NEOMETRIX

Practice Head Torpedo

Product Catalog

www.neometrixgroup.com

About us:

Neometrix Defence Celebrating 20 Years of Excellence!

For the past two decades, Neometrix Defence has maintained its position as a premier provider of advanced test benches and rigs.

Our accreditation by the Directorate General of Aeronautical Quality Assurance, India (DGAQA) and Defence Research & Development Organization, India (DRDO) underscores our commitment to upholding the highest international defence industry standards.

Counting the Indian Air Force/Army/Navy, Ministry of Defence, Hindustan Aeronautical Limited, and DRDO among our esteemed clientele, we are recognized for delivering state-of-the-art solutions and unwavering performance reliability

Strengths & Capabilities:

Neometrix Defence is a powerhouse of engineering brilliance, proudly serving every Indian Air Force station and partnering with the Indian Army, Navy, Railways, BARC, NPCIL, and ISRO. With a team of over 100 elite engineers and visionary founders from IIT Kanpur and IIT Delhi, we harness cutting-edge technology to set the gold standard in mechanical engineering.

We Don't Just Meet Industry Demands – We Define Them!

- We have established our presence in all Air Force stations across India. With the Indian Air Force as our leading customer, we are dedicated to upholding the highest standards of excellence in the aerospace industry.

- Our extensive clientele extends beyond the defence industry, including projects with the Indian Army, Navy, Railways, BARC, NPCIL, ISRO, and more. In essence, we excel in all aspects of mechanical engineering!

- Our team comprises over 100 graduate engineers, supported by a cutting-edge manufacturing site equipped with state-of the-art machinery, enabling us to meet the highest Engineering standards.

- The founders of our company are distinguished graduates from IIT Kanpur and IIT Delhi, bringing extensive expertise and a wealth of engineering knowledge to Neometrix Defence.

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Introduction:

The Practice Head serves as a fully recoverable, non-explosive substitute for the live warhead of a torpedo, allowing realistic exercise firings without the inherent risks of a live-ordnance payload. Engineered as a detachable nose module, it seamlessly integrates with standard practice torpedoes, replacing the warhead section with a hydrodynamically faithful replica. This design ensures that the torpedo's mass distribution, drag profile, and overall handling exactly mirror a combat configuration, providing crews with authentic launch and tracking experiences during training evolutions detailed description.

Internally, the Practice Head is divided into two primary compartments. Forward, a Homing Head housing simulates acoustic and guidance electronics, enabling onboard systems and tracking ranges to process realistic target-seeking signatures. Aft, a sealed oxygen flask and ballast chamber work in concert: the flask injects pressurized air into the ballast compartment only once the torpedo run is complete, expelling water and imparting controlled positive buoyancy. This timed air-release mechanism ensures the torpedo resurfaces precisely at the programmed end-of-run location, simplifying recovery operations and safeguarding expensive instrumentation detailed description.

Beyond buoyancy control, the Practice Head incorporates multiple standardized mounting interfaces—including front and rear collars with pre-drilled pitch-circle patterns—to accommodate depth and roll recorders, signal flares, bellow-reducing valves, and other sensors in a plug-and-play manner. These recesses and hand-holes allow rapid installation or removal of instrumentation without compromising shell integrity, streamlining pre- and post-exercise handling. All structural components are fabricated from anodized AlMg5 alloy with internal reinforcement ribs, guaranteeing that the Practice Head endures the same hydrodynamic and inertial loads as a live warhead while maintaining dimensional stability throughout repeated use.

Key Features:

- Advanced Buoyancy Control: 140 L ballast compartment with a pressure-activated air-release mechanism that expels water through discharge valves when flask pressure drops below threshold, ensuring reliable resurfacing.

- Dynamic Depth Regulation: Integrated depth sensors and roll recorders coordinate with an automatic air-flask system to hold preset depths, mimicking warhead behaviour throughout the run.

- Trim & Stability Assurance: Four internal AlMg5 reinforcement ribs plus a concave separation plate distribute stresses uniformly, preventing unintended pitch or roll under high-speed conditions.

- Modular Sensor Suite: Standard front (OD 500 mm, PCD 468 mm) and rear (OD 532.4 mm, PCD 516 mm) collars with tapped holes accommodate depth/roll recorders, signal flares, bellow-reducing valves, and acoustic devices in a plug-and-play fashion.

- Hydrodynamic Efficiency: Tapered AlMg5 shell (532.4 → 503.05 mm) minimizes drag to faithfully simulate live-warhead runs while reducing energy loss and turbulence.

Technical Specification:

Property	Specifications
Shell Material	Aluminium-Magnesium Alloy AlMg5; thickness 6–8 mm
Overall Length	1,204.20 mm (including collars)
Outer Diameter	532.4 mm tapering to 503.05 mm
Empty Mass / Assembled Mass	58.5 kg / 270 kg
Ballast Capacity	140 L
Test Pressures	External: 12 kgf/cm²; Ballast: 2 kgf/cm²; Instrument: 1 kgf/cm²
Center of Gravity	~64 mm from rear end

Applications:

- Surface & Subsurface Exercise Drills: Train submarine crews in torpedo deployment and handling against screened or unscreened targets, following NATO's CASEX A-5 protocols for realistic counter-attack scenarios, including night-time and low-visibility launches.

- Anti-Submarine Warfare (ASW) Training: Enable surface vessels and maritime patrol aircraft to practice detection, tracking, and evasion tactics against exercise torpedoes equipped with acoustic beacons and homing-head simulators.

- Harbor & Sea Trials: Validate torpedo handling and recovery in varied salinity and temperature profiles; practice positive-buoyancy resurfacing using built-in floatation and pyrotechnic flares to ensure minimal environmental impact and rapid instrumentation reuse.

- Data Collection & Analysis: Retrieve detailed run data—including depth profiles, roll angles, time-stamped flare events, and acoustic logs—for post-exercise forensic evaluation, system performance tuning, and failure-mode analysis.

- Depth-Keeping & Trim Calibration Exercises: Use integrated depth sensors, roll recorders, and the automatic air-flask system to verify and calibrate onboard depth-holding and trim-control algorithms under dynamic conditions.

- Modular Instrumentation Trials: Rapidly mount, swap, and evaluate custom payloads—such as signal-flare ejectors, light devices, pressure equalizers, and new acoustic or optical sensors—via standardized front and rear collars and hand-holes without modifying the shell.

- Recovery Operations Training: Practice end-of-run recovery procedures using onboard floatation, signal-flare illumination, and acoustic beacons to coordinate small-boat or ROV retrievals, reinforcing safety and efficiency in live exercises.

Test & Qualification Procedures:

1. Fitment & Alignment: Assembly on torpedo body; verify CG within ±5 mm, conduct radiographic/NDT weld inspections.

2. Vibration: Sine-sweep 10–30 Hz @ 1.3 mm p-p, 31–60 Hz @ 2.3 g p-p for 60 min; leak checks pre- and post-test.

3. Shock: Half-sine shocks: 15 g ± 10% (10 ms) along X; 30 g ± 10% along Y/Z axes.

4. Bump: 1,000 bumps @ 4 Hz, 25 ± 3 mm drop, 400 ± 40 m/s² peak (JSG 0102 Test 15U).

5. Pressure Cycling: External 12 kgf/cm² × 20 min × 15 cycles; internal ballast 2 kgf/cm² × 20min.

6. Salt-Water Immersion: 18 h immersion + 6 h air dry; post-test visual & coating integrity check.

7. Buckling: Axial compression until yield to confirm design margin.

8. Harbor & Sea Trials: Dry-dock fit and harbour run with empty head; live-fire at sea with recovery.

Compartments & Functional Components:

Ballast Compartment (140 L)

This large, aft-section chamber fills with seawater during the run and houses all the end-of-run buoyancy and recovery devices. It contains:

- Light device & depth/roll recorder for tracking and post-run analysis.
- Signal-flare ejector powered by pyrotechnic cartridges to mark the surfaced torpedo.
- Discharge valves (water-discharge valve & stop-cock) to rapidly expel the 140 L of ballast water at run-end.
- Bellow-reducing & bypass valves that regulate internal pressure and prevent hydraulic lock.
- An automated air-release float mechanism triggered by the aft oxygen flask depressurizing, forcing water out through the discharge valves.
- A sinking plug that seals the chamber during the run to prevent premature flooding.
- All components mount via hand-holes and recesses in the shell, ensuring reliable water flow and straightforward maintenance practice-head-torpedo-c….

Instrument Compartment (Dry)

Sealed off from seawater by welded AlMg5 shell seams and O-ring seals, this forward bay protects the torpedo's critical electronics:

- A safety & recovery unit with its own sealed battery pack.
- Homing-head electronics emulator and combined influence-exploder equipment to generate realistic acoustic and guidance signatures.
- An acoustic noise maker for tracking exercises.
- A safety-valve assembly to vent any accidental over-pressure without flooding the compartment.
- By keeping all electronics in a dry, over-pressure-protected environment, it guarantees data integrity and reliable function throughout high-pressure runs practice-head-torpedo-c….

Structural Ribs & Separation Plate

To withstand intense hydrodynamic and external pressure loads, the Practice Head employs:

- Four AlMg5 frame ribs (Ø 516.4 mm, 15 mm thick) welded circumferentially at predetermined locations for uniform stress distribution.

- One tapered-section rib (Ø 520 → 518 mm)
  positioned 145 mm from the front to reinforce the nose's changing diameter.
- A concave AlMg5 separation plate (max OD 516.4 mm) dividing the ballast and instrument areas: its inward-bent side faces the high-pressure ballast chamber, while the outward-bulged side faces the dry bay, preventing collapse and maintaining compartment integrity under differential pressures practice-head-torpedo-c….

External Mounts & Interfaces

- The Practice Head's robust AlMg5 collars provide standardized, corrosion-resistant attachment points for all external devices:
- Front collar: OD 500 mm, PCD 468 mm, with tapped holes for recorders, flares, and light devices.
- Rear collar: OD 532.4 mm, PCD 516 mm, with 30 holes (28 tapped) for valves, floats, and instrumentation.
- Stainless-steel dowels, inserts, and female-threaded bushings ensure repeated mounting cycles without wear.

These precision-machined interfaces enable rapid, tool-free installation and removal of sensors and recovery gear while maintaining a watertight seal.