

## Outdoor Protection Standards



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## Introduction

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Electronic products and mechanical devices that are exposed to any environment (indoor or outdoor) are commonly also exposed to people, dirt, and moisture. The purpose of the case, cabinet, or covering on any electrical/mechanical product is for protection as well as for beautification (cosmetics) and of course to bear a company logo. The design of the case, including vent holes and the placement of screws and fastening devices, determines how much protection the internal workings of the product has from the environment. These intrusions range from dirt, dust and insects to sprayed/dripped/directed moisture and curious poking fingers.

Ingress Protection is the industry standard term created by the *International*

*Electrotechnical Commission* (IEC), and it is abbreviated IP (not to be confused with Internet Protocol (IP) - a completely different specification altogether). The NEMA (*National Electrical Manufacturers Association*) rating is a second and just as important rating. In the USA you will usually see a NEMA rating code. The IP rating is more common on devices used internationally.

This document has introduced the vandal resistant property for the outdoor cameras which have protective housing to shelter them from the harsh environment (dust, heat, humidity, extreme cold, corrosion, etc.); and also from vandalism or tampering and the meaning of IP code has described for external housing.

## Vandal and Tamper proofing

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In some surveillance applications, cameras are at risk of hostile and violent attacks. While camera housing can never guarantee complete protection vandalism and

tampering; it can be allayed to some extent by considering certain aspects, like, camera/housing design, mounting, placement and use of intelligent alerts.

## What is a Vandal-Proof Camera?

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A vandal-proof camera is a camera and housing intended to resist vandalism, making sure the camera will continue to operate in conditions where people

attempt to break it or impair its function. Numerous companies involved in the production of security equipment offer vandal-proof camera products and

accessories, and people can also order custom designs for special settings. Common applications for these devices include prisons, stores in regions prone to vandalism, and high tech security systems where functionality of the system is critical.

The camera is located in a smooth, tough housing, often dome-shaped, that will resist attempts to break, shatter, or tear it apart. A layer of thick protective glass or plastic is positioned over the lens, allowing the camera to be completely enclosed. Limiting exposure of camera components assures continued functionality. Signal wires and similar devices are tucked inside the housing and run through the wall, making it impossible for vandals to cut them or pull them out to interrupt the signal from the camera.

It may be possible to cover the material protecting the lens of a vandal-proof camera to make it hard to see, but often, the material is designed to resist coatings like markers or paints, and the sight of someone attempting to make something stick over the covering will alert a person monitoring the camera to a crime in progress. When tapes are reviewed, rather than being viewed live, the resistance of the

camera may allow it to snap some photographs before the vandal succeeds in covering it to make it impossible to see what happens next.

Coatings intended to resist markers and tagging can be useful in environments where people are concerned about people marking up the camera housing. While a vandal-proof camera can usually be covered in things like stickers, they may be easier to peel off the slick coating of the housing than they would be otherwise. The camera itself will remain intact, reducing costs associated with rehabilitating security equipment after a vandalism event.

Working around a vandal-proof camera requires more skills and planning than a traditional security camera. This can act as a deterrent, reducing crime in an area, especially if all of the cameras fitted are of this type, eliminating blind spots and making it impossible to engage in criminal activity without being picked up on a camera somewhere in the vicinity. In cases where cameras can be remote controlled to pan, shift angles, and offer other features, the housing can be designed to permit some mobility without exposing the camera body or lens.

## Camera-Housing Design

Housings made of metal provide better vandal protection as against those made of

plastic. The type of housing or camera is another factor to be considered. A regular

fixed camera that protrudes from a wall or ceiling is more open to attack than a discretely designed fixed dome or PTZ dome camera. The smooth, rounded covering of the dome casing makes it difficult to block the camera's view by dropping an opaque cover over the camera. Hence, the more a housing or camera blends into an environment; the better is the protection against vandalism. The lens cover can also either be vandal-resistant or non-vandal resistant.

Most cameras are fitted with some form of protective cover for several reasons. The common exception is probably in small retail establishments where the risk of damage is slight.

### Internal Housings

Housings are used internally for a variety of reasons. Sometimes it is where the need is for the camera to be discrete. This could be in certain types of establishment where the security of customers or members is necessary. It may be that the impression of intrusion of privacy needs to be subtly avoided. There are housings designed to blend in with the decor for aesthetic purposes. These can be miniature cameras secreted in light fittings or ventilation grills. This type of housing is often used in hotels, museums and art galleries, shopping malls, etc.

Another range of housings is designed for covert surveillance. The intention of this housing is that it is not a deterrent but deliberately disguised as some innocuous common object. They usually incorporate a miniature camera fitted with a pinhole lens. These objects have been as diverse as PIRs, clocks, extractor fan controls, smoke detectors, etc. There appears no limit to the imaginative methods of concealing cameras.

Indoor cameras may sometimes have to be protected from attack and therefore fitted in vandal proof housings. This often takes the form of a wedge shaped housing fitted in a false ceiling with the minimum area as shown in Figure 1.

The disadvantage of the wedge shaped housing is that it must be mounted facing in the correct direction. Once fitted it is not easy to change the orientation of the camera. This type of housing is often used when it is required to view along a corridor or other predetermined direction.

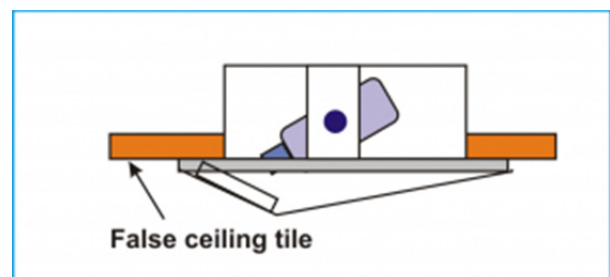
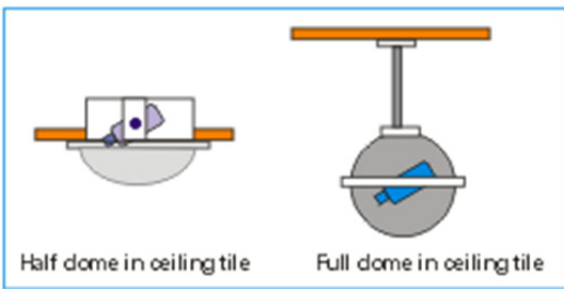


Figure 1 Camera in Wedge Housing in False Ceiling

There may be situations where it is needed to have more flexibility in setting up the direction the camera is viewing. This requirement often also needs the direction being viewed to be discreet. The solution here is to use a type of domed housing (see Figure 2 ). The dome can be either a hemisphere or a complete sphere. The hemispherical, or half dome, can be fitted in place of a standard ceiling tile. The camera is mounted on an adjustable platform that may be set for both angles of view and direction.



**Figure 2 Types of Discreet Camera Dome**

There are two main types of plastic used for the domes. One is a black acrylic material with a less dense slot through which the camera views. The other has a silvered coating on the inside and acts in the same as a one way mirror. With this type of enclosure, there is a great deal of flexibility in setting the camera view. It is also very easy and quick to change the direction of view through 360°.

### **External Housings**

These are often called weatherproof or environmental housings. There are standards that specify the degree of protection to be provided by enclosures. Mainly these are, BS 5490, IEC 529, DIN 40 050. The rating of protection is defined by two digits prefixed by the agreed letters IP. (In some countries three digits are used). The letters stand for Ingress Protection, and the significance of the digits is as follows:

First digit: The degree of protection that is provided with respect to persons and to equipment inside the enclosure.

Second digit: The degree of protection that is provided with respect to the harmful ingress of water.

Third digit: The degree of mechanical protection.

For example, a rating of IP 54 indicates class 5 protection against the ingress of dust and class 4 against the entry of moisture. Camera housings used in the UK will usually have a rating of IP 65 or IP 66.

Note that these ratings only apply to normal environmental conditions. Special protection is required for areas such as refineries, mines, flour mills, etc. If there is any doubt the customer will be aware of special conditions applying to particular parts of the site. Tables 10.1 and 10.2 at the end of this chapter list all the index numbers.

## IP Rating

An IP Rating or code is based on the IEC international standard 60529. According to the standard, it “describes a system for classifying the degrees of protection provided by an enclosure. IEC 60529 is NOT a ‘product standard’ and does not cover enclosure requirements other than the ‘degree of protection’ provided. An IP rating is usually represented by two digits and may contain an additional optional letter. The first digit represents the level of protection provided by the camera's

enclosure against solid objects foreign to the camera and against access to hazardous parts. The first digit can range from 0 to 6, with 0 meaning no protection at all and 6 indicating the greatest protection. The second digit indicates the degree of protection of the equipment inside the enclosure against the harmful entry of various forms of moisture (e.g. dripping, spraying, submersion, etc.) The following tables are described each individual digit (level) and its classification based on IEC 60529. Figure 3 Shows the IP chart for electrical enclosure.

**Table 1 the first digit classification based on IEC**

<b>0</b>	No special protection
<b>1</b>	Protection from a large part of the body such as a hand (but no protection from deliberate access), from solid objects greater than 50 mm in diameter.
<b>2</b>	Protection against fingers or other object not greater than 80mm in length and 12mm in diameter.
<b>3</b>	Protection from entry by tools, wires, etc., with a diameter of thickness greater than 1.0mm.
<b>4</b>	Protection from entry by solid objects with a diameter or thickness greater than 1.0mm
<b>5</b>	Protection from the amount of dust that would interfere with the operation of the equipment.
<b>6</b>	Dust tight.

**Table 2 the second digit classification based on EIC**

<b>0</b>	No special protection
<b>1</b>	Protection from dripping water
<b>2</b>	Protection from vertically dripping water
<b>3</b>	Protection from sprayed water
<b>4</b>	Protection from splashed water
<b>5</b>	Protection from water projected from a nozzle
<b>6</b>	Protection against heavy seas, or powerful jets of water
<b>7</b>	Protection against immersion
<b>8</b>	Protection against complete, continuous submersion in water

The following letters can be appended to classify only the level of protection against access to parts by persons: **A.** back of hand; **B.** finger; **C.** tool; **D.** wire

The following letters may be used to indicate the additional protection to the camera:

**H.** High voltage device; **M.** Device moving during water test; **S.** Device standing still during water test; **W.** Weather conditions; Not every security camera manufacturer provides an IP rating, nor are they absolutely necessary. However, and IP rating provides

a potential user a more specific means of determining the protection afforded to the camera from foreign objects. For example, many cameras are rated by their manufacturers as "Weatherproof." However, a camera that is rated as IP 66 would indicate that it is impervious to dust and that water projected from power jets will not cause harm to the camera and its parts. **Error! Reference source not found.** shows a schematic IP rating chart. Typically, surveillance cameras are rated IP65, IP66, or IP67. see the complete definitions below.

**IP60** -Total dust ingress protection, No protection against liquids

**IP61**-Total dust ingress protection, Protected against condensation

**IP62**-Total dust ingress protection, Protected against water spray < 15 degrees from vertical



**IP63**-Total dust ingress protection, Protected against water spray < 60 degrees from vertical

**IP64**-Total dust ingress protection, Protected against water spray from any direction

**IP65**-Total dust ingress protection, Protected against low pressure water jets from any direction

**IP66**-Total dust ingress protection, Protected against high pressure water jets from any direction

**IP67**-Total dust ingress protection, Protected against water immersion between 15cm and 1m depth

**IP68**-Total dust ingress protection, Protected against long term immersion to a specified pressure

# IP RATINGS CHART





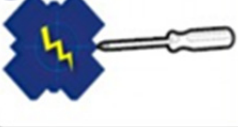





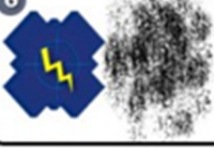



IP	EXAMPLE	SOLID PROTECTION	IP	EXAMPLE	LIQUID PROTECTION
1		Protected against a solid object greater than 50mm, such as a hand	1		Protected against vertically falling drops of water. Limited ingress permitted
2		Protected against a solid object greater than 12.5mm, such as a finger	2		Protected against vertically falling drops of water w/ enclosure tilted 15° from vertical. Limited ingress permitted
3		Protected against a solid object greater than 2.5mm, such as a screddriver	3		Protected against sprays to 60° from the vertical. Limited ingress permitted
4		Protected against a solid object greater than 1.0mm, such as a wire	4		Protected against water splashed from all directions. Limited ingress permitted
5		Dust Protected. Limited Ingress of dust permitted	5		Protected against jets of water. Limited ingress permitted
6		Dust Tight. Zero ingress of dust permitted	6		Protected against strong jets of water. Limited ingress permitted
			7		Protected against the effects of immersion between 15cm and 1m
			8		Protected against long periods of immersion under pressure

Figure 3 Ingress Protection (IP) Chart for Electrical Enclosure

## Selection of External Housings

Weatherproof housings must be about the most mundane aspect of a CCTV installation. Or so it seems, because many engineers simply consider the housing as a protection against the elements. However, there are many aspects to consider and many suppliers of housings. It is about the cheapest element of an external system yet price appears to be the main factor in selecting which to use. Important considerations should be:

- Ease of access for pre-assembly in the workshop.

- Ease of access during installation.
- Ease of access for future service needs.
- Is the camera mounting plate insulated from the case?
- Can the mechanical focusing screw on the camera be reached? Some are at the back, some at the side and some on top.
- Can the lens be focused and the peak/average settings adjusted on site?
- Can one man remove the cover and work on the inside?

If there is a telemetry board fitted, can it be accessed without removing the camera?

## Mounting

The way cameras and housings are mounted is also important. A fixed camera or a PTZ dome camera that is mounted on the surface of a ceiling are more vulnerable to attacks than such cameras that are mounted flush to a ceiling or wall, where

only the transparent part of the camera or housing is visible as there are no cables sticking out; that can be tampered with. Also, if cabling is done on the outside; a metal paneling should be provided to protect cables from attacks.

## Camera Placement

Camera placement is also a key factor in deterring vandalism. By placing a camera out of reach on high walls or in the ceiling, many spur-of-the-moment attacks can be prevented. The disadvantages with respect

to field of view can to extent be compensated for, by selecting a different lens.

## Intelligent Alerts

Tampering alerts also helps protect cameras against vandalism. The intelligent software in the camera can detect if a camera has been repositioned or obscured, and can

send alerts to operators. This is especially useful in installations where hundreds of cameras are used for surveillance and keeping track of each individual camera is difficult.

## IK Code

The "IK" code is a coding system that indicates the degree of protection provided by an enclosure against harmful mechanical impacts. It is defined by standard EN/IEC 62262. It is similar to the IP rating system and consists of the letters IK followed by two digits which indicate the

impact resistance. These digits run from "00" (not protected according to the standard) through to "10" which is for an impact energy of 20 Joules.












The following tables are described IK codes based impact energy.

Table 3 IK codes

Code	Impact Energy	Test
IK00	Non-protected	
IK01	Impact energy: 0,150 joules	Resistant against an impact from an object of 200 grams thrown from a distance of 7.5 cm
IK02	Impact energy: 0,200 joules	Resistant against an impact from an object of 200 grams thrown from a distance of 10 cm
IK03	Impact energy: 0,350 joules	Resistant against an impact from an object of 200 grams thrown from a distance of 17.5 cm
IK04		

	Impact energy: 0,500 joules	Resistant against an impact from an object of 200 grams thrown from a distance of 25 cm
<b>IK05</b>	Impact energy: 0,700 joules	Resistant against an impact from an object of 200 grams thrown from a distance of 35 cm
<b>IK06</b>	Impact energy: 1,00 joules	Resistant against an impact from an object of 500 grams thrown from a distance of 20 cm
<b>IK07</b>	Impact energy: 2,00 joules	Resistant against an impact from an object of 500 grams thrown from a distance of 40 cm
<b>IK08</b>	Impact energy: 5,00 joules	Resistant against an impact from an object of 1.7 kg thrown from a distance of 29.5 cm
<b>IK09</b>	Impact energy: 10,00 joules	Resistant against an impact from an object of 5 kg thrown from a distance of 20 cm
<b>IK10</b>	Impact energy: 20,00 joules	Resistant against an impact from an object of 5 kg thrown from a distance of 40 cm
<b>IK10+</b>	Impact energy:40,00 joules	Resistant against an impact from an object of 5 kg thrown from a distance of 40 cm
<b>IK10++</b>	Impact energy:80,00 joules	Resistant against an impact from an object of 5 kg thrown from a distance of 40 cm
<b>IK10+3</b>	Impact energy:120,00 joules	Resistant against an impact from an object of 5 kg thrown from a distance of 40 cm
<b>IK10+4</b>	Impact energy:160,00 joules	Resistant against an impact from an object of 5 kg thrown from a distance of 40 cm
<b>IK10+5</b>	Impact energy:200,00 joules	Resistant against an impact from an object of 5 kg thrown from a distance of 40 cm

Table 4 IK mechanical protection

IK		MECHANICAL PROTECTION	
0		No protection	
01		Impact energy 0.150 Joules	
02		Impact energy 0.200 Joules	
03		Impact energy 0.350 Joules	
04		Impact energy 0.500 Joules	
05		Impact energy 0.700 Joules	
06		Impact energy 1.00 Joules	
07		Impact energy 2.00 Joules	
08		Impact energy 5.00 Joules	
09		Impact energy 10.00 Joules	
10		Impact energy 20.00 Joules	