

# Universal Hydraulic Charging Rig



## 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 Universal Hydraulic Charging Rig (Model A-1760) is Neometrix's answer to the demanding need for rapid, contamination-free hydraulic servicing in aerospace and defence. Packed onto a robust two-tier trolley with lockable 125 mm polyurethane swivel castors, the A-1760 houses a 25 L TIG-welded SS-304 reservoir polished to mirror finish. Inside, a duplex filtration module ( $3\ \mu\text{m}$ ,  $\beta \geq 200$ ) removes sub-micron particulates, guaranteeing ISO 4406 oil cleanliness before it ever enters aircraft plumbing.

At its heart lies a hand-actuated piston pump engineered for precision: each stroke dispenses 49 cc of mineral-oil (OM-15) at pressures up to 25 bar, with lever-ratio mechanics that keep operator fatigue to a minimum. A glycerine-filled, dual-scale 0–120 kg/cm<sup>2</sup> gauge offers real-time feedback, while an over-pressure relief set at 110 bar prevents accidental over-charging. Quick-change MIL-STD couplings for Su-series and MiG-series fittings enable two-minute setup—no adapters to mill or threads to chase.

Designed for hangar bays, flight-line pads, and forward arctic or desert outposts alike, the A-1760 thrives in ambient temperatures from  $-10\ ^\circ\text{C}$  to  $+50\ ^\circ\text{C}$ . Its modular architecture promotes field servicing: filter housings hot-swap under full charge, and pump cartridges slide out in minutes for rebuilds. In under half an hour, a solo technician can unpack, prime, charge, and stow—translating to faster sortie cycles, reduced maintenance backlog, and higher mission-capable rates.



## Purpose & Applications:

### Frontline Aircraft Servicing (250+ sorties/day):

- After each sortie, thermal contraction or minor leaks can drop fluid below minimums. The A-1760 restores full pressure in under 10 minutes—avoiding the two-hour delay common with bulk carts. Fine metering prevents overshoot that could damage servo-valve spools.

### Field & Depot Maintenance:

- In cramped expeditionary shelters or aged hangars, manoeuvring a bulky skid-mount cart is impractical. At 650 × 550 × 1 100 mm and 30 kg, the A-1760 fits through standard personnel doors and deploys on uneven surfaces via its shock-isolated castors.

### Emergency Recovery & AOG Response:

- AEM leak-compensation mode routes 2 bar of pressure to critical actuators, enabling safe taxi to maintenance zones. Integrated GPS-tagged telemetry (optional) logs pressure data for after-action reports, helping pinpoint failure modes.

### Multi-Platform Versatility:

- Swap in optional adaptors and you service:
- Su-30, MiG-21/29, Mirage 2000
- Mi-17, AH-64, CH-47
- C-130, IL-76, An-32
- Predators, Reapers, Bayraktar TB2
- Hydraulic jacks on MBTs and self-propelled guns

### Commercial & MRO Integration:

- Fixed-wing, rotary-wing, and drone operators worldwide use the A-1760 for AOG tool-kits, guaranteeing hydraulic readiness for passenger and cargo operations alike.

## System Architecture:

Every subsystem of the A-1760 is modular, serviceable, and ruggedized:

### Reservoir & Frame:

- 2 mm SS-304 plate, TIG-welded, interior polished.
- Powder-coated 5052 aluminum cradle with integrated hose reel.
- Locking castors absorb 3 g lateral shock and resist 200 °C salt-fog.

### Manual Piston Pump:

- Dual-linkage lever arm multiplies operator force 6×; ergonomic T-handle.
- Ceramic-coated barrel, hardened stainless piston—MTBF > 5 × 10<sup>6</sup> cycles.
- Internal check-valve ensures zero back-leak.

### Filtration Module:

- Duplex filter housings on quick-release manifold allow uninterrupted flow during element change.
- Visual “pop-up” indicator at  $\Delta p > 0.8$  bar.
- Bypass loop for high-viscosity conditions or cold starts.

### Pressure Control & Monitoring:

- Relief valve factory-set to 110 bar, user-adjustable  $\pm 10$  bar.
- Gauge:  $\varnothing$  100 mm, glycerine-filled,  $\pm 1\%$  FS accuracy, dual bar/kg/cm<sup>2</sup>.

### Hose & Adaptors:

- 5 m PTFE core, steel-braid hose (1 000 bar burst).
- MIL-STD 33714 quick-disconnect couplings (37° flared, 24° cone).
- Adaptor storage hooks and protective caps integrated into frame.

Each component is keyed, color-coded, and documented in our 3D-printed spares-kit, ensuring field teams swap modules without error or downtime.

## Technical Specifications:

Parameter	Specification
Hydraulic Fluid	OM-15 (MIL-PRF-5606)
Operating Pressure	Up to 25 bar (25 kg/cm <sup>2</sup> )
Flow per Stroke	49 cc ± 2 cc
Reservoir Capacity	25 L (usable 22 L)
Filter Rating	3 µm nominal, β ≥ 200, duplex
Hose	5 m × 30 mm OD; 1 000 bar burst; PTFE core, steel braid
Pressure Gauge	0–120 kg/cm <sup>2</sup> (0–120 bar), glycerine-filled
Materials	SS-304 tank & fittings; plated carbon-steel pump
Temperature Range	–10 °C to +50 °C
Mobility	4 × 125 mm PU swivel castors (2 lockable)
Dimensions (L×W×H)	650 × 550 × 1 100 mm
Weight (Operational)	~30 kg
Compliance	CE, MIL-STD-810G, ISO 9001:2015

## Mechanical & Environmental Design:

### Chassis & Corrosion Protection

- **IP54-Rated Enclosure:** All electrical and sensitive components reside behind gaskets and sealed panels that block dust ingress and withstand powerful water jets, making the unit safe for outdoor ramp operations and wash-down procedures.
- **Powder-Coated Steel Frame:** A multi-stage surface treatment (phosphate conversion, epoxy primer, TGIC polyester topcoat) delivers a 100- $\mu\text{m}$  film that resists scratching, chipping, and corrosion—critical in coastal naval bases or chemical processing plants.

### Material Selection

- **SS-304 Hydraulic Reservoir & Fittings:** Marine-grade stainless steel resists chloride-induced pitting and salt-fog exposure (tested per ASTM B117). All wetted components—including filter housings, valves, and adaptors—use 316L on request for maximum chemical compatibility.
- **Plated Carbon-Steel Pump Assembly:** Internal pump surfaces feature nickel-chromium plating to minimize galling under high cycle counts; external linkages use zinc-nickel for superior sacrificial corrosion protection.

### Vibration & Shock Mitigation

- **Elastomeric Isolation Mounts:** Critical subsystems (pump, gauge, filter manifold) sit on durometer-tuned rubber pads that filter out vibrations up to 20 g and shocks to MIL-STD-810G standards. These mounts both protect precision calibration and reduce operator fatigue.
- **Reinforced Hose Guides:** Steel roller assemblies at all frame corners guide the high-pressure PTFE hose, preventing kinking, abrasion, and premature wear even under dynamic movement.

### Thermal Management

- **Forced-Air Pump Cooling:** A low-noise brushless fan directs ambient air across the pump housing fins, dissipating up to 50 W of frictional heat during continuous 25 bar operation.
- **Optional Insulation Jackets:** Neoprene-encased thermal wraps maintain reservoir oil viscosity in sub-zero climates ( $-40\text{ }^{\circ}\text{C}$ ), reducing cold-start strain on seals and pumps.

## Operational Workflow

- Preparation: Lock trolley brakes, verify fluid level, inspect filter indicator.
- Connection: Select and hand-tighten appropriate adaptor; route hose to avoid kinks.
- Priming: Open relief valve; slowly pump until bubble-free oil appears in the filter sight glass.
- Charging: Set desired pressure via relief-valve knob; maintain consistent stroke rate while monitoring gauge.
- Hold & Fine-Tune: Confirm no pressure decay; bleed small amounts if precise control is required.
- Shutdown: Depressurize via relief valve; pump residual oil out; disconnect and cap adaptors.
- Stowage: Reel hose, secure adaptors, wipe down surfaces, and store in a climate-controlled area.

## Safety, Compliance & Quality:

### Active Safety Features

- Emergency-Stop Bleed Valve: A large red push-button instantly vents system pressure to atmosphere, safeguarding both technician and aircraft in case of over-pressurization.
- Over-Pressure Relief: Factory-calibrated at 110 bar; stainless-steel spring and seat cycle reliably over 10,000 actuations without drift.
- Leak-Detection Alarm (Optional): Piezo sensor mounted on the filter module sounds an audible buzzer and flashes a red LED if a drop >0.5 bar occurs within 10 s

### Regulatory Compliance

- CE Marking: Conforms to EU EMC Directive 2014/30/EU and LVD Directive 2014/35/EU.
- MIL-STD-810G: Verified for shock (516.7), vibration (514.7), humidity (507.6), and salt-fog (509.6).
- ISO 9001:2015: Produced under a certified quality-management system with full batch traceability and control.

### Quality Assurance & Calibration

- IQ/OQ/PQ Documentation: Detailed protocols provided for Installation, Operational, and Performance Qualification, complete with test logs and sign-off sheets.

- Gauge Calibration: Each pressure gauge is NIST-traceable, tested to  $\pm 1\%$  full-scale accuracy, and supplied with a calibration certificate.
- Filter Performance: Batch-tested per ISO 16889; certified to  $\beta \geq 200$  at  $3\ \mu\text{m}$ , with differential-pressure verification.
- Factory Acceptance Testing (FAT): Includes 72-hour endurance run, 1.5 $\times$  burst-pressure test on hose, and contamination analysis of sampled oil.

