. As already mentioned, the parking area ramps are to be included in this perimeter.

Access to buildings can be controlled via AXIS A8207-E, a network intercom that is also equipped with a keypad and a 13.56 MHz / 125 kHz dual technology reader for access control functions. It connects to a network to provide videotelephony functions with RS485 OSDP or Wiegand technology for access control functions via a third-party UTL.

The access control functions can be virtually connected to an AXIS A1001 or AXIS A1601 Network Door Controller via RS485 OSDP or Wiegand technology as well as through the single network cable. In addition, it is possible to use the QRcode access functions for visitor management.

Cameras:
The use of fixed cameras for formal identification requires 120 pixels/ft at all access doors. Recognition cameras: 45 pixels/ft, and general surveillance cameras: 15 pixels/ft are installed at strategic points in the building in order to track an individual's movement.

The cameras have to be able to work in backlit conditions, an important parameter for entrances. A WDR function of 120 dB is required.

AXIS P3245-LV/V
For corridor intersections, multi-sensor cameras are economically a very good choice.

AXIS P3717-PLVE/P3715-PLVE
For wide-open areas, 360° panoramic cameras provide an overall view of the area.

AXIS M3068-P/58-PLVE
The use of cameras with IR lighting built in is necessary when there is a risk of power failures. It is possible to video-monitor elevator cars.

AXIS P9106-V
OptimizedIR technology allows the power of the LEDs to be adjusted depending on the distance to the subject.

IP horn speakers integrated into the security network broadcast a lockdown or evacuation message in the event of an intrusion that is dangerous to people and property. This depends on the procedure selected by the safety officer according to the site environment. The message can be triggered by a button on a control desk, a virtual button in the VMS, or by panic buttons located throughout the building.

5.4   Products

AXIS C1004-E	AXIS C1410	AXIS C2005
> All-in-one speaker system > Connects to a standard computer network > Simple installation with PoE > Remote health checks > Scalable and easy to integrate	> All-in-one speaker system > Connects to a standard network > Simple installation with PoE > Remote health checks > PIR sensor for motion detection	> All-in-one speaker system > Connects to a standard computer network > Simple installation with PoE > Remote health checks > Scalable and easy to integrate

AXIS A9161 I/O Relay	2N SIP MIC	
> 6 I/Os with controlled inputs and configurable 12 and 24 V DC output levels > PoE or 12 and 24 V DC input > Based on Axis open platforms - VAPIX® and ACAP	> All-in-one microphone console > 12 configurable buttons for 12 areas > Pre-recorded or live announcements > Quick installation with just one network cable (PoE) > Future-proof design	

6. Special cases

This section deals with special cases related to buffer zones, perimeter, and peripheral protection.

6.1 ATEX sites

6.1.1 Requirements

Protect explosive areas with robust equipment. Examples of ATEX classified environments include the oil and gas industries, chemical plants, textile and paper industries, food production, and waste treatment. ATEX, IECEx and UL-certified cameras have an electrolytically polished stainless steel housing. This steel housing is capable of containing flames in the event of an electrical incident, and prevents sparks from igniting vapors, gases, dust, or fibers in the surrounding environment.

6.1.2 Solutions

The layout used is the same as for a conventional site, but the thermal sensors for perimeter detection and the PTZ cameras for verification must be suitable for use within of this particular type of area.

XF40-Q2901 thermal sensor	XP40-Q1942 motorized camera
> Detects fires and leaks > Monitors the temperature of the equipment and surrounding area > Visual verification > Certified for hazardous applications > Supports advanced analytics	> 360° pan and 90° tilt > VGA 640x480 > Electronic image stabilization > Certified for hazardous applications > Supports advanced analytics

6.2 Sends alarms to operators

6.2.1 Requirements

Sends an alarm to a remote monitoring operator if the company does not have operators on site.

6.2.2 Solutions

AXIS A9161 and AXIS A9188 transmits a physical I/O alarm to the central alarm station transmitter to the remote monitoring company's front-end. The latter will receive an alarm and the associated video. This alarm can be generated by the AXIS D2110-VE radar, thermal sensors, and optical cameras.

6.3 On-site smoke detection

6.3.1 Requirements

Detection of on-site fires to react quickly and avoid terrible accidents.

6.3.2 Solutions

Special case of high fire risk areas inside or outside. Axis cameras equipped with the ACAP Smoke Guard software can generate a technical alarm and send it to the video operator when smoke appears, complementing the perimeter protection to limit the impact of projection from outside the site.

About Axis Communications

Axis enables a smarter and safer world by creating network solutions that provide insights for improving security and new ways of doing business. As the industry leader in network video, Axis offers products and services for video surveillance and analytics, access control, intercom and audio systems. Axis has more than 3,800 dedicated employees in over 50 countries and collaborates with partners worldwide to deliver customer solutions. Axis was founded in 1984 and has its headquarters in Lund, Sweden.

For more information about Axis, please visit our website www.axis.com

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