



## The REG Series from Bosch

Application Note: Mastering the Art of Licence Plate Capture



The REG Series from Bosch is a complete range of dedicated licence plate capture cameras, engineered to overcome the many challenges consistent, reliable licence plate capture entails.

REG cameras capture plates 24/7, from vehicles moving at speed and regardless of the prevailing weather or ambient lighting conditions. Deployed for critical security, vehicle surveillance and Intelligent Transport System (ITS) applications worldwide, REG Series

cameras are field proven to deliver the high contrast licence plate images needed for Automatic Licence Plate Recognition (ALPR).

The latest development REG-SENTRY utilises this ALPR expertise to deliver a flexible, user friendly access control solution.

**Bosch Security Systems**  
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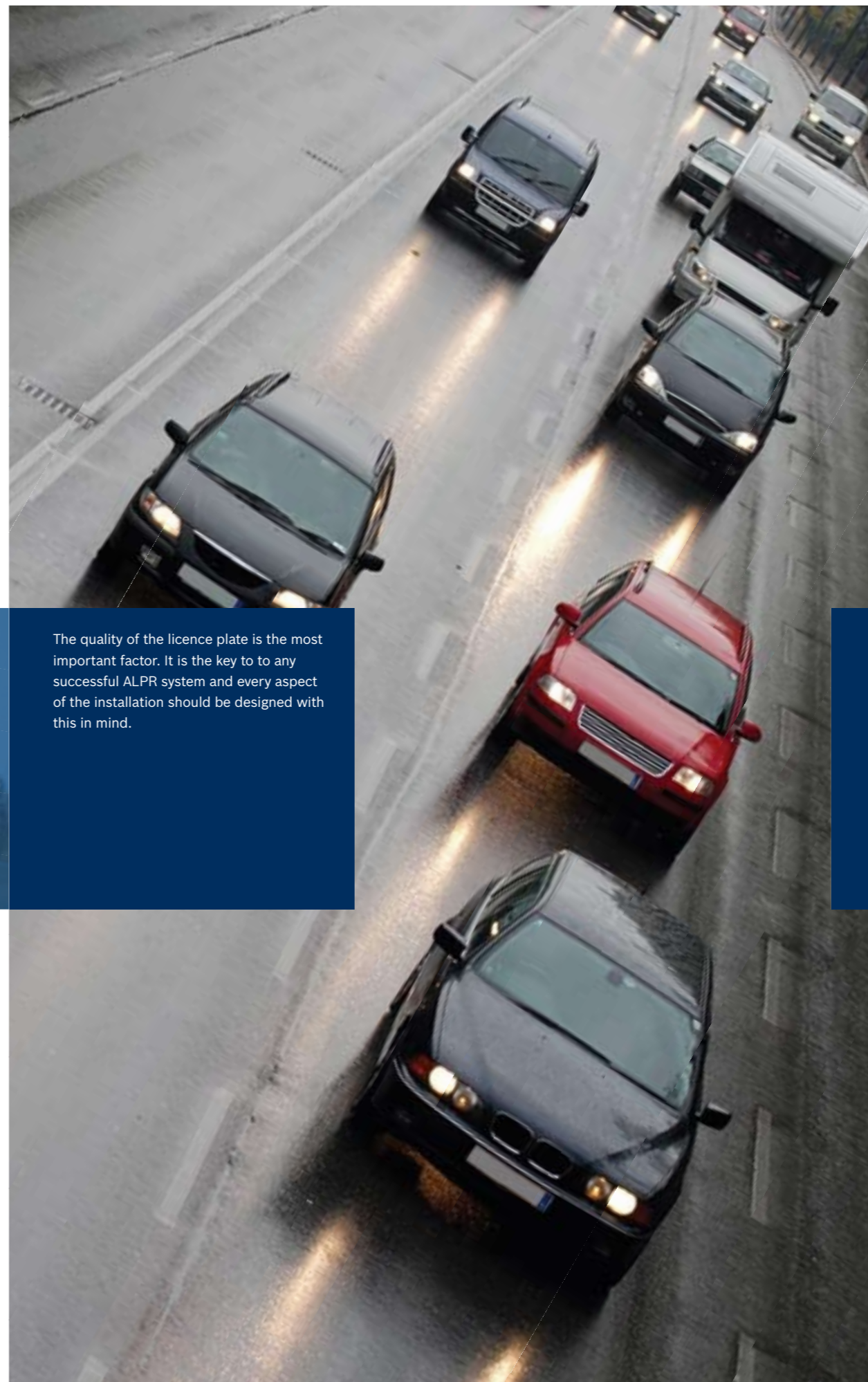
**Mastering the art of licence plate capture**

With major demand for Automatic Licence Plate Recognition it's little wonder the technology has developed so rapidly.

It's easy to see what's driving this demand, most criminal activity will involve a vehicle at some point and because licence plates are inherently linked to identifying information, the ability to accurately capture and retain these images can be indispensable.

Following high profile success stories like London's congestion charging scheme, demand also exists in areas like ITS, traffic management, tolling and parking. There are opportunities to specify and install ALPR systems at every level – from simple security and access control applications to major urban projects.

Whatever the application all ALPR based projects have one thing in common – the key to their effectiveness is the reliability and capture capabilities of the camera at the front end. REG cameras capture plates 24/7, in brightly lit and dark conditions; are effective at high speed, at different approach angles and are not prevented from working by any ambient lighting or adverse weather conditions. All REG Series cameras can be connected to industry standard DVR's for simple capture and record applications and are easily integrated with intelligent software to allow proactive operation against an active database.



The quality of the licence plate is the most important factor. It is the key to any successful ALPR system and every aspect of the installation should be designed with this in mind.



**Installation priorities**

Wherever you pitch your business – entry, intermediate or advanced level systems – the best advice is to learn from other people's mistakes, not your own. Bosch work with leading consultants and installers to fit ALPR systems that really work – and it's surprisingly easy to fit systems that don't.

**Here's what we've learned:**

1. The quality of the licence plate image is the most important factor, it is the key to any successful ALPR system and every aspect of the installation should be designed with this in mind.
2. In more advanced installations where intelligent software is used to process licence plates, the quality of the captured image becomes even more important. The system will need to deal with a totally different set of image quality challenges – dirty licence plates; vehicles moving at speed; headlights and changing light and environmental conditions.

Figure 1  
Vertical angle camera  
positioning

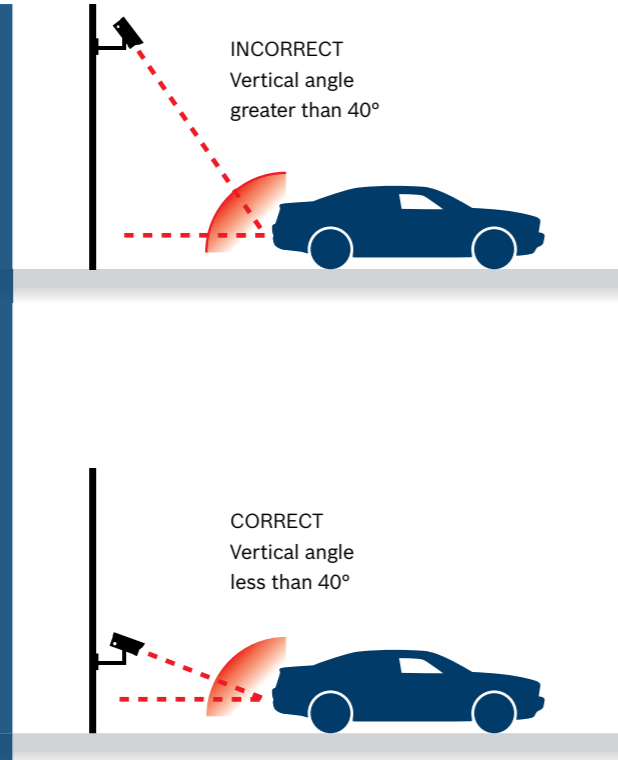
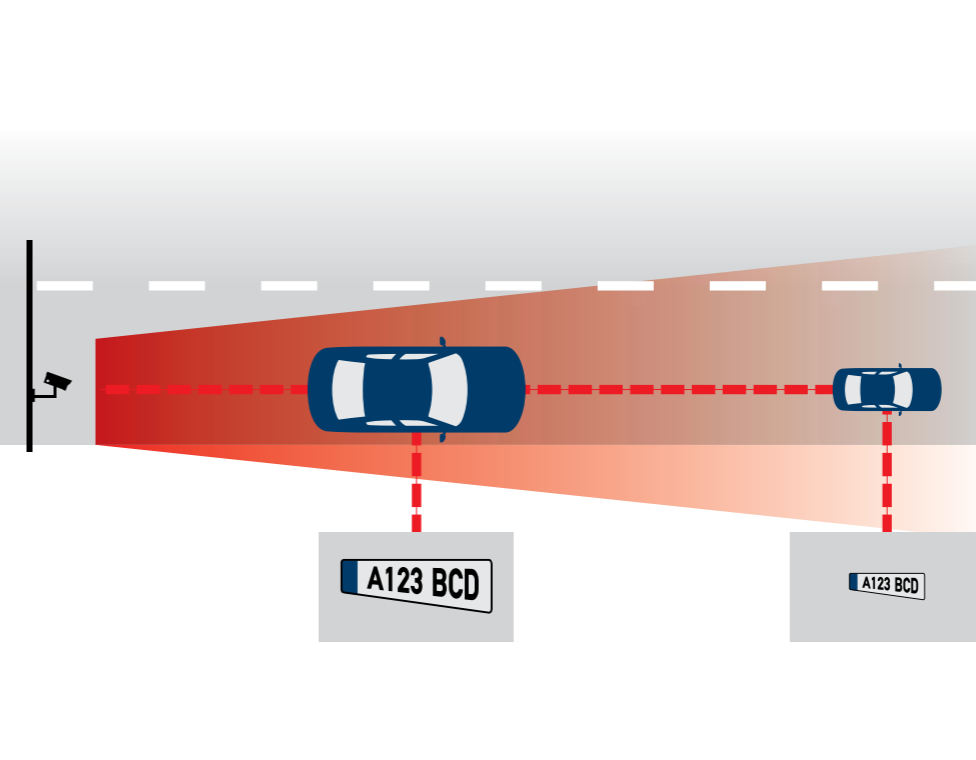


Figure 2  
The plate image will appear  
bigger at the near end of  
the capture zone and  
smaller at the far end



#### Practical installation advice

##### Use dedicated cameras

End users will often push installers to fit ALPR cameras to play a dual role. They want to capture licence plates and at the same time provide surveillance of the surrounding area. As a rule this won't work. An ALPR camera has a difficult enough task when focused totally on capturing the plate – ask it to cover a wider area and performance will be compromised.

To address this problem Bosch developed the REG-D1 and REG-Z1 which combine a high resolution licence plate capture camera with a colour overview camera to enable surveillance of the surrounding area, including shape, make and colour of the vehicle.

##### Camera positioning

Ideally site REG cameras by control points like barriers where vehicles have less opportunity to travel at excessive speeds or at angles to the camera. The narrower the lane the easier it is to capture the plate. REG cameras should be positioned so as to give a horizontal field of view of no more than 3m, this gives a sufficient number of pixels across the plate. For wider lanes, it may be necessary to use more than one camera or install traffic calming measures.

Ensure a clear line of sight from REG to the vehicle at all times. The camera should not be positioned too high above the road; the shallower the angle the better, ideally no more than 40 degrees (see Figure 1). The distance to the centre of the lane determines the angle of incidence – this must also be less than 40 degrees. This set-up provides the best possible opportunity to capture the plate for playback and analysis.

Be sure to select the correct REG camera for the distance you need to cover. REG cameras are calibrated to provide a minimum plate to screen width of 18%, this is the minimum percentage Bosch recommend for use with OCR (Optical Character Recognition) software. The plate image will appear larger at the near end of the capture zone and smaller at the far end, if the application requires a greater range in conjunction with a higher % FOV then Bosch recommend selecting a REG camera with a greater focal length. Bosch's new REG-SENTRY ALPR based access control system requires a minimum plate to screen ratio of 22%.

##### High speed cameras for high speed vehicles

Within a conventional CCTV shutter interval of 1/50 seconds, a vehicle travelling at 60mph will move approximately 20 inches. Under these conditions the camera is not shuttering fast enough to capture a clear licence plate image and would appear blurred. REG Series cameras shutter at speeds of 1/1000 seconds to ensure images are clear, high contrast and suitable for use with ALPR software.

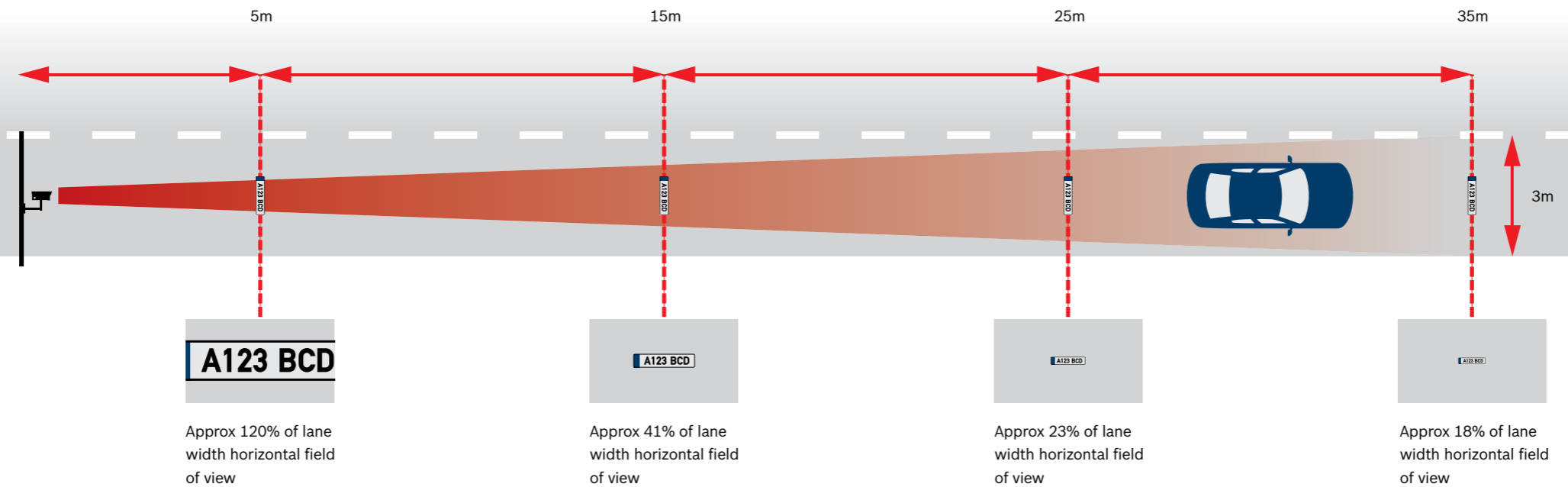
##### One camera, one lane

Installations can fail where a single camera is set-up to cover more than one lane; in and out of a car park for example. Although the camera is dedicated to capturing the licence plate, by attempting to cover too wide an area image size and quality can be compromised.

Remember! A single REG camera should cover a lane no wider than 3.5m, any wider and image quality may be compromised, accuracy of the licence plate image is paramount especially when it is intended to be used with intelligent software.

##### The importance of infrared

Infrared illumination is critical for successful ALPR applications. REG cameras filter out all visible light, leaving only infrared light which is used by the camera to solve the problem of glare caused by headlights, sunlight and wet road reflections. Using high intensity IR light in this way also helps REG cameras capture dirty or obscured plates.

Figure 3  
Horizontal Field  
of View

### Recording and compression

DVRs compress images during conversion from analogue to digital. While compression is fine for many surveillance applications it works by cutting the file size of each image to save on memory. Avoid compressing images too much, doing this reduces the resolution of the licence plate image and can render it useless. Also be aware DVRs with black level drop out can occasionally report a false camera fail.

**Remember!** Quality images are the key to a successful ALPR applications. A simple test is to play back the recorded images to determine if they are fit for purpose.

### Capture and recognition

Although the two terms are often confused and sometimes interchanged they are very different.

Capture refers to the process of imaging the licence plate; it has nothing to do with recognition or interpretation in an intelligent manner.

Recognition – as in Automatic Licence Plate Recognition or ALPR – refers to the intelligent software process of reading, recognising and analysing captured images. Optical character recognition (OCR) is used to create an alphanumeric data string of the licence plate characters, the data is then saved digitally and can be transmitted to a remote location using the internet, wireless broadband or other transmission systems. The digital record can then be searched for, reviewed, compared to active database and used to trigger commands like opening barriers.

Identifying whether a project requires capture or both capture and recognition at an early stage is essential.

The diagram above (Figure 3) highlights why choosing a correctly calibrated REG unit is so critical – notice the final viewing images on the screens above. REG Series cameras are calibrated to provide a maximum plate to screen width ratio of 18% (or 170 horizontal pixels, 16 vertical pixels per image field) for non-software based applications plate to screen ratio may be less critical.

The example shown assumes that the licence plate is exactly central to the lane – this rarely happens so a good system design must allow for the horizontal location of the licence plate to vary by as much as 1.75m.

### Getting it right

In conclusion no matter what the requirement the key to a successful ALPR system is the reliability and capture capabilities of the cameras at the front-end. High quality licence plate images 24/7 are essential; to achieve this requires a combination of good installation practices, and the right equipment.

The first step is to identify the level of intelligence required, Avoid over-specifying by identifying the intelligence needed from the outset – entry level, intermediate or advanced level – consider on key issues and challenges involved and select the right REG Series camera for the job.