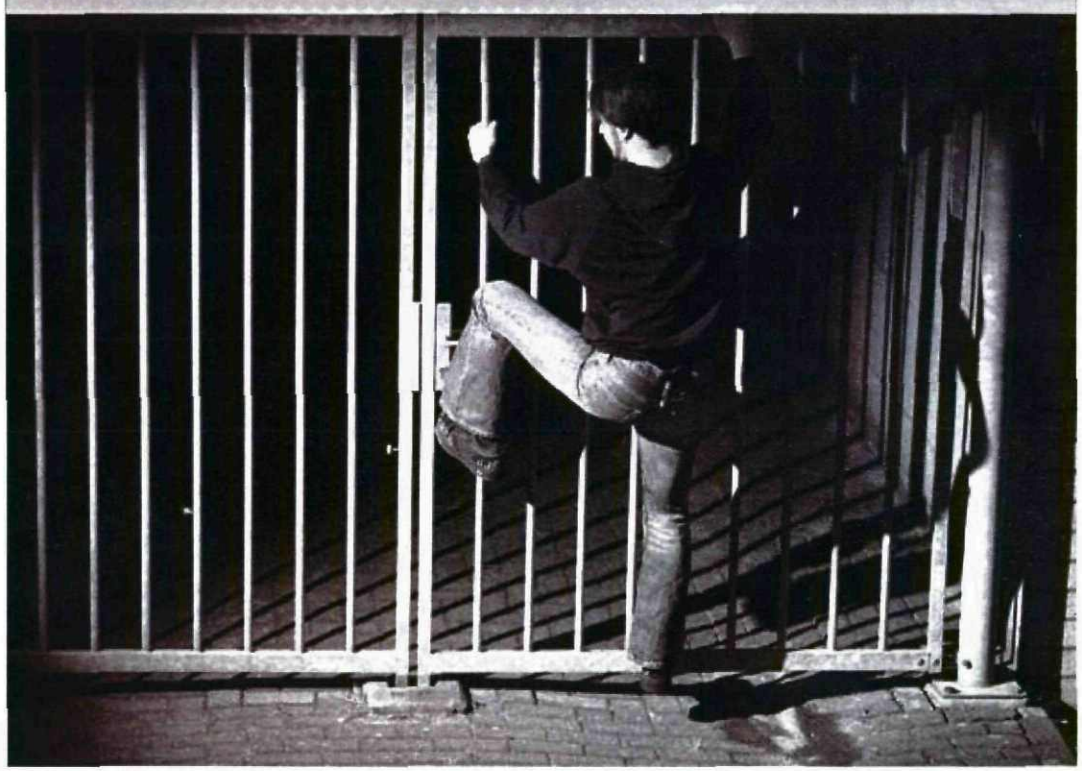


# AutoDomes and Infrared Illumination from Bosch
Application Note

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**Infrared and Intelligent Video Analysis.**
Like all software, video analysis requires valid data to ensure proper function. Without valid data for the algorithms to process, even the most advanced video analysis software will fail. The necessity for good data is summarized in the classical computing axiom "Garbage In, Garbage Out."

Active-infrared is an enabling technology for the night-time function of video analysis. Active-infrared illumination eliminates the poorly-lit, noisy images typically seen under low light conditions. These noisy images, which represent poor data, wreak havoc on video analysis software and render them ineffective. However, the addition of active-infrared improves the images dramatically, enabling high resolution performance. These images serve as usable data, allowing analysis software to function as intended. Similarly, other video-based functions commonly found on DVRs, NVRs and digital video management systems will also fail in the darkness. These functions - which include video motion detection, automatic alarms, false alarm suppression, and video motion searching, intrusion detection, event recording – all require high SN ratio images to work properly and function optimally when used with infrared illumination in low lighting conditions.

**Summary.**
In summary, there are four general strategies for effectively using infrared illumination:

- 360º Area illumination, where a number of infrared illuminators are used to cover the entire area surrounding an AutoDome.
- Specific target illumination, where infrared illuminator units are positioned to shine light on specific areas or objects.
- Local area illumination, where infrared illuminators are positioned in proximity to the specific targets under surveillance, and
- Direct integration to MIC PTZ Cameras, where infrared illuminators are attached directly onto MIC PTZ Cameras so that they move with the camera.

The use of infrared illumination also brings important functional benefits to frame integration, video motion detection and video analysis.

It is worthwhile to note that each of the strategies above apply equally to infrared illumination and white light illumination, which is often specified in applications where it is important to have color surveillance video at night. For additional details on white light illuminators, refer to AEGIS White Light product literature from Bosch.

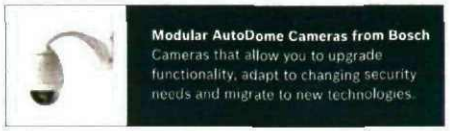
One of the major challenges for effective AutoDome function is night-time imaging performance. Although AutoDomes generally deliver acceptable images during the day, darkness produces negative effects which include noisy images, shadows and motion blur. Often, the darkened images become unusable. It becomes clear that lighting is a key consideration which determines the effectiveness of surveillance systems under low light and no light conditions.

**The Case for Infrared Illumination.**
Infrared (IR) illumination has been used for many years to solve the problems associated with surveillance in darkness and low light. Specially designed for surveillance applications, infrared illumination is strategic, targeted lighting which security cameras use to produce effective images under low light and no light. Infrared illumination has the additional benefit of being invisible to the human eye, preventing light pollution while persevering through the night-time environmental ambience.

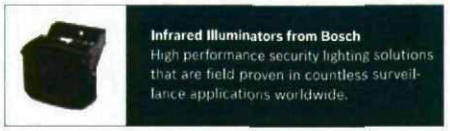
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VS-EH-en-06_F01U520112_01

Mastering the application of infrared illumination is a relatively simple matter, with the key factors being wavelength, beam pattern and illumination range. Additionally, not all light is created equal, and it is important to choose a quality of light appropriate for the application. For example, Black Diamond infrared illuminators produce high-uniformity light to eliminate hot-spots and areas of underexposure within the light beam. In the vast majority of applications, there are four approaches to applying infrared illumination.

**Modular AutoDome Cameras from Bosch**
Cameras that allow you to upgrade functionality, adapt to changing security needs and migrate to new technologies.



**Infrared Illuminators from Bosch**
High performance security lighting solutions that are field proven in countless surveillance applications worldwide.



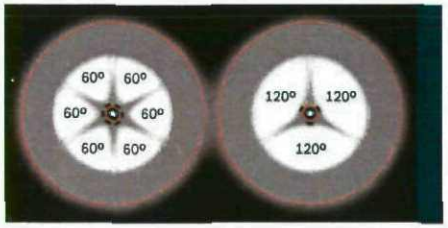
**MIC400IP Infrared Cameras from Bosch**
Fully functional pan/tilt/zoom cameras for virtually any application, including harsh and unforgiving environments.





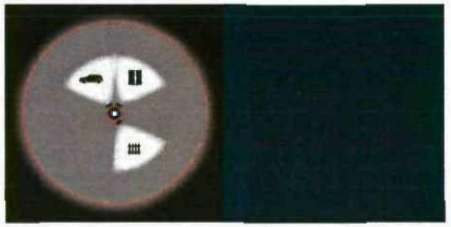
**Frame Integration.**
Some dome cameras use frame integration techniques to overcome the problem of obtaining clear images in dark scenes. Because frame integration typically involves slowing down shutter speed and combining frames, it is acceptable only in a limited number of applications. Frame integration is generally not effective for imaging of moving objects, resulting in motion blur and loss of detail. For example, if an intruder moves through these areas during the dome's 'tour' he will only be recorded as a blur and vital information and detail will be missed. The net result will be large and potentially serious gaps in the surveillance system's total coverage.

The problem of motion blur caused by frame integration is easily solved by simply providing more light. By using infrared illumination, the camera determines that there is sufficient light on scene and therefore does not revert to frame integration mode. Night-time motion under sufficient infrared illumination appears the same as normal surveillance video taken during daytime: motion is crisp and critical details are clearly visible.

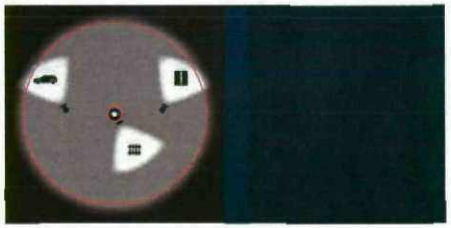



**Approach 1: 360º wide area illumination.**
The most comprehensive approach is to install infrared illumination sufficient for 360º coverage. The 360º technique ensures that light will be available in every direction around the camera, thereby reducing risk of the camera missing important events hidden by darkness.

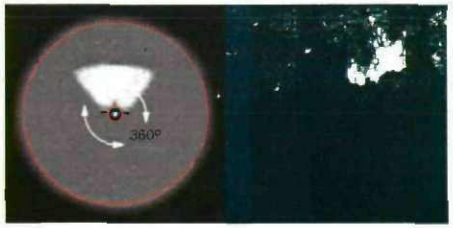
Conventional infrared illuminators presented challenges to security integrators because six or more units were required to achieve 360º coverage. However, Black Diamond technology incorporates micro-refraction to enable beam patterns of up to 120º from a single illuminator. Therefore, three units of Black Diamond infrared illuminators achieve full 360º coverage.



**Approach 2: Specific Target illumination.**
An alternative solution to the above can be achieved by using „specific target" illumination. This is a method of providing illumination in and around the scene, to illuminate specific areas of risk rather than the whole area being viewed by the dome camera. The technique, involving the strategic positioning of infrared to illuminate targeted locations, matches the illumination to the vulnerable areas within the scene. These can be gates, doorways, pathways where intruders are likely to enter, or anywhere the security manager perceives there is exposure to risk. During the full 360° rotation of the dome camera, there may be only two or three specific targets that need to be viewed under infrared illumination. The infrared illuminator units can be mounted on and around the camera pole to continuously illuminate these targets, allowing the camera to effectively monitor all key areas of the scene.



**Approach 3: Local Area illumination.**
Certain environmental factors may make it preferable or necessary to position infrared illumination away from the camera. For example, there may be power limitations at the camera site, requiring re-trenching of new cable lines. Or there may be a great distance between camera and target surveillance area, making it necessary to use more energy to illuminate an area far away. Under situations such as these, consider positioning the infrared illumination above or near the specific target. For best results, properly match the camera angle of view to the infrared illumination and position the illuminators in such a way to minimize shadows on target.




**Approach 4: MIC PTZ Camera with Integrated Infrared.**
MIC Integrating infrared illumination directly onto the pan-tilt mechanism ensures that light is directed to the same area being monitored by the camera. This technique produces the advantage of always having infrared illumination available for the camera, regardless of its position. Essentially, the technique achieves virtual 360º coverage without wasting any light on non-illuminated areas. While the technique is feasible using conventional pan-tilt motors, MIC pan-tilt-zoom domes deliver faster performance in a much more compact package.