TECHNOLOGY WHITE PAPER

TOWER-10AM / TOWER-12AM

TOWER-10AM and TOWER-12AM are new harsh environment industrial intrusion detectors from Visonic. Employing several revolutionary patented technologies, these detectors introduce detection sensitivity, anti-vandalism and anti-masking capabilities that go far beyond anything previously available in the market. This white paper describes the design, technology and functionality innovations behind the TOWER® detectors’ unprecedented performance.

Visonic®
For a secure way of life
## CONTENTS

**INTRODUCTION** 2

1. **VANDAL-RESISTANT, ROBUST DESIGN** 3-6
   1.1 V-Slot® Technology 3-5
   1.2 Ultra-strong Closing Mechanism 5
   1.3 Robust Design - Worthy of the TOWER Name 6-7

2. **SUPERIOR RANGE AND COVERAGE AREA** 6-9
   2.1 Combination Elliptical-Parabolic Mirror Optics 7
   2.2 Obsidian Black Mirror™ Technology 8
   2.3 Efficient Optical Window 9
   2.4 Better Immunity to False Alarms 9

3. **COMPLETE ACTIVE-IR ANTI-MASKING BUNKER PROTECTION** 9-10

4. **FULL COMPLIANCE WITH GRADE 3 EN 50131-2-2 AND EN 50131-2-4** 11

5. **INSTALLER-FRIENDLY FEATURES** 11

6. **OTHER FEATURES** 12

7. **CONCLUSION** 12
Introduction

With the new TOWER-10AM (PIR) and TOWER-12AM (dual technology), Visonic is once again revolutionizing the intrusion detection industry.

These two new members of the TOWER® series represent a new era in motion detector technology, design and reliable performance. They are specially designed to address the harsh environment challenges involved with protecting large industrial, commercial, institutional and governmental sites, including public places such as museums, schools, hospitals, stores, and transportation stations.

The TOWER-10/12AM detectors are designed completely differently to any detector available today. They are constructed differently, they look totally different and their performance is far superior to any other detector in the market. Although they are relatively small in size, they are extremely powerful, providing a wide range of features and capabilities, as well as a high level of reliability that was never before possible.

The revolutionary technology behind the new TOWER family of detectors is protected by eight new patents and several existing patents, all owned by Visonic.

The main features of the TOWER-10/12AM detectors are:

1. Vandal-resistant design
2. Extremely large coverage area: 25m x 30m / 90° (82ft x 100ft / 90°)
3. Complete, virtually undefeatable anti-masking protection
4. Full compliance with 50131-2-2 and 50131-2-4 Grade 3.
1. Vandal-resistant, Robust Design

Detectors installed in industrial, commercial and institutional sites, including public places such as museums, hospitals, schools, governmental offices, and bus and train stations are often subjected to intentional and unintentional acts of vandalism and damage that sooner or later render the detectors inoperable.

Bearing in mind these tough conditions, and with the goal of creating the most impenetrable set of defenses for the detectors, Visonic designers chose to explore challenging new design routes for the TOWER-10/12AM. Their revolutionary approach resulted in superior vandal resistance that addresses the special harsh environment challenges of such sites better than any other comparable detector in the market.

The building blocks of the TOWER 10/12AM vandal-resistant design are described below.

1.1. V-Slot® Technology

The most critical and vulnerable part of PIR and Dual Technology detectors is the optical lens or window positioned at the front of every detector. Due to their conventional optical design, the window or lens of the detectors available today, aside from the new TOWER-10/12AM detectors, is made of a thin and very sensitive plastic material that is usually very large in size, occupying anything from 30% to 70% of the detector’s face. The large size of the window or lens is mandatory to provide the wide angle field of view and large coverage pattern of these detectors.

Fig. A: Typical detectors (left) have a large, protruding window that is vulnerable to vandalism, while the TOWER-10/12AM detectors have a small, recessed slot that is almost impossible to break.
A second drawback of the detectors available today is that their window or lens is either flat or convex, protruding from the front of the detector casing. This makes them highly sensitive and very vulnerable to mechanical damage and vandalism.

As a result, any moderate pressure or impact applied to the optical window or lens of such detectors can easily tear, deform or severely damage the detector’s window or lens, rendering the detector inoperable.

To solve these problems, the TOWER-10/12AM detectors employ a revolutionary new patented optical design concept named V-Slot Technology.

Instead of using a conventional large, protruding and hence vulnerable, window, the TOWER 10/12AM detectors use an exceptionally small and narrow slot window with a recessed shape, which is extremely strong and very well protected against mechanical damage and vandalism.

The primary advantage of the V-Slot technology used in the TOWER-10/12AM is its exceptionally small optical slot, which replaces the traditional large window. This narrow slot has many advantages and is a key element in the vandal-resistant design of the TOWER detectors.

To enable the small slot to provide a large field of view (FOV), the TOWER detectors use a revolutionary patented mirror constructed from both elliptical and parabolic segments. This unique construction enables curtain-like "beams" positioned in a concentric orientation and sharing a common cross point. Because the cross point is extremely small and narrow, an extraordinarily small optical slot can be positioned exactly at the cross point of the beams without obstructing the wide FOV of the detector.

Fig B: The slot is positioned exactly at the intersection point of the PIR beams, allowing a 90° FOV despite the small size and recessed position of the slot.
Summary of the V-Slot approach

Visonic’s unconventional and unique V-Slot technology enables both a very wide field of view and an extremely large coverage area of 25m x 30m (82ft x 100ft) / 90°.

The FOV and coverage pattern is constructed of 11 curtain-like PIR beams with 11 true creep zones – all using a very small slot that is just 15mm x 30mm (0.6in x 1.2in).

This small, recessed slot provides wide angle coverage with extraordinary strength and protection against vandalism, thus rendering the TOWER-10/12AM virtually vandal-proof and the ideal solution for harsh-environment industrial and commercial applications.

1.2. Ultra-strong Closing Mechanism

With the TOWER line, Visonic is introducing an entirely new concept in detector casing design. The common method of closing the cover over the base depends on a hinge-like mechanism. Because there is just one point of closure, the case can be relatively easily popped open with a forceful hit.

However, the TOWER detectors use a unique, linear sliding mechanism that creates a locked closure around the full circumference of the base. The cover slides into strong grooves within the base, and the captive locking screw actually drives the cover closed over the base, shutting the detector firmly and almost hermetically.

The difference between this unique closing mechanism and the common method is much like the difference in strength between a regular, hinged door and a sliding door: it is the major reason that high-risk sites, such as jail cells, use sliding doors.

Fig. C: The unique, strong closing mechanism creates a locked closure around the entire circumference of the detector case.
1.3. Robust Design – Worthy of the TOWER Name

The vision guiding the TOWER mechanical designers was to create an ultra-strong and durable detector while allowing unprecedented detection sensitivity and reliability: a detector that can stand up to the most demanding and hostile environments. The result of their groundbreaking work is a uniquely shaped robust detector that supports the inclusion of all the elements that make the TOWER detectors the de-facto standard for vandal-resistant detection.

_The guiding vision and the outstandingly strong and sturdy results earned the detectors their evocative name: TOWER._

_Just like the archers in medieval fortresses, who stood watching the enemy from behind small shooting slots in the tower, fully protected from any threat, so stands the Visonic TOWER detectors – the next generation of harsh environment intrusion detectors._

2. Superior Range and Coverage Area

Despite their compact size, the TOWER detectors provide the largest coverage of 25m x 30m (82ft x 100ft) / 90° with an optional 35m (115ft) / 5° long-range curtain coverage. Both coverage options provide a true creep zone extending virtually all the way under the detector.

*Fig. D: The large coverage of 25m x 30m (82ft x 100ft) / 90° with true creep zone is ideal for large commercial and industrial environments such as museums, warehouses, hospitals, and transportation stations. With the detector installed up to 4m (13ft) from the floor, the coverage provides a true creep zone that reaches almost all the way under the detector.*
This market-leading coverage was achieved by a unique combination of innovative technologies and features:

- Combination elliptical-parabolic mirror optics
- Obsidian Black Mirror™ Technology
- Thin, yet efficient, optical window
- High immunity to false alarms

### 2.1. Combination Elliptical-Parabolic Mirror Optics

Other mirror detectors available in today’s market use either spherical or the more efficient parabolic shaped mirror segments. With the TOWER series, Visonic introduces for the first time a totally new, patented mirror technology that use elliptical mirror optics as well as a unique combined elliptical-parabolic mirror design.

This state-of-the-art mirror technology employs unique mirror segments that have a parabolic curvature on the horizontal plane and elliptic curvature on the vertical plane. This results in a very efficient mirror with exceptionally high optical gain, delivering longer range.
2.2. Obsidian Black Mirror™ Technology

To reduce white light interference from car headlights, most PIRs in the market use either highly pigmented lenses or windows, or special silicon filters positioned in front of the pyroelectric sensor. However, the problem with these methods is that they significantly weaken the far-infrared energy (the energy emitted by humans that the detector needs to detect), thereby reducing the motion detection sensitivity, usually by 30% or more.

To solve this problem, Visonic invented yet another revolutionary patented technology: Obsidian Black Mirror™ Technology. Instead of using a conventional bright “nickelized” mirror, Visonic developed a unique black nickel coating that acts as a selective optical filter to infrared energy. This unique coating not only virtually eliminates white light interference, it actually increases the detection sensitivity. The black nickel-coated mirror provides 20% more detection sensitivity compared to conventional bright nickelized mirrors.

Due to the Obsidian Black Mirror Technology, the TOWER detectors provide more than 15,000 LUX immunity to white light – several times more immunity than required by the most demanding international standards\(^1\). At the same time, they provide up to 50% better detection sensitivity.

\(^1\) European standard 50131-2-2 and 50131-2-4 require 2,000 LUX; other international standards require immunity to 6,500 LUX.

Fig. F: The black nickel-coated mirror, which has a similar appearance to raw obsidian, eliminates white light interference and increases detection sensitivity.
2.3. Efficient Optical Window

To increase the resistance of the conventional large optical windows to mechanical damage, it is common for industrial and anti-vandal detectors to use a thick window material. However, in most cases, the thickness of the material significantly weakens the far-infrared energy, thereby further reducing the sensitivity of the detector.

Because the TOWER-10/12AM detectors use Visonic’s patented V-Slot technology instead of a conventional window, there is no need to use a thick material. The slot is very small and recessed with a concave shape that enhances its strength. These three characteristics allow for a relatively very thin, yet very strong optical window which minimizes IR energy loss, providing better sensitivity detection and accuracy with superior strength.

2.4. Better Immunity to False Alarms

The use of the V-Slot and Obsidian Black Mirror technologies provide not only better range and detection sensitivity but also significantly higher optical gain. This results in greater immunity to both electrical and environmental interferences, thereby reducing false alarms and further extending the range.

3. Complete Active-IR Anti-Masking Bunker Protection

One of the most common deficiencies of anti-masking detectors in the market is that they provide only partial protection against masking of their field of view (FOV). A sophisticated intruder can easily mask certain parts of the detector window and protection pattern without being detected. It is well known also that creep zones are very difficult to protect and in many cases are left without adequate, or even any, protection against masking.

The TOWER-10/12AM detectors are equipped with superior Active IR Anti-Masking (AM) that provides total bunker-like, virtually impossible to defeat, protection to each and every part of the detectors’ pattern, including the creep zones.
The building elements of the TOWER-10/12AM Complete Anti-Masking Bunker Protection are:

- **Ultra-small V-Slot** — Small size of the slot, as opposed to the conventional large-size window, makes it easier to protect the whole slot area. Masking of even a small part of the slot will trigger a masking alert.

- **Recessed slot design** — Keeps the slot back behind the vertical plane of the detector front, and enables it to be 100% covered by the anti-masking active IR illumination screen in front of the detector.

- **Complete IR perimeter shield** — The IR illumination is projected out from the full circumference of the slot, creating a dome-like IR shield that protects the slot from every angle and direction. As can be seen in Fig. G, the Active IR light pipe of the AM IR illumination protrudes all around the perimeter of the slot.

- **Highly effective creep zone protection** — The creep zone of the detector, which with conventional detectors cannot be well defended, is fully protected from masking due to the unique recessed shape of the slot and the IR illumination perimeter.

- **Anti-spray perimeter grooves** — Small grooves etched into the perimeter of the slot, around the circumference of the IR light pipe, intensify the sensitivity of the anti-masking circuitry, providing a full-proof defense against even the lightest spray or lacquer. These patented tooth-like grooves make a more intricate and delicate pattern of IR beams, so that even an exceptionally fine spray or light lacquer will alter the beams and therefore be immediately detected. Because of the small size of the slot, it is impossible to spray the slot without some of the spray being captured by the grooves and triggering a masking alarm.

- **Separation between the IR transmitter and receiver** — The unique inner structure of the TOWER detectors enables the IR transmitter and receiver to be located in different parts of the detector. This in turn significantly enhances the sensitivity of the anti-masking digital adaptive mechanism.
4. Full Compliance with Grade 3 EN 50131-2-2 and EN 50131-2-4

The TOWER-10/12AM detectors fully comply with Grade 3 requirements of EN 50131-2-2 and EN 50131-2-4 – the most advanced and most stringent requirements for intrusion detectors.

5. Installer-friendly Features

In addition to the unique advantages described above, the TOWER-10/12AM detector series provides many other high-value installer-friendly features, including:

- Built-in selectable E.O.L. resistors for alarm, trouble and tamper outputs
- Plug-in terminals attached to the base for easy pre-wiring
- All electronic and optical parts are protected in plastic housing
- Unique sliding closing mechanism with captive screw
- Extended mounting height of 1.5 - 4m (5 - 13ft)
- Low supply voltage indication
- Optional swivel mounting brackets
6. Other Features

- Microprocessor controlled, digital TMR signal processing
- Bi-directional dual-slope digital temperature compensation
- Front and back tamper
- True creep zone down-looking optics
- Pet immunity (18kg/40lb) using a special pet mask
- Remote controlled walk-test input
- Built-in auto diagnostic for both PIR and microwave detectors

7. Conclusion

Visonic’s introduction of the TOWER-10AM and TOWER-12AM harsh environment industrial intrusion detectors is a defining moment for the intrusion detection industry. Applying revolutionary design and construction and leveraging several patented technologies, these detectors take detection sensitivity, anti-vandalism and anti-masking capabilities far beyond anything else available in the market. Although they are relatively small in size, they are extremely powerful, providing a wide range of features and capabilities, as well as a high level of reliability that was never before possible.

Their unprecedented performance makes TOWER detectors ideal for the harsh environment challenges involved with protecting large premises, such as industrial, commercial, institutional and governmental sites, and public places such as museums, schools, hospitals, stores, and transportation stations.