



CASE STUDY

Enabling Absolute Position Control in a Vehicle-Mounted Remote Weapon Station



Netzer Precision supplied non-contact capacitive absolute encoders for both axes of a vehicle-mounted remote weapon station, delivering confirmed azimuth and elevation position feedback from the moment power is applied - with no homing sequence required.

The result: precision that the fire control system can trust before the first command is issued.

Case Study Snapshot

- **Industry** Ground Combat Systems
- **Application** Azimuth and elevation position feedback for a vehicle-mounted remote weapon station (RWS)
- **Product Families** VLP-100 (azimuth turret), DS-130 (elevation base)
- **Environment** High EMI, sustained shock and vibration, -40°C to +105°C, extended depot maintenance intervals
- **Program Context** Production-qualified; active deployment on a land-based combat platform
- **Supplier Certifications** AS 9100, ISO 9001:2015
- **Why Failure Was Not an Option** A position error on either axis means the weapon is not pointed where the fire control system believes it is pointed.

The Challenge

A vehicle-mounted remote weapon station operates inside one of the most demanding encoder environments in ground defense: sustained shock and vibration from vehicle mobility, wide thermal swings across all deployment regions, and a platform dense with motor drives, radio systems, and co-located electronics generating significant EMI.

The azimuth axis required an encoder that could mount directly over the turret drive shaft with no additional hardware and support continuous 360° rotation with no mechanical stops. The elevation axis required a compact, sealed solution that integrated within the drive assembly without adding envelope to an already constrained space.

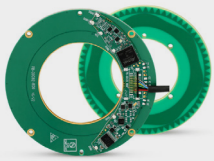
Both axes shared a hard requirement: absolute position from power-on. A weapon station cannot execute a homing sequence before confirming where the barrel is pointed. When the operator designates a target from inside the vehicle, the system must slew to that position immediately and with zero ambiguity - latency or position error at the moment of engagement is operationally unacceptable.

Optical encoders were ruled out by shock and vibration. Magnetic encoders were ruled out by the platform's EMI environment. Both technologies also accumulate mechanical wear - unacceptable across the depot maintenance intervals of a combat vehicle. A non-contact, absolute, EMI-immune solution with low-latency output was required.

The Netzer Solution

The Electric Encoder™ uses non-contact capacitive sensing to deliver absolute rotary position without magnetic field dependence, optical line-of-sight requirements, or mechanical contact between moving parts.

Two encoder families addressed the distinct requirements of each axis:



VLP-100

Hollow-shaft harsh environment



DS-130

Encapsulated encoder

Both are non-contact, absolute from startup, and carry no mechanical wear components. The platform has confirmed absolute position on both axes the instant it powers up - no startup sequence, no delay. Low-latency SSI and BiSS outputs feed directly to the fire control system, supporting slew-to-cue response with no position ambiguity between the operator's designation and the weapon's confirmed pointing angle. Both encoders are compatible with standard motor drives and servo controllers, enabling plug-and-play integration without additional signal conditioning hardware.

Netzer engaged the integrator early through its EVL (Engineering Validation Level) process - a structured methodology for confirming encoder performance against an application's specific parameter ranges before the production configuration is locked. Final interface dimensions and electrical output configurations were aligned through the CustomFit program. Qualification testing covered thermal cycling, shock and vibration profiling, and EMI susceptibility evaluation. The encoders are production-qualified and confirmed in active deployment on the platform.

Netzer Precision maintains AS 9100 and ISO 9001:2015 certification across its manufacturing and quality management operations, providing the traceability and documented quality assurance expected of components integrated into production defense systems.

Results & Reliability

Ground defense programs require position sensing that is ready at power-on, survives the full platform environment without maintenance, and holds accuracy across the operational life of the vehicle.



Capability

Performance

Sensing technology	Non-contact capacitive - inherently EMI-immune
Position output	Absolute from power-on; no homing required
Accuracy	$\pm 0.006^\circ$ (VLP-100 and DS-130)
Operating temperature	-40°C to $+105^\circ\text{C}$ (VLP-100)
Shock and vibration	Non-contact architecture - no mechanical elements subject to fatigue or wear
EMI Immunity	Full immunity; no magnetic field dependence
Form factor - azimuth	VLP-100: 100 mm OD / 48 mm ID; hollow shaft, direct drive integration
Form factor - elevation	DS-130: 130 mm OD / 90 mm ID; encapsulated, sealed
Interface	SSI and BiSS - compatible with standard motor drives and servo controllers

Supplier Certifications



Netzer's non-contact capacitive architecture - $\pm 0.006^\circ$ on both axes, full EMI immunity, and zero mechanical wear - delivered exactly that. The encoders are production-qualified and confirmed in active deployment on the platform.



Key Takeaway

A vehicle-mounted remote weapon station requires confirmed absolute position from power-on, with no homing delay or ambiguity, in an environment defined by shock, vibration, temperature extremes, and EMI. Netzer's VLP-100 and DS-130 delivered reliable azimuth and elevation feedback while supporting direct mechanical integration, standard control interfaces, and wear-free operation across extended service intervals.

Precision engineered to be ready when the mission is.



Contact us for more information

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