INTRODUCTION

This booklet provides a comprehensive overview of our various panorama concepts including the high-end Logipix Panorama Cameras and the Virtual Panorama. You will have an exclusive insight on the hardware units, the embedded Artificial Intelligence and the advanced display technology, which together result in a complete solution that determine the future of video surveillance.

All images in this booklet were taken by Logipix cameras

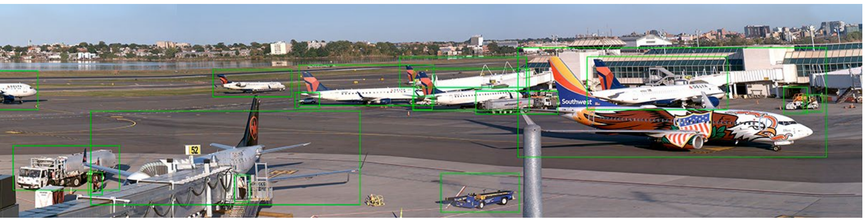
CHALLENGES OF **WIDE AREA SURVEILLANCE**

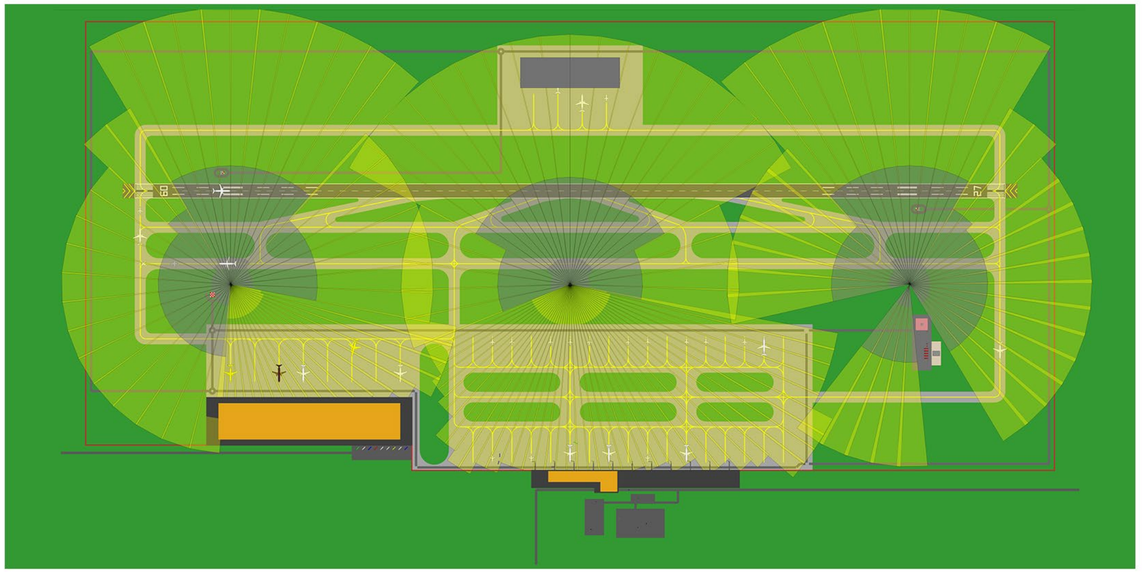
Efficient wide area surveillance is a significant challenge. A video surveillance system comprising hundreds of traditional IP cameras is not able to effectively cover a vast area.

If operators have to scan through a large number of camera images, important things might go unnoticed. Monitoring becomes exhausting really fast and accurate visual orientation is almost impossible. Archive playback can be also difficult from multiple cameras and in addition the individual image streams are not synchronized.

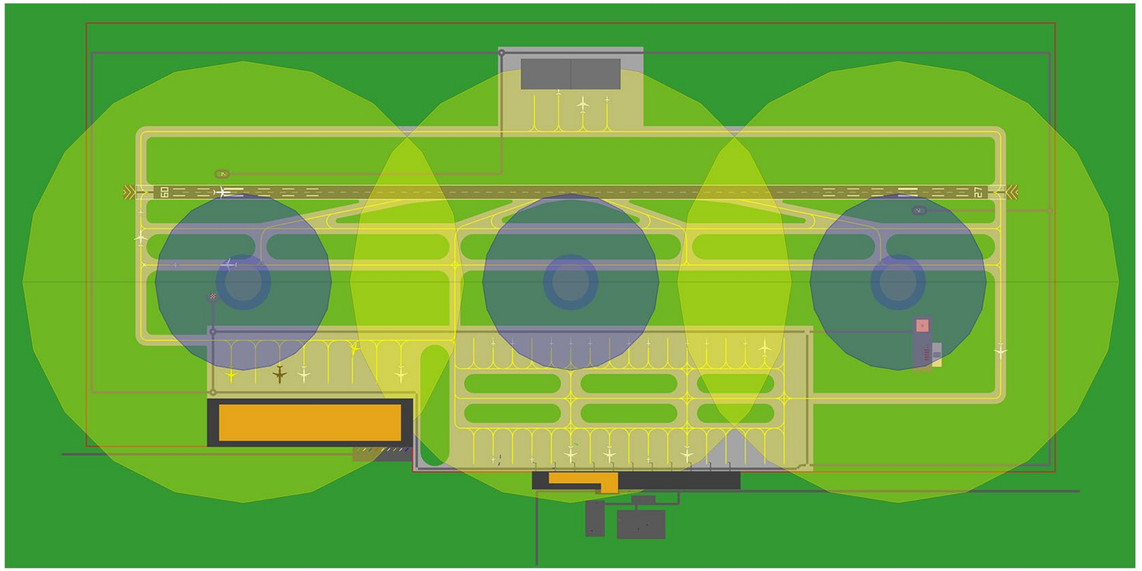
Furthermore those cameras deliver visual information of only a thin defense line. Installation and maintenance is also time-consuming and expensive with a traditional system.

> Logipix, however, has effective Panorama solutions that solve many issues of wide area video surveillance.





Full coverage by 261 pieces of traditional 2 MP cameras



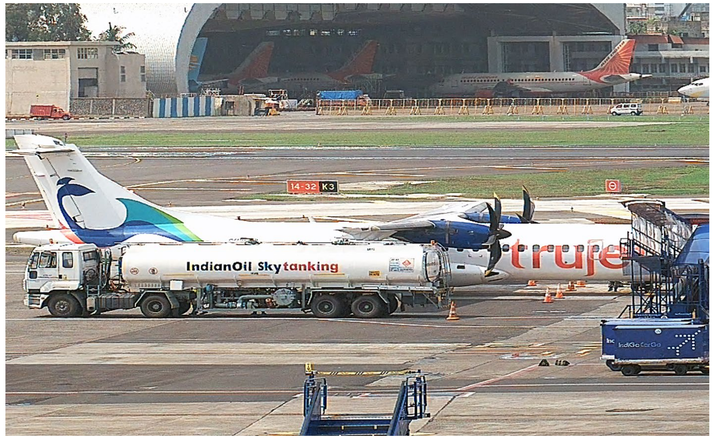
Full coverage by 6 pieces of 200 MP Logipix Panorama Cameras

OUR ANSWER FOR
WIDE AREA SURVEILLANCE

Logipix engineered a leading-edge panoramic technology in order to make the video surveillance of vast areas more effective. The high-resolution panoramic images ensure better spatial awareness for operators, as the view is displayed contiguously, which helps visual orientation within immense areas.

The essence of this technology is the precise 3D geometric stitching of images taken by individual image sensors. This development allowed our company to diversely design panorama solutions. We provide multi-sensor Panorama cameras in various concepts and also freely structurable Virtual Panoramas built from several individual high-resolution cameras.

Distance of the registration number: 80 m



Distance of the fuel tanker: 225 m

Click to watch the video

Logipix Panorama Camera - Checking tail numbers

Device: Logipix 180° 200 MP Panorama Camera Image info: detail (50% of the full image)

THE LOGIPIX PANORAMA
IN A COMPLETE SYSTEM

	PANORAMA CAMERAS						VIRTUAL PANORAMA
CAMERA TYPE	40° 320 MP & 6 MP Dual Vision	40° 320 MP	180° 300 MP	180° 200 MP	20° 200 MP	10° 100 MP	Variable structures built of 20 MP single cameras
STITCHING	Triple row arrangement + single raw arrangement	Triple row arrangement	Double row arrangement	Single row arrangement	Triple row arrangement	Triple row arrangement	Freely customizable arrangement
VISION	Visible light & thermal	Visible light					
DESIGN	General | Airport | Military grade | Marine grade						Custom camera housings
EMBEDDED INTELLIGENCE	Video Content Analysis						
RELATED NVR	Network Video Recorder 4th gen						
COMPLEMENTARY COMPONENTS	Long-range PTZ | 6 MP PTZ | IR Flash | Thermal camera | Radar						
VIDEO MANAGEMENT SOFTWARE	Control Center Professional or Ultimate | Command & Control Center | LAARS						

Panorama camera
180° 200 MP (white finish)

Panorama camera
180° 200 MP (black finish)

Panorama camera
40° 320 MP (white finish)

Panorama camera
40° 320 MP (black finish)

Panorama camera
40° 320 MP & 6 MP Dual Vision

Panorama camera
180° 300 MP (white finish)

Panorama camera
20° 200 MP (white finish)

END-TO-END

LOGIPIX SOLUTIONS BASED ON THE PANORAMA

LAARS

A few Panorama cameras are able to effectively cover the airside areas of even the largest airports. Thanks to the enormous resolution, operators get a realistic visual representation of the entire airside and they can observe it just as in case of direct out-of-the-window observation. The Panorama cameras create the basis of the accurate Video Content Analysis functions, which increasingly facilitates monitoring at the airside.

Related panorama cameras:
180° 200 MP | 180° 300 MP
40° 320 MP
40° 320 MP Dual Vision

Border Video Surveillance

Panorama cameras can play a key role in border surveillance as they can cover long kilometers of border sections and also monitor the surrounding area of the defense line in depth. Using the Dual Vision Panoramas, humans can be detected even from 3 kilometers away automatically in all lighting conditions. The Thermal Panorama extension provides images for accurate target tracking in challenging visibility conditions.

Related panorama cameras:
40° 320 MP
40° 320 MP Dual Vision

Critical Infrastructure Video Surveillance

The Panorama solution can aid the protection of critical infrastructures that hold great importance and may experience significant threat. Thanks to the panoramic images, critical situations can be understood more easily in context, which supports quick decision making and allows much better control of any threatening situation.

Related panorama cameras:
180° 200 MP | 180° 300 MP
40° 320 MP

Stadium Video Surveillance

The Logipix Virtual Panorama camera was specially developed for video surveillance in stadiums. Its flexible camera structure is ideally suited for all stadium designs and sizes. The large panoramic images ensure face recognition at every seat in the stadium, resulting in safe and secured events in the venue.

Related panorama cameras:
Logipix Virtual Panorama

Safe & Smart City

As Panorama cameras are developed to cover large areas and provide intelligent surveillance functions, they are able to make cities safer and more secured. They can efficiently monitor huge city squares and green parks. Thanks to their resolution the panoramas deliver images that are suitable for human identification from more than 100 meters away.

Related panorama cameras:
180° 200 MP | 20° 200 MP
10° 100 MP

Other wide areas

Logipix Panorama Cameras are appropriate for diverse wide area surveillance tasks. Beside they effectively cover immense areas, they can be prepared to provide various computer vision functions in order to facilitate video surveillance.

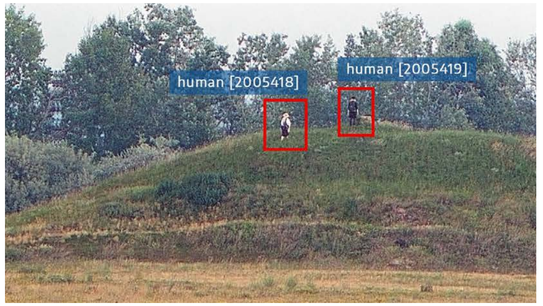
Related panorama cameras:
40° 320 MP | 40° 320 MP Dual Vision
180° 200 MP | 20° 200 MP
10° 100 MP | Virtual Panorama

WHAT DIFFERS OUR
PANORAMA TECHNOLOGY

- Logipix geometrically merges images at the image borders resulting in a contiguous panoramic image just as if it were taken by a single sensor camera.
- Synchronized imaging ensures that stitched panoramic images remains glitch free near the stitching borders too without object duplication or hidden object anomalies.
- Logipix uses adaptable white balance and image tone correction algorithms to smooth gradient differences in the panoramic image.
- Thanks to the precise image synchronization and special stitching technology zooming and panning are seamless at the stitching borders as well.
- Logipix delivers 20 fps panoramic video streams with hundreds of megapixel resolution.
- We developed a special technology to handle large visual data and utilize the full resolution during monitoring.
- Intelligent Video Content Analysis (VCA) is performed on full resolution JPEG2000 image streams.
- Logipix VCA is able to seamlessly track objects even if they move across stitching borders in the panoramic image.
- Logipix Sensor Fusion Technology makes it possible to fuse the data of image sensors, thermal imagers and external surveillance sensors, therefore realizing a more accurate analyzes and reliable computer vision in complete systems.
- Logipix provides automatic PTZ control, based on the tracking information of Video Content Analysis algorithms that run on the stitched panoramic images.

Click to watch the video

Border Surveillance - Automatic Target Detection at Dusk



Distance of target: [2005418]: 1305 m [2005419]: 1312 m

Distance of target: [2005412]: 470 m [2005417]: 1860 m

Device: Logipix 40° 320 MP Panorama Camera Image info: detail (65% of the full image)

FINANCIAL **BENEFITS**

- **Reduced infrastructure requirements**

  No need to install numerous poles or masts for individual cameras. The network infrastructure is far less complex and cabling is also fast and easy.

- **Long lifetime**

  Logipix technologies ensure the Panorama Cameras are prevented from both physical and technological obsolescence for a long time.

- **Uninterrupted operation**

  The Logipix Panorama Cameras are developed to operate with high MTBF.

- **Designed to last**

  Logipix Panorama Cameras can withstand intense weather conditions. They are full metal constructions with built-in heating and cooling systems, and they are also available made of marine grade materials.

- **No need for frequent maintenance using human resources**

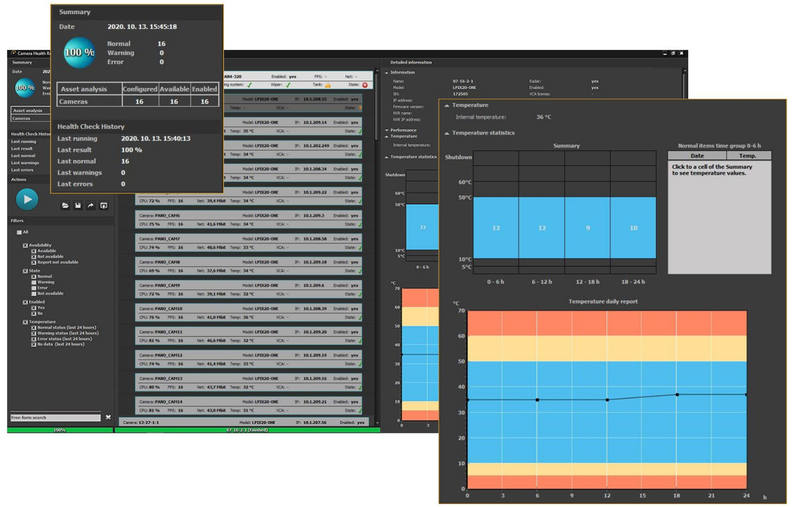
  The Panorama Cameras are capable of self-maintenance, thanks to their built-in self-cleaning and deicing systems.

- **Low running cost, remote maintenance**

  Beside standard maintenance, which is well-planned and organized for the Logipix Panorama Cameras, Logipix provides remote maintenance as well. The system constantly gives feedback on the condition of the cameras and other components. By exploring early warnings, failures can be prevented.

- **Less manpower**

  As vast areas can be monitored with much fewer cameras that provides far better spatial orientation for viewers and also VCA based Real-time Decision Making Support, far less operators are needed for efficient surveillance.

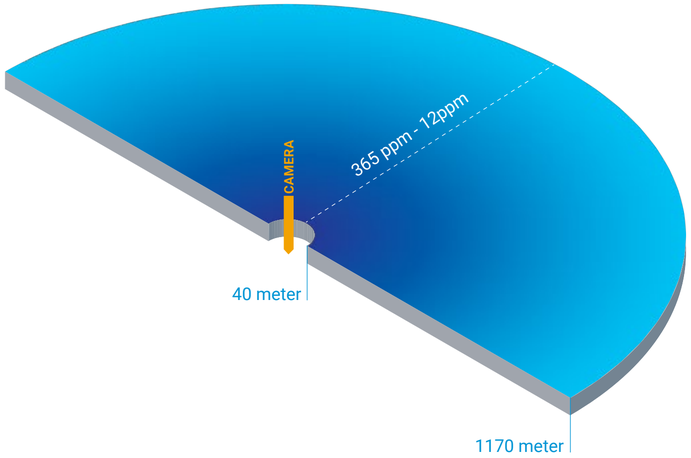


THE CONCEPT OF THE
LOGIPIX PANORAMA CAMERAS

Logipix created multi-sensor Panorama Cameras in six main designs. All of them provide hundreds of megapixels and 20 fps at full resolution to surveil vast areas from a single viewpoint. The Logipix Panoramas cover the largest areas possible with the highest resolution.

Logipix 180° 200 MP Panorama Camera

- effective coverage area: 40 - 1170 meter
- blind area: 0 - 40 meter

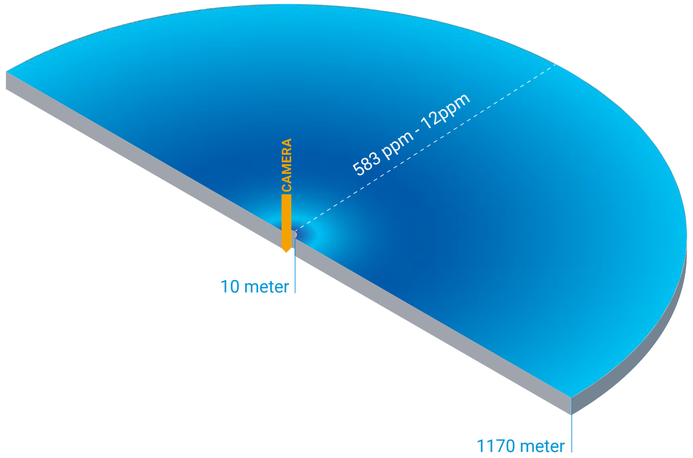


365 ppm - 12 ppm

40 meter — 1170 meter

Logipix 180° 300 MP Panorama Camera

- effective coverage area: 10 - 1170 meter
- blind area: 0 - 10 meter

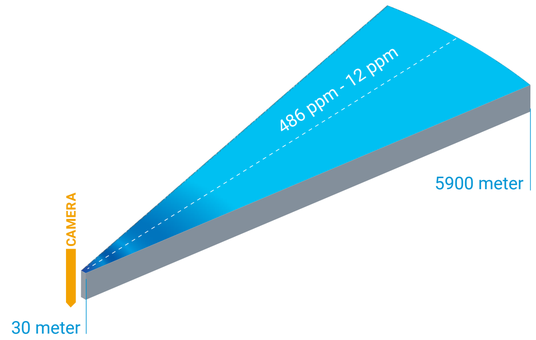


583 ppm - 12 ppm

10 meter — 1170 meter

Logipix 20° 200 MP Panorama Camera

- effective coverage area: 30 - 5900 meter
- blind area: 0 - 30 meter

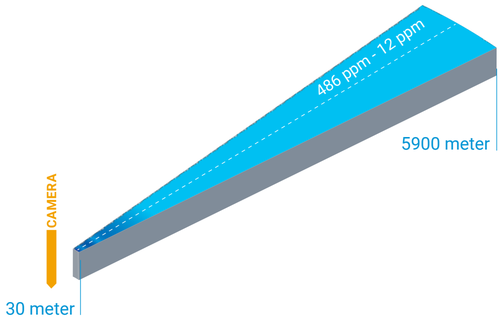


486 ppm - 12 ppm

30 meter — 5900 meter

Logipix 10° 100 MP Panorama Camera

- effective coverage area: 30 - 5900 meter
- blind area: 0 - 30 meter

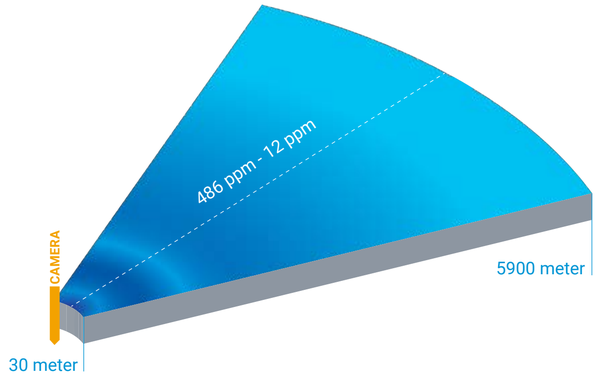


486 ppm - 12 ppm

30 meter 5900 meter

Logipix 40° 320 MP Panorama Camera

- effective coverage area: 30 - 5900 meter
- blind area: 0 - 30 meter



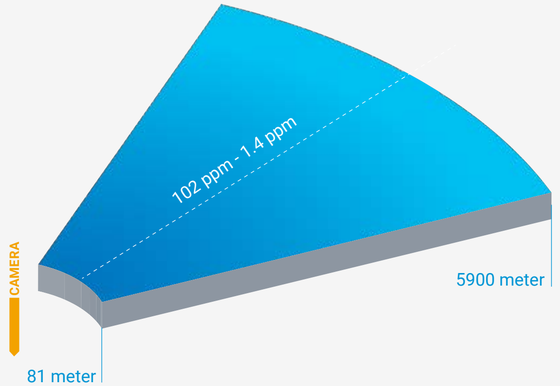
486 ppm - 12 ppm

30 meter 5900 meter

Logipix 40° Thermal Panorama extension

- effective coverage area: 81 - 5900 meter
- blind area: 0 - 81 meter

The thermal panorama module, built inside the 320 MP Dual Vision Panorama Camera has an effective coverage area that is equal to the 320 MP resolution visible-light module. A much lower resolution is sufficient for accurate automatic detection and classification during thermal surveillance.



102 ppm - 1.4 ppm

81 meter 5900 meter

SURVEILLANCE
IN THE LONG WAVELENGTH
IR ELECTROMAGNETIC RADIATION

UNBEATABLE **RESOLUTION**

Logipix applies several specifically developed, high-quality sensor-lens combinations within massive, purpose-designed camera units. Their enormous resolution ensure the cameras deliver useful visual information from even kilometers away.

	AUTOMATIC DETECTION AND TRACKING BY COMPUTER VISION			
PANORAMA CAMERA	Human (23 ppm)	Light vehicle (12 ppm)	Heavy vehicle (8 ppm)	Airplane (2 ppm)
40° 320 MP *	3 000 m	5 900 m	8 860 m	35 400 m
180° 300 MP	600 m	1 170 m	1 760 m	7 048 m
180° 200 MP	600 m	1 170 m	1 760 m	7 048 m
20° 200 MP	3 000 m	5 900 m	8 860 m	35 400 m
10° 100 MP	3 000 m	5 900 m	8 860 m	35 400 m

* Also with Thermal Panorama extension

Distance of the excavator: 180 m

Click to watch the video

Industrial port surveillance

Device: Logipix 180° 200 MP Panorama Camera Image info: detail (59% of the full image)

PIONEERING TECHNOLOGIES
TO PRODUCE HIGH-END QUALITY

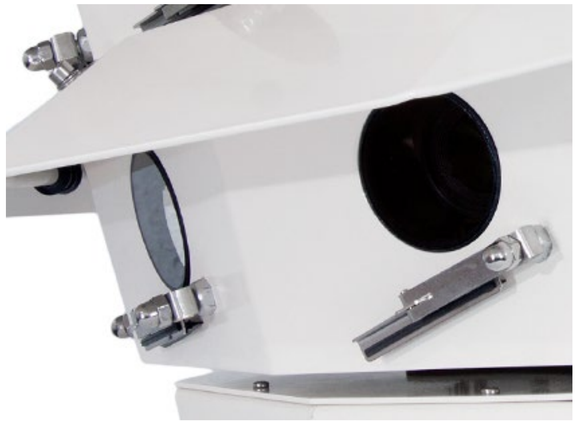
High-quality lens
Sharp details in the image corners too, which further improve the quality of the stitched panoramic image

Multiple 1” size CMOS sensors
Exceptional dynamic range, details in both shady and bright areas

Custom-designed chip
Full control over image processing, effective computing performance utilization

Embedded AI
High-performance environment for calculations and data processing on the full resolution raw video

JPEG2000 image compression
Dynamic resolution scalability for smart display of large panoramic videos



High-grade materials
The Panorama cameras are built to last. The all-metal construction of the camera housing with quality glass windows and sunshields result in a massive, robust, reliable construction that can withstand extreme environments. The Logipix Panoramas are also available made of marine grade materials.

Advanced thermal control
The cameras are equipped with a complex thermal control system in order to operate properly in intense temperatures and both humid and dry conditions. The fans, heat pipes and glass heating make ensure that the inside temperature of the camera always remains within the operational value.

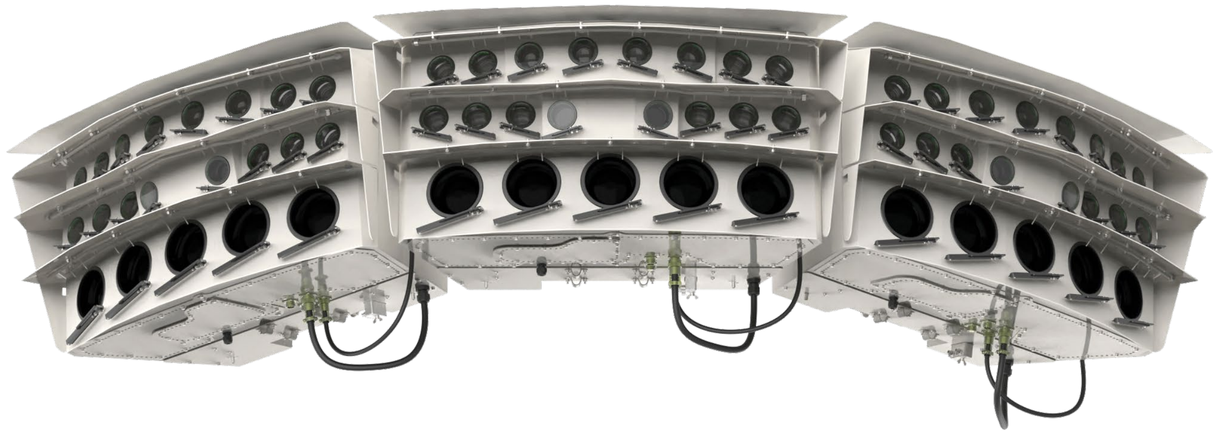
Self-cleaning system
All Panorama cameras can clean their own front glasses, thanks to their built-in water tank and wiper system. The high-quality rubber blades and the cleaning liquid ensure the wear-free cleaning of the windows. Even heavy dirt can be washed with this technique. The procedure can be scheduled and automatically started, so maintenance of the camera is easy, fast and effortless. The devices are able to send warnings if their water tank needs to be refilled, which is a one-man action, thanks to the smartly designed water pump system.

De-icing
In some environments the extreme cold may cause operational difficulties for video surveillance systems, but not for the Logipix Panoramas. Remotely controlled concentrated glass heating and zone-divided, contact-based house heating ensure to melt down ice, frost or accumulated snow from the surface of the device.

CROSS-MAPPED
VISIBLE-LIGHT AND THERMAL IMAGING

The Logipix Dual Vision Panorama takes images utilizing both the visible-light and the long wavelength IR Electromagnetic Radiation. The 320 MP visible-light module is completed with a 6.6 MP Thermal Panorama extension. The thermal camera is designed to see the very same area that the visible-light module does. Covering this broad range of ER spectrum the camera can be used in all visibility conditions, including zero-lighting scenarios and thick foggy and hazy weather conditions.

The images of the two panorama modules are cross-mapped. Each pixel of the thermal sensor is assigned to a group of pixels of the visible-light sensor. Therefore, these two types of sensors complete and strengthen each other, forming the most powerful camera for wide area surveillance. The AI-based VCA algorithms, which processes the image contents run on both types of images simultaneously. The outcomes of the analysis can be visualized on either images, no matter which one was the source of the detection.



Device: Logipix 40° 320 MP Panorama Camera Image info: 87% of the full image

EMBEDDED **INTELLIGENCE**

Having an extremely high-resolution video of a vast area is just the first step in making video surveillance more effective. We realized the potential in computer vision technologies, wherewith we were able to upgrade the security and video surveillance in many industries.

We developed embedded Video Content Analysis algorithms considering the specific tasks of different application areas. As Logipix analyzes the video content as close to the image sensor as possible, resolution reduction or software-based visual enhancement algorithms do not disturb the calculations. High-resolution panoramic images and accurate VCA together create a powerful combination that provides reliable automatism in video technology.

	Airside	Border	Critical infrastructure	Safe & Smart City
Object detection	+	+	+	+
Object / target tracking	+	+	+	+
Object classification	+	+	+	+
Geofencing	+	+	+	+
Virtual fence	+	+	+	+
Collision prediction	+	Not relevant	+	Not relevant
Proximity alert	+	Not relevant	+	Not relevant
FOD detection	+	Not relevant	Not relevant	Not relevant
Local traffic enforcement	+	Not relevant	+	Not relevant
Object history	+	+	+	+

OBJECT **HISTORY**

The specially developed Logipix VCA and advanced server applications make it possible to manage video history differently compared to conventional solutions. Logipix allows for object-based archive search. Operators can search for different types of objects, objects with registered IDs, status changes of objects, or objects that were staying in specific areas in specific time intervals. This method greatly facilitates search procedures, specially in areas where hundreds or even thousands of objects are moving 24/7.

Device: Logipix 180° 200 MP Panorama Camera Image info: detail (13% of the full image)

SENSOR FUSION

Logipix created a special technology wherewith the information of the sensors and external sensors can be fused. Sensor Fusion results in a more accurate analysis as algorithms can rely on a broader spectrum of reality. The extreme high-resolution visible-light and thermal image data can be augmented by radar data and other surveillance sensor data from sources, like seismic detectors or fiber optic sensors.

Thermal sensors are able to deliver useful visual information even when visible-light and short wavelength IR electromagnetic radiations are less informative. Surveillance radars see behind dense vegetation and can be also useful in pitch darkness. Logipix analyzes the data of several sensors together for accurate detection, classification, geopositioning and speed measurement. It is able to visualize layered images together and always highlight the most relevant objects with regard to the current monitoring task.

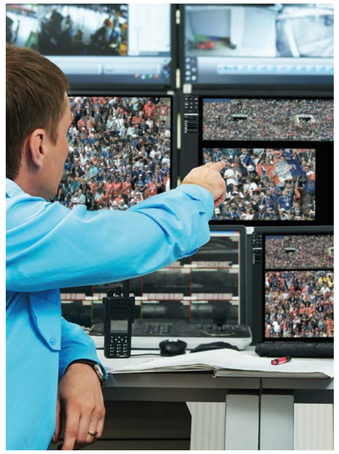
IN THE MONITORING ROOM

Utilizing the full resolution of large panoramic images during live monitoring or archive playback is not a straightforward task. If we would transmit full panoramic images constantly, it would take an unmanageable load on the network infrastructure.

Otherwise, as our Panorama Cameras use the JPEG2000 image compression we were able to overcome this issue.

Utilizing the resolution scalability of this compression standard the Video Management Software displays only the relevant pixels in the monitoring room. The resolution of the transmitted images always adapt to the screen resolution. This way full panoramic overviews are transmitted in lower resolution, but when users zoom in, the system sends the cropped image in higher resolution. As the zoom value increases, so does the transmitted image resolution.

Operators can use multiple zoom windows on a single panoramic image. They can perform monitoring tasks just as if they were using multiple PTZ cameras, but at the same time they also get a large overview. Working with this technique operators have better spatial awareness in the whole monitored area and they are able to surveil and understand situations in a more complete context.



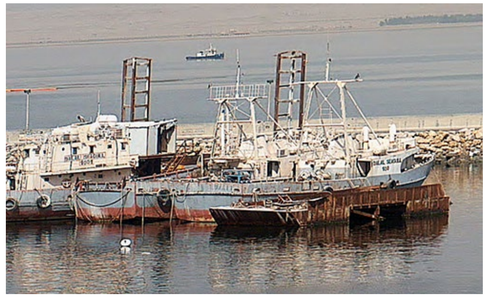
Device: Logipix 40° 320 MP Panorama Camera Image info: detail (25% of the full image)

ADVANCED **ZOOM FUNCTIONS**

- **Panorama and PTZ camera cross mapping** – This specially developed function allows the Panoramas and PTZ cameras to be assigned by registering common spatial points that are visible to both cameras. The function allows for automatic PTZ control based on VCA algorithms that analyze the images of the Panorama Camera.
- **ePTZ** – ePTZ is an automatic zoom function wherewith operators get detailed visual information on situations in no time. In case the VCA or any configured external source triggers an alarm, a close-up appears immediately of the detected object in an individual zoom window. The system tracks the motion of the source object automatically. Both the Panorama Camera itself and an assigned PTZ camera can deliver the tracking zoom image of the detected object.
- **Zoom tour** – Several predefined zoom positions can be assigned to the panoramic view. Operators can step these presets and navigate the zoom position within the panoramic image and they can even step between several Panorama cameras. This way the entire covered area can be inspected easily. Also automatic tours can be configured from these presets that scan through the desired area in a specified sequence.

Click to watch the video

Port coverage



Distance of the rear boat: 1500 m

Distance of the license plate: 35 m

ASSOCIATED **INTERACTIVE MAP**

Logipix allows to associate interactive maps with the panoramic image. The map shows the objects that are visible in the panoramic view as real-time moving, color-coded icons. This way operators can monitor situations in a more extensive context and they can easily select objects to display close-ups of them in automatically tracking zoom windows.

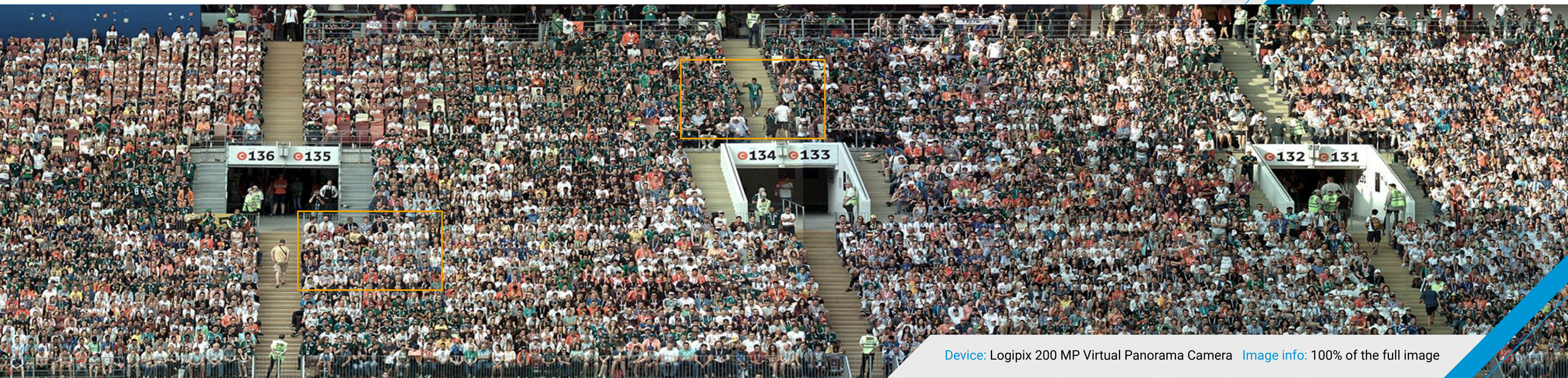
Device: Logipix 180° 200 MP Panorama Camera Image info: detail (70% of the full image)

THE CONCEPT OF THE VIRTUAL PANORAMA

Logipix recognized there are certain areas that can be covered more effectively if the number and also the position of the cameras can be freely customized. As our panorama technology allows to stitch the images of individual Logipix cameras, we created the Virtual Panorama.
The solution is based on several individual 20 MP Logipix camera images that are stitched together to create expanded panoramic views with resolutions up to hundreds of megapixels. There are neither hidden nor redundant areas in the stitched images. As the devices are installed individually, the structure of the camera system is easily tailored to newly emerging needs.

Click to watch the video

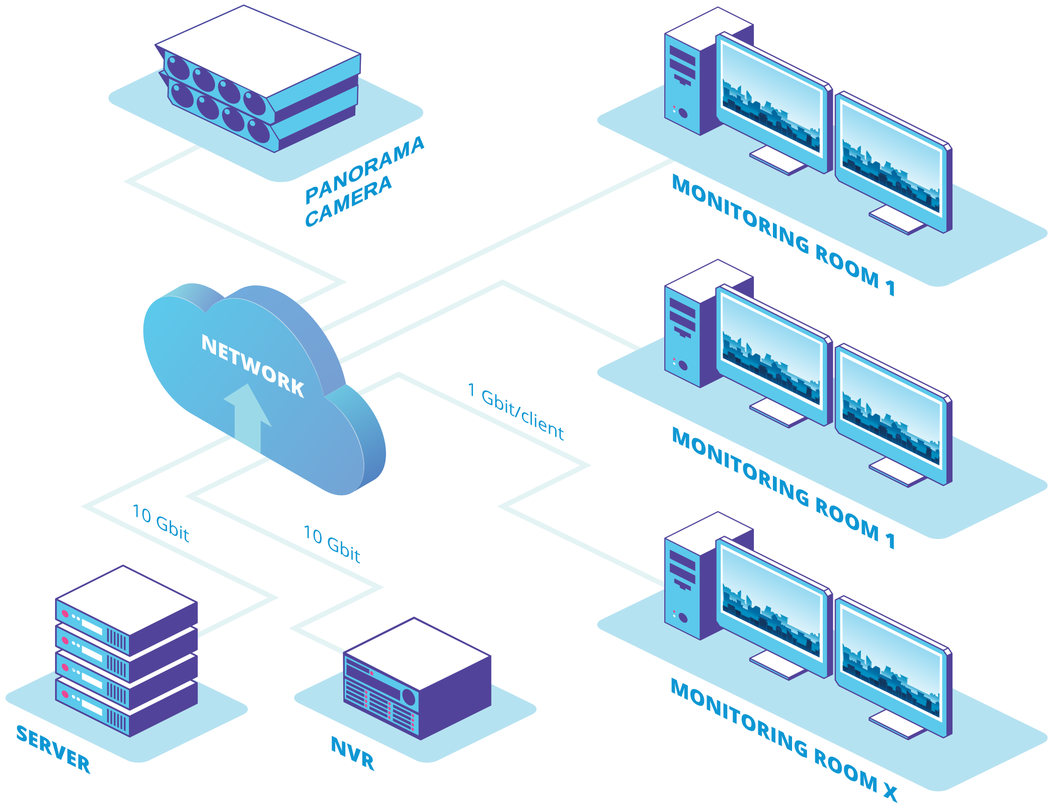
Logipix Stadium Video Surveillance



Device: Logipix 200 MP Virtual Panorama Camera Image info: 100% of the full image

MULTI-USER **ACCESS**

Multiple users can access the Logipix Panoramas at the very same time. This allows synchronous work for operators in the same monitoring room or even simultaneous operation of different monitoring rooms, which are set up for different monitoring purposes.



RECORDING

Different models of the 4th generation Logipix Network Video Recorders are specifically designed to handle the huge amount of data that the Panorama cameras produce. Logipix NVRs have up to 256 TB storage capacity and can be customized to individual needs. Some models of the 4th generation design can be further expanded with our specially-developed external storage units, reaching a total of 768 TB capacity. Logipix always considers the specific surveillance task and designs the most suitable storage system and storage management that helps keep costs at bay.

STRENGTHS OF THE
LOGIPIX PANORAMAS

- Our specially-developed stitching technology provides a seamless panoramic view without object duplication or hidden objects and disturbing color gradient differences at image borders.
- Dual Vision Panorama Cameras provide a thermal imaging module that covers the exact same area that the visible-light module does. The images of the two modules are cross-mapped pixels-by-pixels. Together, they ensure a broader range of spectrum for more effective surveillance.
- The Logipix Panoramas provide large panoramic images with a resolution high enough for face recognition and also for automatic detection of humans even from kilometers away.
- Logipix uses the scalable JPEG2000 image compression standard, which makes it possible to utilize the full resolution of the Panoramas during monitoring.
- Large panoramic images ensures better spatial awareness for operators within the monitored area, as the space is not split by individual cameras on a confusing monitor profile.
- Operators can use multiple zoom windows for the Panorama camera just as if they were using several PTZ cameras simultaneously. They can utilize the benefits of hundreds of megapixels during live monitoring and archive playback.
- Combining high-end panorama technology with computer vision algorithms enables the effective video surveillance and accurate analyses of even compound situations within an immense area.
- Logipix Panorama and VCA makes it possible to accurately track hundreds of objects at the same time.
- Maintenance procedures are easy and cost-effective as less resources are needed.