Vehicle Optronics
From reconnaissance and observation to action: to see is to be prepared

Keeping the peace, securing borders and protecting civilians in theatre is a daunting challenge. To rise to it, forces must be able to track and manoeuvre any time day or night, in inclement weather, and across rugged topography. For vehicle-mounted forces, this means being able to observe and evaluate the terrain, detect and identify threats, and track with absolute assurance. Indeed, the mission’s very success hinges on the crew’s ability to see, identify, track and engage under every light and weather condition.

Drawing on a deep well of experience in optronics, Hensoldt Optronics has developed a wide spectrum of observation and targeting platforms that enables security forces to find, fix and follow targets of interest and opportunity even under the most adverse conditions. Our sensor solutions can easily be integrated into every new wheeled, tracked and armoured vehicle or may be integrated into legacy systems any time. It interfaces with both new and existing fire control systems. The long-range sensors have been stabilised to defy difficult terrain. Driver’s vision enhancers offer drivers to manoeuvre at top speeds under all light conditions.
On-the-spot identification, faster acquisition

Image and target data may be merged to give security forces a more accurate impression of the given conditions. Crews are able to respond much faster and – if necessary – acquire targets much sooner. And with that, the observation and targeting platform speeds up response time considerably. It not only saves time – in a crunch, it can save lives.

Enhanced situational awareness

Situational awareness – the ability to detect, process, and understand precisely what is happening – is critical to every security force. With the benefit of stabilised panorama viewing and targeting, the crew never loses track of the surroundings.

Networked intelligence

Vehicle-mounted crews need to know what they are seeing and where potential threats loom. This networked solution provides in real-time the information commanders need to make critical decisions quickly in today’s deployment scenarios.

Custom configurations

The observation and targeting platform may be equipped with up to three sensors such as a thermal imager, a daylight zoom camera and an eye-safe laser rangefinder. With this triple-play capability, acquiring target coordinates is an exercise in efficiency.

Our product lines

- **Vehicle Optronics**
  - Fire control and surveillance systems 4
  - Driver’s sight devices 14
  - Boresighting 20

- Airborne Optronics
- Maritime Optronics
- Surveillance Optronics
- High-Performance Optics
- Sight Systems Hensoldt Line
Fire control and surveillance systems

It could be something as innocuous as sand, snow, haze or fog. It could be the pitfalls of unfamiliar terrain. Or it could be the confusion that often accompanies action. All these variables impede security forces’ ability to perceive objects in the field. State-of-the-art optical and optronic systems can restore and even vastly enhance this ability even in the face of chaos, disorder and adverse atmospheric conditions. They can be a tremendous asset if they are precise and reliable. If they are not, they can be a great liability that put lives at risk.

Hensoldt Optronics, a company rooted in a rich heritage of inventing precision optical devices, understands this pressing need for accuracy and dependability. Our ultra-precise optical and optronic systems have been engineered to withstand adverse environmental conditions and operate day and night, in place and on the move. The peerless quality of these devices affords commanders the peace of mind that comes with knowing their security forces are free to focus fully on the crux of the matter - the mission at hand.
Nothing less than the best for our customer

Hensoldt Optronics’ name may be new, but our reputation precedes us. With well over a century of leadership in optics, our company’s skill-set is unrivalled. And our products, systems and solutions have proven their merits many times over in action. Be it reconnaissance, fire control, range finding or near-field observation – whatever the task may entail, we have a field-tested solution to get the job done.

Hensoldt Optronics offers a host of world-class, high-performance sensors for imaging, stabilisation, range-finding, target designation and networking, as well as thermal imagers, day-vision cameras and image processing solutions. Best of all, our approach is modular so every customer gets nothing less than the best in a custom package tailored to fit the given needs.
It is dusk; clouds obscure the moon. The lead battle tank in a formation rolls out across a shallow river, straddling the far bank to emerge on an open field bordered by forest. The wood-line at the far end of the field is enveloped in haze. There may be movement, but objects are impossible for the unassisted eye to make out in the murky twilight. The commander has a tough decision to make – advance, bypass, or fall back. How valuable the right tactical intelligence assets would be in moments like these.

**Main features & benefits**

- High accuracy and precision
- Compact design ruggedised
- According to MIL-SPEC
- Compact, lightweight, and
- Easy to integrate in new and existing armoured vehicles
- Multiple sensors available up to HD sensors, NIR/SWIR cameras and Laser Range Finder /Designator
- Configuration for day-sight cameras, thermal cameras and laser rangefinders.
- Including HD sensors, NIR/SWIR and Dual-band Laser Rangefinder/ Target Designator
- As gunner Sight or fully panoramic as commander sight
- Stabilised line of sight
- Additional features: multi target tracking, digital video streaming
**Stabilised and ruggedised**

When mission success depends on getting a clear view in a mercurial and often confusing environment, security forces need the highest quality, most reliable electro-optics technology available. Hensoldt Optronics furnishes a compact, multifunctional system in a compact design that offers the best in a fully integrated acquisition and tracking system. Our land-based Electro Optical Targeting System, or EOTS for short, is a stabilised and ruggedised, 24-hour day/night observation and targeting system.

**Gyroscopic-based stabilisation**

Without stabilised periscopes, main battle tanks and armoured vehicles on the move would have great difficulty observing and targeting objects. Our advanced versions enable the crew to quickly gauge the vehicle’s surroundings and detect and engage targets on the move. They feature a gyroscopic-based stabilising mechanism that compensates for movements and vibrations to keep images steady at all speeds on paved roads and even in rugged terrain. An integrated thermal imager provides sharp observation capabilities day and night and in adverse weather conditions. The on-board laser rangefinder delivers target data directly to the fire control system and connected command & control information systems.

EOTS enables gunners to immediately engage targets at long range with remarkable precision. To this end, the system accommodates three powerful sensors: a third-generation thermal imager, a highly sensitive day-vision CCD zoom camera, and an eye-safe, high-pulse laser rangefinder / designator.

The new integrated automatic tracking system further enhances EOTS’ mission-tested reconnaissance and targeting capabilities. This small, lightweight platform can be easily integrated into any vehicle or anti-aircraft system. And courtesy of its modular design, upgrades are easily accomplished.
A patrol is out on a long-range recon mission to probe what may be unfriendly territory. The clouds hang low and heavy winds are kicking up dust. Visibility is poor, so the scouts can’t call on air support for intel or, in a pinch, for added fire power. And the lightly armoured vehicles are soft targets, so their crews need to know exactly what may be out there.

Modern-day pathfinders sent out to reconnoitre the terrain and gather information deep in potentially hostile territory simply cannot do without reliable intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) capabilities. Hensoldt Optronics has further developed - on basis of the combat proven BAA II - the BAA NG (Next Generation) with high definition EO-sensors in order to detect and identify objects with authority much earlier at extended ranges and in a higher level of details. A high resolution display supports the operator with improved D/R/I capabilities.

**Laser target designator**
Directing “joint fires” is the main responsibility of Joint Forward Observers (JFO) and Joint Fire Support Teams (JFST). This is why Hensoldt Optronics has developed a compact and powerful Laser Rangefinder Target Designator which is fully integrated into the sensor head and provides additional targeting capabilities to the BAA NG.

**Main features & benefits**
- Long range performance to support far target locating
- Selectable sensor
- Configuration for day-sight cameras, thermal cameras and laser rangefinders.
- Including HD sensors, NIR/ SWIR and Dual-band Laser Rangefinder/Target Designator
- Additional features: multi target tracking, digital video streaming, image fusion, Laser target illuminator / pointer, Heat haze correction , LOS stabilization for observation on-the-move
- Extended Options:
  - High precision INU/GPS for target locating, various mast configurations
Combat proven

BAA II - Proven in action

Fielded and battlefield proven by German Joint Fire Support Teams the BAA II marks an evolutionary advance in mission proven reconnaissance, observation and target acquisition systems. The sensor head combines four high-performance sensors – a third-generation thermal imager, a high-resolution CCD camera, and as an option a laser rangefinder and a laser target illuminator. It may also be deployed remotely; that is, away from the vehicle.

An automatic movement detection function is on board to support the crew, which comes in very handy on longer-range missions. The image fusion function combines the data from the thermal imager and the CCD camera to create a single image.

The BAA NG is the consequent enhancement of the combat proven BAA II and combines the years of mission-experience by German armed forces with the high-performance sensors latest technology and new patented image processing algorithm’s to provide best ISTAR capabilities for future challenges.
In a combat environment like in Afghanistan, dust and haze are all-encompassing. It is in these hostile conditions, that an MBT Leopard 2 and infantry fighting vehicles are sent to protect a convoy on a reconnaissance mission in a secluded area. The convoy is suddenly attacked from an unknown direction. Thanks to the third-generation thermal imager ATTICA, the Leopard 2 commander can quickly locate the aggressors and react.

The periscopes are the perfect solution for dire weather conditions and darkness, cutting through the dust and the haze.

Hensoldt Optronics offers gyro-stabilised Periscopes providing precisely the panoramic vision that could mitigate the risk inherent in such troops-in-contact (TIC) situations. Even in extremely rugged terrain, its dual-axis, stabilised line of sight delivers a clear, stationary image.

Tough enough for the military
Engineered specifically to withstand the rigours of military use, our Periscopes resist shock, vibration and temperature extremes.

They can be readily integrated in fire control systems and may be used in the visual and in the infrared spectral ranges.

A mode for every mission
The Periscope’s four operating modes accommodate every type of mission posture:
• The commander controls the periscope in observation mode for independent orientation regardless of gun position.
• The commander monitors the target in alignment mode whereby the periscope is slaved to the gun.
• The commander controls the main weapon using the periscope in designation mode. In this case, the gun is slaved to the periscope.
• The periscope resides at the index position; that is, at the 12 or 6 o’clock position relative to the vehicle’s main axis.

The PERI R17 A3 retains proven PERI R17 A1 and A2 modules and submodules, so that the logistics for the two are largely compatible.

Main features & benefits
• Combat proven hunter-killer capability
• Designed for the commander’s station
• Integrates into armoured vehicles’ fire control systems
• Remarkably easy to operate despite its advanced capabilities
• Bright spot protection
• Automatic brightness control
• Automatic contrast control
• Muzzle flash protection
From darkness to light
The latest generation of ATTICA thermal imagers features prominently in the PERI R17 A3 and PERI RTWL.

Combat proven
The range of PERI R17 A1 through A3 is currently in use by the LEOBEN community. The combat proven PERI R17 A3 is in service in the Leopard 2 fleets of Canada, Denmark and Germany and was employed in Afghanistan by the Danish Armed Forces.

Enhanced hunter-killer capability
The PERI RTWL is the latest development of glass optical periscopes by Hensoldt Optronics for the PUMA as well for the Leopard 2 commander. Based on the Puma development, this enhanced periscope includes superior glass optical performance combined with latest technology in optronics. Besides a third-generation thermal camera and CCD camera, this periscope offers an eye-safe laser rangefinder for enhanced hunter-killer capability. New fibre optical gyros increase the MTBF and drift performance of the system. For full mission success, the image of the thermal imager can be displayed directly into the commander’s ocular.
Retrofits and upgrades
For the Leopard and Marder fleet

Retain your fighting ability without having to reinvest in new weapon systems!

Hensoldt Optronics caters to the customers’ demands, offering leading-edge, cost-efficient solutions in this time of shrinking defence budgets. The retrofit solutions offered are specifically designed to extend the product life cycles of Main Battle Tanks (MBT) like the Leopard 2 and Marder. The optics and optronics for the MBT modernization can be easily retrofitted.

On average, a Leopard 2 that is currently in use is expected to be commissioned until at least 2030. Aside from the obvious economic advantage of saving the costs associated with the purchase of a whole new weapon system, our retrofit products allow customers to extend the lifespan of their weapon systems. Retrofits are a sensible option for staying up to date with modern mission scenarios and changing operational requirements, while benefiting from the newest technological developments during the lifespan of the tank.

The performance and reliability of existing systems can be greatly improved through upgrade solutions. This is particularly true in the realm of thermal imager upgrades to ATTICA, a thermal imaging device of the third generation, that offers a much better image quality including an extension of the identification capabilities and ranges than its predecessors WBG-X and OPHELIOS.

Of course Hensoldt Optronics also caters to those customers having to replace the obsolete TIM thermal imager and WBG-X thermal imager.

Among our upgrade options for the Leopard fleet, Hensoldt Optronics offers eyesafe laser range finders with an increased repetition range and enhanced penetration through dust.

FERO Z18
Hensoldt Optronics offers various upgrades for the FERO Z18 auxiliary sight in its many variants. When new ammunition types are introduced, the reticles can be updated to incorporate the new ballistics data.

During a Leopard 2 upgrade from A4 to A5+ the armor setup is changed. Hensoldt Optronics offers an upgrade for the FERO Z18 with an additional optical link to ensure its functionality.

We are here to help your existing fleet successfully complete its missions while keeping costs down to a minimum.
**Capability Enhancement**
Firepower of modern MBT is defined in terms of precision and penetrating power.

Hensoldt Optronics upgrade solutions are in place to keep your system up-to-date with today’s requirements.

**Precision**
The upgrade solutions offered allow for a high hit accuracy even on the move with a precision offered by the high performance fire control system, highly accurate stabilization system and high performance optronics and sights achieved by the state-of-the-art sensors.

**Enhanced situational awareness and network intelligence**
ATTICA GL for the Leopard and ELRF/Day Unit allows real-time information transfer so that commanders need to make critical decisions quickly in today’s deployment scenario.

ATTICA GL provides both, gunner and commander with increased target acquisition ranges where the eyesafe ELRF/Day Unit provides an Increased Repetition Range to allow to respond much faster and – if necessary – acquire targets much sooner.

**Marder retrofit solution**
ATTICA GM for the Marder IFV provides both gunner and commander with increased target acquisition ranges.

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**Main features & benefits**
- Third-generation thermal imager
- Increased target acquisition range
- Enhanced image processing
- Higher MTBF

**Main features & benefits**
- Eyesafe laser rangefinder
- Increased repetition range
- Enhanced penetration through dust
- Higher range accuracy
Driver’s sight devices & Optronics for weapon stations
Every time soldiers dismount, leaving the safety of an armoured vehicle, they are exposed to danger. In any kind of crisis situation, and especially in the face of asymmetrical threats, troops need to know what awaits them before they dismount, and be able to respond quickly in the face of danger. The answer to this tactical challenge is the right sensor package, tailored to the vehicle, platform and mission profile.

Hensoldt Optronics small gun mount periscopes and sensors for remote-controlled weapon stations provide powerful sight and vision capabilities that defy adverse conditions and enable soldiers in vehicles to see what is out there. With this asset mounted to the vehicle or weapon station, troops will always have on-board access to critical situational information. What’s more, they furnish the means to accurately target any clear and present danger – without endangering friendly forces or causing collateral damage. The following pages offer a detailed look at these solutions.

Clouds roll in and a thick, inky-black darkness falls like a veil over the hardscrabble prairie. A patrol moves cautiously, feeling its way along on quickly and, if necessary, shift positions in a flash under these conditions.

Hensoldt Optronics understands that the mission posture has changed markedly in recent years, and that clear vision and agile maneuverability are more important than ever. Enter our driver’s sight devices, innovations engineered to deliver richly detailed images via image fusion.
Vehicle Optronics

SPECTUS II / NDP 30 / DVE / NDV 70
Driver’s nightsight devices

The lessons learned of the current multinational missions underline the high importance of modern driver’s sight devices. Due to an intensive testing we developed the multispectral driver’s sight systems SPECTUS II and NDP 30.

These driver’s sight devices for battle vehicles combines an uncooled thermal imager with a low light level camera. These two images may be merged seamlessly to provide a much sharper view when visibility is low. This image fusion capability offers drivers optimal vision with full protection, even under severe conditions.

SPECTUS II

The SPECTUS II driver sight is easily installed on new vehicles or acts as a state-of-the-art retrofit. With the possibility to serve as a forward and reverse sensor it enables the driver to perform his task as well as tactical observation with the advantages of multispectral vision.

NDP 30

The NDP 30 brings the multispectral driver’s sight to vehicles using periscope shafts. Thus being an ideal which have little impact on the vehicle’s infrastructure.

Main features & benefits

- Low Light Level Camera (LLL) and thermal imaging for best possible visibility
- Smooth fusion between IR and low light level camera
- Noiseless operation for stealth missions
- Low power consumption
Unique pairing of thermal imager and low light level camera

What makes this driver’s sight device so unique is the combination of a high-resolution thermal imaging sensor with a parallel low light level camera. This enables SPECTUS to provide seamless coverage for the entire range of daytime and night vision. At twilight and at night, the low light level camera makes the most of the remaining moon or starlight. When the light for optimal visual conditions is no longer sufficient for the low light level camera, the driver can switch on the thermal imager.

The two optronic sensors work in different spectral ranges and complement each other with image data. This is a tremendous advantage for the driver. Operational capability is ensured even if one of the sensors fails. Images may be superimposed in any ratio desired. The driver determines the percent ratio of the image mix depending on weather, visibility, tactical requirements and road conditions.

Driver’s Vision Enhancer

The Driver’s Vision Enhancer, or DVE for short, is our cost-effective solution. It enables drivers to see behind the vehicle and manoeuvre accordingly. The vehicle may be overlaid on the display in a size that is true to scale.

NDV70

The driver’s night vision device NDV 70 is a periscope with lens, image intensifier and a bi-ocular eyepiece assembly. It was developed for the periscope shaft of the APC Fuchs 2, but can be used with a comparable shaft in any other vehicle. The driver’s outlook offers a wide field of view and a 1:1 magnification. The device is thus ideal for driving and monitoring in darkness and under poor visibility conditions. The image is projected onto a large field magnifier, so that the driver does not need to use an eyepiece.
The ability to remotely target objectives under severe weather conditions, day and night, is an indispensable tactical asset. Hensoldt Optronics is able to deliver this enhanced target acquisition capability. Leveraging all the considerable engineering skills of our sensor specialists, we have developed a line of state-of-the-art targeting units to meet discriminating military demands.

Our sensor boxes are engineered for versatility. They may be adapted and matched to the given vehicle or weapons station, and they provide the full package of sensors needed to rise to the challenges of every tactical situation.

**Potent targeting capabilities**

Our targeting sensor units readily integrate into weapon stations and other targeting platforms requiring a compact, lightweight optronics sensor package assembled and fine-tuned to deliver high performance. These units may be retrofitted on platforms that are already deployed and installed in new stations before they roll off the assembly line.

**One size does not fit all**

The design of these sensor packages is flexible enough to enable custom configurations – that is, the best fit for the organisation and its application needs.

**A-la-carte offering**

Our standard optronic sensor suite consists of the modules described below. All main housings are ruggedised, approved for and proven in military targeting applications. And they feature a mechanical and electrical interface, uncooled or cooled infrared or CCD cameras, eye-safe laser rangefinders, and various options.

The TSU is our state-of-the-art Targeting Sensor Unit. Its upscaleable with a cooled, high-performance thermal camera, a solid-state, eye-safe laser rangefinder and colour zoom CCD camera. The TSU-H3 also features a motorised tilt unit to provide superior elevation between the sensor unit and the line of fire. Extended options include a hotspot overlay and a tracker.

### Main features & benefits

- Ruggedised optronics sensor package
- Compact and lightweight
- Flexible, modular and powerful
- All-weather, day & night
- Features and options scalable to fit

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**Sample integration**

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Gun-mounts and small weapon turrets don’t leave much room for telescopes and sensors. However, light vehicles do have a need for better targeting capabilities, as security forces’ experiences would attest. To satisfy this demand, Hensoldt Optronics has developed the small gun-mount periscope KLP TW. Especially engineered to make the most of the limited space on gun mounts and small weapon turrets, it provides enhanced aiming capabilities based on an optical day-vision telescope and a thermal imaging channel. The KLP TW enables vehicles that had to be operated without high-quality targeting optics to be much more effective. It can also serve as an optical aiming device for tank-mounted machine guns and as an infrared sensor box, and may even be linked with fire control systems. The periscope design provides under armor protection for the gunner while also guarding against fragmentation and direct fire that could damage the precision sensors and optics.

Due to the optimized integration of both the day and the night viewing channel observation and targeting requires just one eyepiece, no matter what the visibility is. An internal mechanical switch-over toggles between the direct view and the micro-monitor, with a smooth changeover.

The KLP TW provides a WFOV and a NFOV in both the day channel and the thermal imaging channel. Thus giving an excellent overall view of the scene for clear reconnaissance and precise aiming at long ranges. The fields of view provide plenty of latitude for ballistic shooting even with automatic grenade launchers configured at high elevations.
Boresighting
Missing the target is no option
A Soldier in the field is confronted with various hostile threats, that make an immediate reaction inevitable. Lives and the success of the mission depend on the aiming accuracy of his weapon. Therefore having the highest possible first hit probability becomes a mission critical ability and in the field also a matter of pure survival. He needs to be on target – always.

The higher the hit probability, the greater the combat value of a weapon. Battlefield supremacy, increased survivability and less ammo usage are among the easily achievable advantages of a well-adjusted weapon system. The risks of collateral damage and friendly fire are comparably minimized as is the chance to give away ones position by missing the target with the first shot.

Aligning targeting sights with live ammunition can be a very expensive proposition. In times when budgets are tight, these unnecessary expenses are most unwelcome. Hensoldt Optronics has a far more affordable alternative to offer. Our boresighting solutions not only drive down costs to a fraction of the expenses associated with conventional methods, they also save time. But most important they line up the targeting optics with a vastly improved accuracy – combat proven.

Hensoldt Optronics offers the high-performance boresight tools to enable armed and security forces to do their duty with the highest possible level of aiming accuracy. With decades of experience our high precision boresights provide the advantage to keep control in combat situations and outperform any opponent. Covering handheld weapons up to heavy weapon systems Infantrymen or vehicle crews alike benefit from this vast improvement of their survivability and combat capabilities.
Boresight alignment

Universal precision
The Universal Muzzle Boresights provides the cost effective means to adjust aiming sights of almost all firearms in today’s service. It provides a compatibility from 5.56 to 155 mm caliber for long and short range alignments. By combining easy handling and high durability the user benefits from a fast adjustment of his targeting equipment and low lifecycle costs. Usable from factory to crew-level the universal boresight line provides highest precision, where it is needed – on target.

Highest accuracy
The High Precision Alignment Devices (HiPAD) have their origin in the German Leopard MBT program. Being used in the Leopard tanks as standard equipment ever since, it stands for unmatched accuracy. The HiPAD program utilizes self-centering caliber bars from machine cannon to howitzer caliber. It provides the capability of highly precise long range alignments or extremely accurate short range collimator adjustments of targeting systems. Thus providing the highest accuracy available – with the first shot.

Synchronous operation
Not only the aiming system needs to be thoroughly aligned to the weapon. Both their movements during the aiming process must be as well. If not done so the ballistic calculation might become wrong. The Synchronous Operation Test Devices from Hensoldt Optronics measure both the elevation of weapon barrel and targeting system, providing the ability to check, to adjust and to hit.
So simple, yet so efficient
By using highly accurate weapon barrel adapters (caliber bars) the line of sight of the gun is taken as reference for the alignment of the respective targeting sight. Being a truly mechanical and optical process with no need for electronics and long preparations this makes it a matter of minutes to check and eventually adjust the optics. The rugged design of the boresight tools guarantees a long life span with almost no lifecycle costs.

By providing the means either to carry out short or long range adjustments the boresight equipment can be used in a factory, a workshop, on a shooting range or in the field alike. Interchangeable boresighting telescopes simplify the application and can as well be used for primary and secondary armament making the acquirement even more economic.

Main features & benefits
- Improved accuracy
- Lower costs
- Easy handling
- Rugged design
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