NEOMETRIX

Test Rig for IRAB

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.

Table of contents

Sr No.	Description	Page no.
1	Introduction	1
2	Purpose & Application	2
3	Key features	3
4	Technical Specifications	4
5	System Components & Architecture	5
6	Installation & Maintenance	5
7	Operational Workflow	5
8	Safety, Compliance & Quality	5

Introduction:

The IRAB Brake System Test Rig is Neometrix's turnkey solution for validating "Independent & Release Brake" (IRAB) pneumatic valves used on electric locomotives. Its robust stainless-steel enclosure houses dual 250 kW compressors, a high-flow manifold (up to 2 000 LPM), and precision DAQ (1 kHz, 24-bit) integrated with a Siemens S7-1200 PLC. The user-friendly "CCUBTB" PC software automates test recipes, real-time data plots, and one-click PDF reporting—ensuring repeatable, standards-compliant testing under both routine and extreme conditions.

Built for both shop-floor durability and laboratory precision, every component—from the ISO-class air prep unit to the quick-change valve mounts—is selected for long service life with minimal maintenance. The modular frame allows rapid reconfiguration between different valve types, while the integrated air-dryer and coalescing filters safeguard against moisture-induced errors. An ergonomically laid-out control console and front-panel gauges give technicians immediate insight into system health, reducing setup time and enhancing throughput.

Beyond its core testing capabilities, the rig supports advanced diagnostics and predictive maintenance workflows. Captured test data can be fed into asset-management systems to flag valve performance drift, schedule pre-emptive rebuilds, and extend service intervals. Neometrix also offers optionally integrated cloud reporting, enabling remote monitoring of fleet-wide valve health and simplifying compliance with evolving regulatory standards.

Designed with scalability in mind, the rig's architecture accommodates future expansions such as additional sensor channels, higher-pressure modules, or tailored test stands for related pneumatic systems. Modular I/O cards and open communication protocols (Modbus/TCP, OPC-UA) allow seamless integration into plant control networks and Industry 4.0 frameworks. Firmware updates deliver new test sequences and standards compliance as specifications evolve, while Neometrix's global service network ensures timely calibration, spare-part delivery, and on-site support—maximizing uptime and safeguarding long-term return on investment.

Purpose & Applications:

- OEM Quality Control: Inline validation of 18 IRAB valve variants (auto-brake, feed/reducing, relay, safety, check, magnet) before assembly, reducing field failures.
- Depot Maintenance & Overhauls: Preventive checks and annual servicing in railway workshops; “golden curve” comparison and audit-ready reporting speeds turnaround and ensures traceability.
- Field Commissioning: Rapid on-site brake-system verification for new or refurbished locomotives with quick-connect plumbing, detachable covers, and minimal site-prep requirements.
- Regulatory Certification: Executes RDSO, UIC & EN endurance, rapid-charge, slow-release and high-temperature protocols; generates comprehensive data logs and PDF dossiers for type-approval and audits.
- R&D & Life Testing: Accelerated cycling (up to 10 000 actuations), contamination and thermal-stress profiling for new valve design validation, material testing, and failure-mode analysis.
- Training & Skill Development: Hands-on pneumatic principles, calibration routines, and fault-finding exercises via guided software modules—ideal for technical institutes and in-house operator certification.
- Aftermarket Validation: Certification of third-party spare-parts and refurbished assemblies against OEM performance curves, ensuring equal or superior reliability and maintaining warranty compliance.
- Warranty & Acceptance Testing: Batch testing of returned or newly produced valves under customer-specific acceptance criteria, automating pass/fail reporting to streamline claims and turnaround.
- Condition Monitoring & Predictive Analytics: Integration with fleet-management systems to trend leakage, cycle-time drift, and response-time degradation—enabling data-driven maintenance scheduling and avoiding unplanned downtime.
- Custom Valve Prototyping: Rapid configuration of bespoke test recipes and custom fixturing to support development of specialty pneumatic components beyond standard IRAB valves.
- Mobile Field Service Units: Easily deployable skid-mounted version for remote sites or emergency repair workshops, with onboard compressor, air-prep, and battery-backed PLC/DAQ for power-outage resilience

Key Features:

Broad Valve Coverage & Quick Change-Over

- Tests 18 IRAB valve types (auto-brake, feed/reducing, relay, safety, check, magnet) on a single platform.
- Quick-change mounts and color-coded adapters enable swap-out in under 10 minutes, eliminating setup errors.

High-Precision Pneumatics

- Dual 250 kW compressors deliver 8–10 kg/cm² with ±0.02 kg/cm² stability and up to 2 000 LPM flow.
- Multi-stage air conditioning (prefilter, coalescing filter, dryer) ensures ISO 8573-1 Class 1 purity.

Fast Data Acquisition & Analysis

- Four 24-bit DAQ channels sample at 1 kHz for sub-millisecond pressure transients and leak detection.
- Real-time waveform metrics (rise/fall time, overshoot, leakage) with automatic SQL archiving.

Safe, Automated Operation

- Dual pressure relief valves, electronic shut-off, and software watchdog trigger immediate test aborts on fault.
- Front-panel E-stop, lock-out/tag-out, and safety-rated PLC comply with IEC 60204-Intuitive Software & Future-Ready Design

Intuitive Software & Future-Ready Design

- RDSO-compliant recipes, drag-and-drop recipe editor, interactive plots, and one-click PDF reports.
- Modular I/O chassis and open protocols (Modbus/TCP, OPC-UA) support expansions and Industry 4.0 integration.

Technical Specifications:

Parameter	Specification
Medium	Oil-free, filtered compressed air
Supply Pressure	8–10 kg/cm² (max 10.5 kg/cm²)
Flow Rate	70 CFM (2 000 LPM)
DAQ Resolution	24 bit, up to 1 kHz sampling
Gauge Accuracy	±0.5 % FS
Temp. Range	0–48 °C ambient
Power	230 VAC ± 10 %, 50 Hz, 5 kVA
Footprint (WxDxH)	1.5 m × 0.8 m × 1.8 m
Weight	~650 kg
Noise Level	< 75 dB(A) @ 1 m
Software	Windows 10 Pro, .NET, SQL Server

System Components & Architecture:

- Enclosure: SS-304 frame with roll-out covers and condensate tray.
    - Air Prep Unit: 5 µm prefilter → 0.01 µm coalescing filter → refrigerated dryer → ISO 8573-1 Class 1.
    - PLC & DAQ: Siemens S7-1200 PLC; NI DAQ streaming to PC via USB-Ethernet I/O.
    - Control Console: Industrial touchscreen, status LEDs, emergency-stop.
    - PC Workstation: Dell-class PC running “CCUBTB” software with recipe editor, dashboard, and report manager.

Installation & Maintenance

Site Requirements

- Drive air: 8–10 kg/cm², oil-free, 70 CFM
- Ambient: 10–40 °C, dust-free workshop
- Power: 230 VAC, 5 kVA, single-phase

Routine Schedule

- Daily: Check filters, condensate drains, emergency-stop
- Weekly: Inspect seals, review test logs, clean prefilters
- Monthly: Calibrate transducers, lubricate solenoids
- Annual: Full system audit by Neometrix; firmware/software updates

Operational Workflow

Setup: Mount N_2 cylinder, connect drive air, verify valve positions.

Priming: Open inlet valve, set drive regulator to ~6 bar until outlet gauge reads cylinder pressure.

Boosting: Increment drive air to reach test pressure; fine-tune via micrometre knob.

Testing: Connect UUT with quick-disconnect; monitor stability for leak/burst protocols.

Vent & Change-Out: Close drive air, open vent valve, disconnect hose, swap UUT.

Safety, Compliance & Quality:

- Setup: Connect compressed-air & power; launch software.
- Recipe Selection: Choose valve type & test profile.

- Automatic Test: System purges, pressurizes, actuates, records data, and generates pass/fail PDF.
- Manual Mode: Console toggles for troubleshooting; live pressure readouts.
- Calibration Mode: Sensor swap-out and comparison against certified gauges.