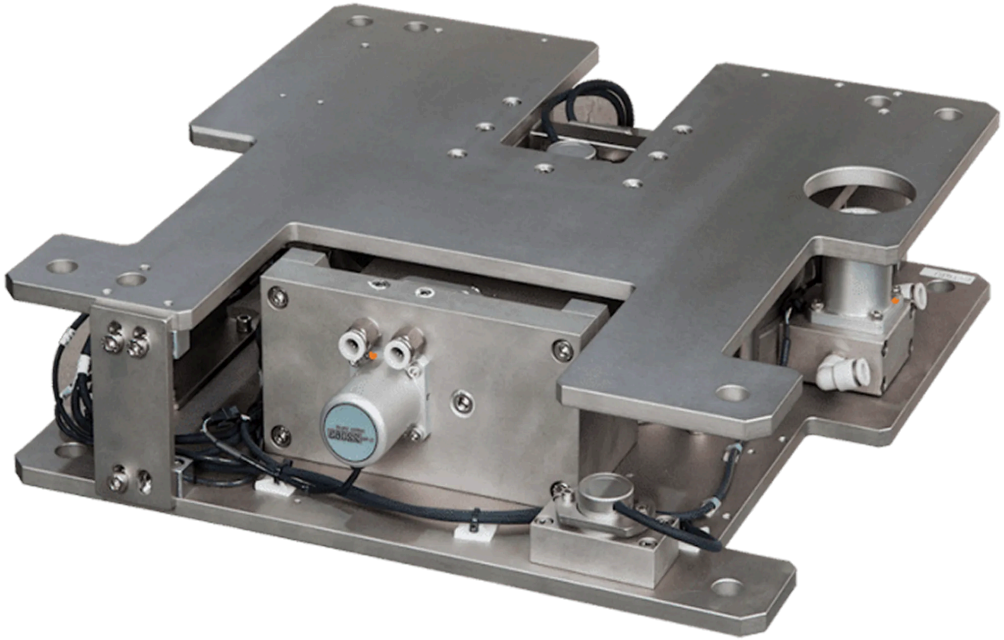
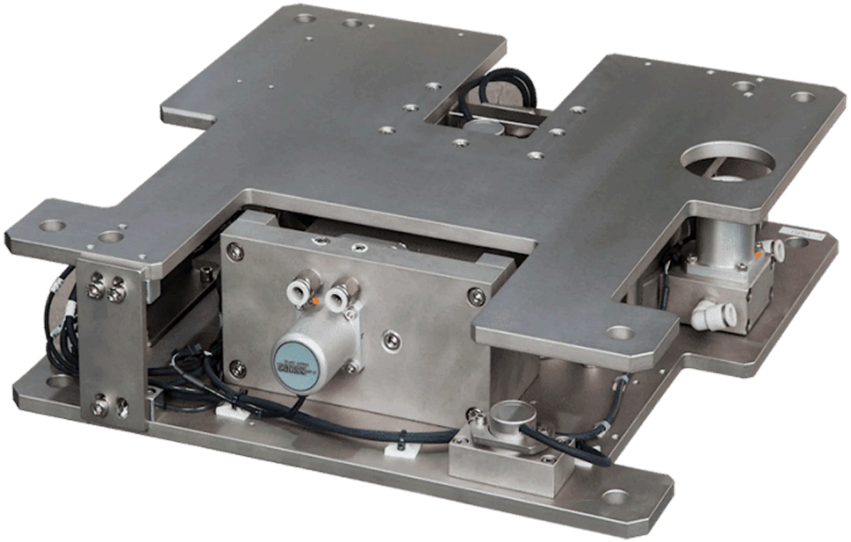
DAEIL SYSTEMS

Active Pneumatic Vibration Isolation System

DVIA-P Series



Pneumatic force. Semiconductor precision.



Introducing the DVIA-P: an active pneumatic vibration isolation system engineered for the most demanding tools on the fab floor—wafer inspection, metrology, lithography and e-beam systems with onboard wafer loaders and high-speed linear stages. Pneumatic servo-valve actuators, accelerometers and displacement sensors work together under digital control to cancel vibration in all six degrees of freedom, from 0.5 Hz to 150 Hz.

Where electromagnetic isolators run out of force, pneumatics keep going. Seven isolator sizes carry payloads from 550 kg to 20,000 kg, so one platform architecture scales from a compact automated AFM to a 20,000 kg lithography system. Stage feedforward and position feedback bring the payload to rest in under a second after every stage move and hold it within ±10 µm—cleanroom-ready, air-and-power simple, and in production at tier-1 semiconductor fabs.

DVIA-P at a glance.

Six numbers that define the platform.

20,000 kg

Maximum payload

The DVIA-P20000 carries 20,000 kg. Seven isolator sizes start at 550 kg.

6 DOF

Degrees of freedom

Active control of X, Y, Z, θx, θy and θz—every translation and every rotation.

0.5–150 Hz

Active isolation range

Isolation begins at 0.5 Hz, far below the resonance of any passive pneumatic mount.

≥ 90 %

Isolation from 4 Hz

70 % of floor vibration removed at 2 Hz, 90 % or more from 4 Hz to 150 Hz.

< 1 s

Settling time

Stage feedforward and acceleration feedback bring the platform to rest in under a second.

±10 µm

Position accuracy

Six displacement sensors hold the static position and level of the payload to ±10 µm.

Clean dry air

5–6 bar · 250 L/min

Power

AC single phase · 100–240 V · 100 W

Certification

CE

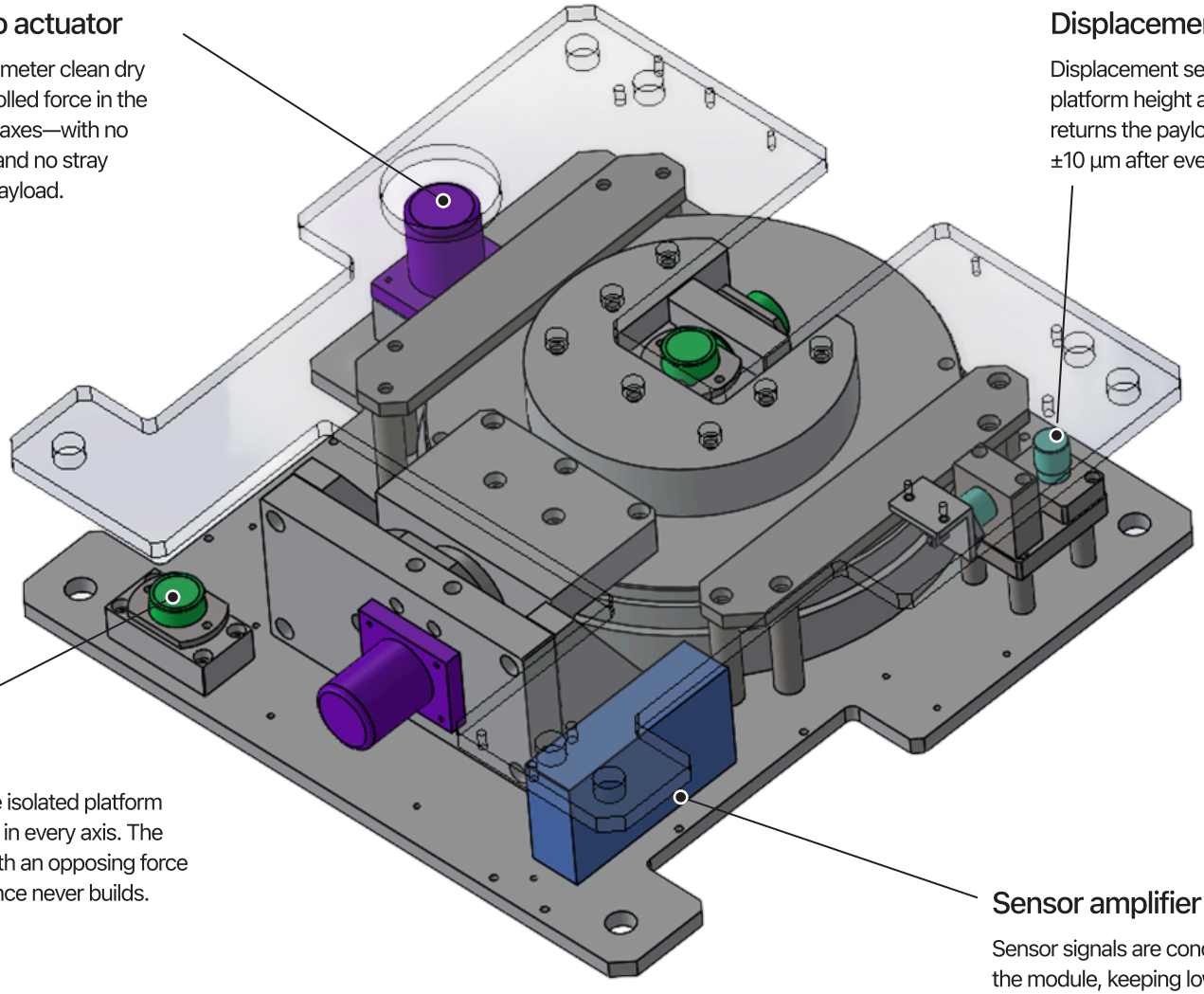
Take a closer look.

Pneumatic servo actuator

Servo-valve actuators meter clean dry air into precisely controlled force in the vertical and horizontal axes—with no heat-generating coils and no stray magnetic field at the payload.

Displacement sensor

Displacement sensors continuously measure platform height and tilt. Position feedback returns the payload to its reference within ±10 µm after every load change.



Accelerometer

Accelerometers on the isolated platform detect residual motion in every axis. The controller responds with an opposing force in real time, so resonance never builds.

Sensor amplifier board

Sensor signals are conditioned and amplified inside the module, keeping low-frequency signals clean before they reach the digital controller.

Technical features.

Isolation from 0.5 Hz.

Active control extends isolation far below the natural frequency of any passive pneumatic mount. Accelerometers detect payload motion and the servo valves respond with an opposing force, so the DVIA-P begins isolating at 0.5 Hz, removes 70 % of floor vibration at 2 Hz and 90 % or more from 4 Hz to 150 Hz—while the resonance peak that limits passive isolators is actively damped away instead of amplified.

Position held to ±10 µm.

Six displacement sensors measure the platform's height and tilt without interruption. The position feedback loop drives the servo valves to return the payload to its reference position after every load change or stage move, holding static position within ±10 µm so that the optical column, wafer chuck and loader remain exactly where they were calibrated.

Settles in under a second.

Stage feedforward uses advance information about stage motion to apply an equal and opposite force before the payload can react. Combined with acceleration feedback, the DVIA-P brings the platform to rest in less than one second after each move—so measurement throughput is set by the tool, not by waiting for vibration to decay.

Air does the work.

Pneumatic servo-valve actuators generate the force that voice-coil systems cannot—up to 186,000 N vertical and 5,800 N horizontal on the DVIA-P20000—with no heat-dissipating drive coils and no stray magnetic field at the payload, an advantage for electron-beam columns and thermally sensitive optics. Air springs, actuators and sensors are integrated in each isolator module, and the complete system runs on clean dry air and 100 W of single-phase power.

Feedback and feedforward control.

Four control loops. One still platform.

Acceleration feedback for superior stability.

Accelerometers on the isolated platform continuously measure its motion, and the controller corrects it in real time: if the payload moves up, the servo valves push it down; if it moves down, they push it up. Disturbances are countered the instant they begin, so resonance never builds.

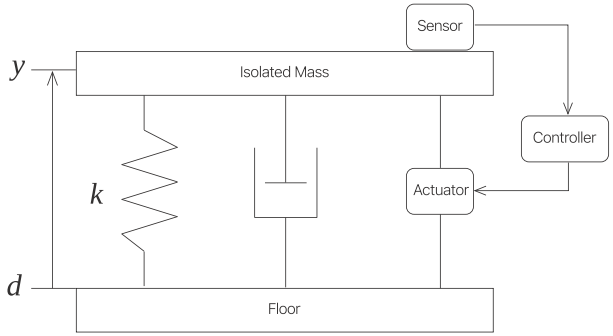
Position feedback for absolute alignment.

Displacement sensors measure the platform's height and tilt. Whenever load shifts—a wafer loader extending, a stage reaching the end of its travel—the digital controller returns the platform to its original position within ±10 µm, keeping optics and chuck where they were calibrated.

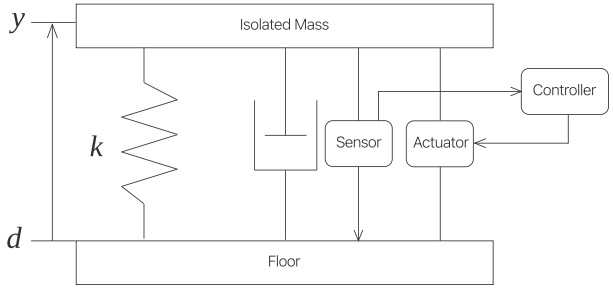
Feedforward for exceptional performance.

Floor feedforward measures incoming ground vibration and applies an equal and opposite force before it reaches the payload, self-optimizing its gains as conditions change. Stage feedforward uses advance stage-position information to cancel the reaction forces of motorized stages as they occur.

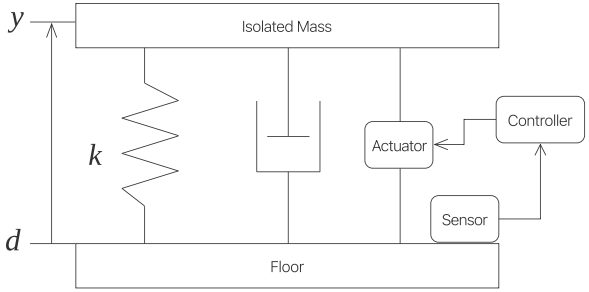
Feedforward removes the predictable. Feedback fine-tunes the rest.



Feedback loop



Position feedback loop



Feedforward loop

Control, uncompromised.

Nineteen channels in, ten channels out—16-bit sampling and 24-bit drive. The DVIA-P's digital signal processor computes each of the six degrees of freedom independently, decoupling the axes to eliminate cross-coupling, and commands the pneumatic servo valves in real time.

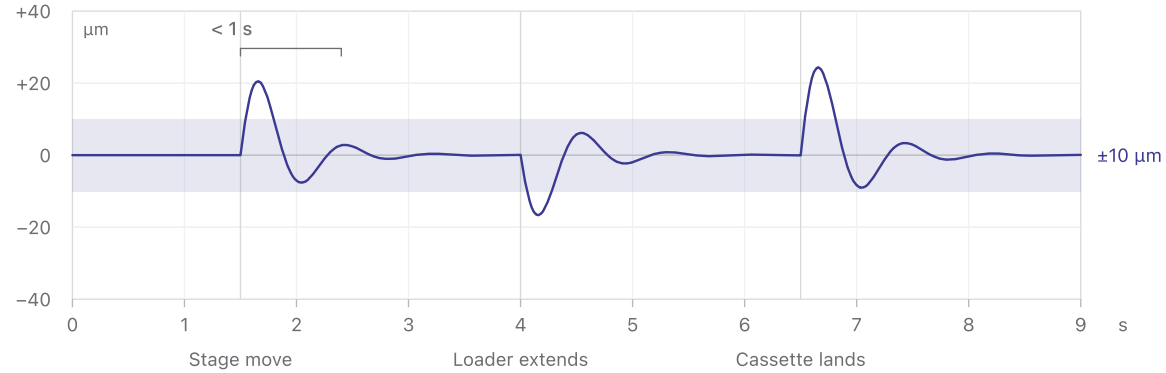
Position feedback.

Isolation keeps the tool still. Position feedback keeps it exactly where it was calibrated.

Six displacement sensors measure the platform's height and tilt without pause. Whenever load moves—a stage crossing the wafer, a loader extending, a cassette landing—the digital signal processor commands the pneumatic servo valves to bring the platform back to its setpoint, within ±10 µm, in all six degrees of freedom. The air spring carries the static load, so the platform holds that reference without a continuous actuator force and without adding heat at the payload.

±10 µm—held continuously, in all six degrees of freedom.

Typical response to a load change



Typical platform response. Every load change drives the platform off its setpoint. Acceleration feedback damps the motion and position feedback drives the platform back to its reference, returning it inside the ±10 µm band in under a second and holding it there—not once, but on every event, for as long as the tool runs. Illustrative, drawn to the published specification: settling time < 1 s, position accuracy ±10 µm.

The loop

01 Measure

Six displacement sensors track platform height and tilt without pause, resolving every axis independently.

02 Compute

The digital signal processor compares each axis against its setpoint and decouples all six degrees of freedom.

03 Correct

Servo valves meter clean dry air into each isolator until the platform is back on setpoint—and hold it there.

What it protects

Working distance

Electron-optical columns are calibrated at a fixed working distance. Holding platform height holds that geometry, so focus and astigmatism settings stay valid through the shift.

Registration and overlay

Mask-to-wafer registration and stage coordinate systems assume the platform has not moved since calibration. Position feedback keeps that assumption true.

Facility connections

Vacuum, gas and cooling lines run from fixed facility points to a floating tool. A platform that always returns to the same height keeps those connections unstrained.

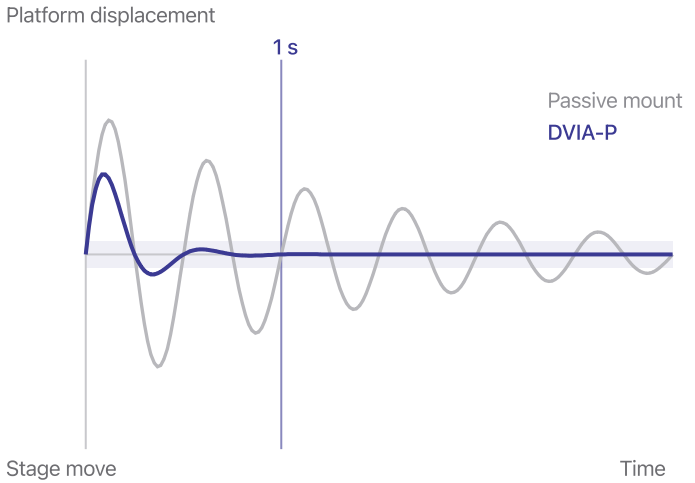
Unattended operation

In-line tools run around the clock. The loop holds the reference hour after hour, with no operator intervention and nothing to adjust by hand.

Engineered for moving stages.

Fast wafer stages create the disturbance. The DVIA-P removes it.

Every stage acceleration pushes back on the tool. On a passive mount the platform rocks at its natural frequency and takes seconds to settle, and measurement has to wait. The DVIA-P treats stage motion as a known input: stage feedforward applies the counter-force in step with the stage profile, acceleration feedback damps what remains, and position feedback restores the platform to within ±10 µm—so the tool can measure again in under a second.



Illustrative settling response after a stage move (not measured data).

01

The stage moves

The tool controller shares the stage position or a trigger signal with the DVIA-P controller in advance of the move.

02

The force is cancelled

Stage feedforward commands the servo valves to apply an equal and opposite force as the stage accelerates and decelerates.

03

The platform returns

Acceleration feedback damps residual motion and position feedback restores height and level to ±10 µm—within one second.

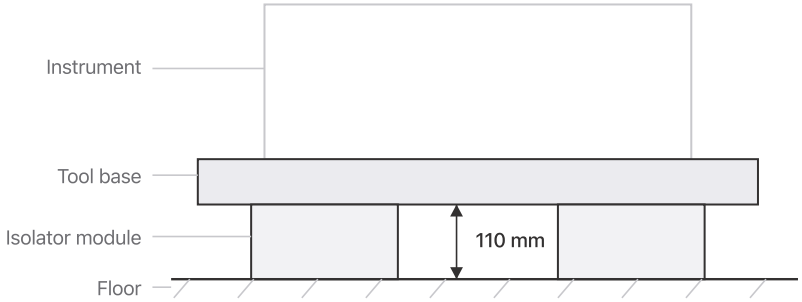
Tell us about your stage.

Settling depends on moving mass, velocity, acceleration, stroke and duty cycle. Share the stage profile and DAEIL tunes the stage feedforward to your tool—and can verify the result on our in-house test bed before the system ships.

Fits under the tool.
Runs on air and power.

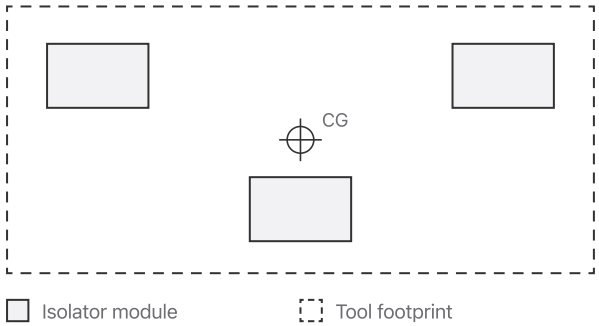
DVIA-P isolator modules are placed under the tool base at its support points—typically three per system. Each module carries its own air spring, servo-valve actuators and sensors, so quantity and placement follow the tool's footprint and weight distribution rather than a fixed frame. The lowest-profile modules, the DVIA-P2200 and DVIA-P4000, stand just 110 mm tall; module height runs to 284 mm across the seven sizes.

Low profile



Side elevation — module under the tool base, shown at the 110 mm profile of the DVIA-P2200 and P4000.

Placed at the support points



Example layout — module quantity and position are set from the footprint drawing and the weight distribution.

Two utilities. Nothing else.

Clean dry air at 5–6 bar (250 L/min) and a single-phase 100–240 V outlet supplying 100 W are the only services required—no three-phase power, no cooling water, nothing beyond the utilities already at the tool. Cleanroom-ready construction and CE certification come standard, and DAEIL's engineers configure every system from your tool model, footprint and facility conditions, including custom support frames machined in-house.

Clean dry air

5–6 bar · 250 L/min

Power

AC single phase · 100–240 V · 100 W

Isolator module height

110–284 mm depending on model

Turnkey. From survey to sign-off.

Five engineered steps, delivered end-to-end by DAEIL SYSTEMS—from the first floor measurement to the final performance certification.

01

Site Survey

Measure the floor before you isolate it.

Our engineers characterize floor vibration and the sub-structure beneath the metrology bay—mapping vibration sources, weak access floors and the structural changes the tool requires, before a single drawing is produced.

Floor vibration analysis · Sub-floor structural assessment

02

Custom Design

Engineered to your fab. Confirmed before fabrication.

From the survey data we design the custom concrete frame, concrete pads and reinforced beams that replace the weak access floor and sit flush with the surrounding fab. Every drawing is signed off by your team before manufacturing begins.

Engineering drawings · Customer sign-off

03

Manufacturing

Built to spec. Inspected before it ships.

The concrete substructure, reinforced support beams and active isolation hardware are fabricated in our own facility, and every component is inspected against the approved drawings before it leaves the floor.

QA-verified components · Pre-shipment inspection

04

Installation

On-site. End-to-end. Flush with your fab.

Our team removes the existing access floor, positions the concrete frame and pads, integrates the reinforced beams and installs the DVIA-P isolators—mounted flush with the fab floor, with no elevation differentials and no interference with adjacent tools.

Full structural integration · Tool-ready platform

05

Tuning & Verification

Tuned by hand. Verified on-site.

Field engineers tune the system to your specific tool, measure floor and isolated-mass vibration in parallel, and verify that the tool maker's published vibration requirement is met before handover.

Vibration measurement report · Performance report

One supplier. Five steps. Zero handoffs.

No third-party subcontractors. No coordination overhead. From the first floor measurement to the final performance certification, DAEIL SYSTEMS engineers own every step.

FDC. Native SECS/GEM.

The DVIA-P streams its full state into the fab's host system over native SEMI standards—HSMS (E37), SECS-II (E5), GEM (E30). Every second, a single S6F1 trace message carries 30 SVIDs: FLOAT and ACTIVE lamps, three vibration alarms, communication faults, six displacement channels and nine acceleration channels. Internal polling: 500 ms. Trace transmission: 1 s. No middleware. No event chatter. Trace-only by design.

HSMS

TCP/IP transport. The platform listens as passive equipment; the host connects as active. Select, Linktest and Separate are handled per the E37 state machine, with T3, T6, T7 and T8 timers enforcing the session.

SECS-II

Message format. S1F13/14 establishes communication, S2F23/24 starts the trace, and S6F1 streams the payload in big-endian—every second. W-bit fixed to 0; no host acknowledgment required.

GEM

Equipment model. Online and offline state, alarms, status and trace data—the platform exposes itself as standard GEM equipment. Monitoring only; FLOAT/ACTIVE control stays on the platform.

30 SVIDs

Per S6F1 message: 7 status and alarm flags, 6 displacement channels and 9 acceleration channels, including the base axes. I4 integers at 10 µm and 10 µm/s² resolution.

Monitoring · Alarm · Log.

A dedicated Windows monitoring application ships with every DVIA-P. It polls the controller over RS-232 in real time—vibration, floating status, position, communication—and latches every alarm until the operator clicks Confirm. The instant something fires, the app jumps from minimized to topmost on the screen. No notification toasts. No chance of being missed. Every state change is timestamped and written to disk.

POLL — Real-time

Periodic status polling over RS-232 at a configurable interval. The controller's 16-bit status word is read, decoded and compared cycle to cycle.

LATCH — Alarm history

OR-latched alarm state. Transient events that fire and clear within a single polling cycle still appear in the history bar—held until the operator clicks Confirm.

TOPMOST — Visual alert

Minimized during normal operation. The instant any alarm fires, the window jumps to topmost; Confirm returns it to minimized —until the next event.

LOG — Persistence

Every state change is written to disk with a timestamp. Log rotation keeps the most recent lines hot and archives the rest automatically—UTF-8 throughout.

Applications

Engineered for semiconductor metrology at every node—each configuration engineered to the specific process the tool runs.

CD-SEM

Sub-nanometer linewidth measurement.

CD-SEMs measure feature widths at advanced process nodes. Floor vibration broadens edge profiles and degrades repeatability. The DVIA-P delivers vibration-free wafer staging at the precision modern lithography demands.

Defect Review SEM

Catch every defect. Skip every false call.

Defect review depends on stable beam-to-stage alignment as the SEM scans the wafer. Imperceptible floor motion produces artifacts indistinguishable from real defects. The DVIA-P holds the tool steady through full-wafer cycles.

Photomask Repair

Repair to the original spec.

Mask repair tools deposit and remove material at the nanometer scale. Stability during the repair operation determines whether the mask returns to spec or fails final inspection. The DVIA-P keeps the repair head locked on target.

Reticle Inspection

Every die. Every defect. Zero noise.

Reticle inspection scans every micron of the photomask for defects that could replicate across millions of die. Vibration introduces image noise that masks real flaws. The DVIA-P delivers the mechanical silence it demands.

E-Beam Lithography

Precision patterns. Pristine edges.

Pattern transfer at the nanoscale demands a vibration-free writing field. Floor disturbances translate directly into line-edge roughness and overlay error. The DVIA-P isolates the column at the frequencies that matter most.

Automated X-Ray Inspection

Sub-micron CT. 24/7 on the line.

In-line AXI resolves hidden solder joints in BGAs, flip-chips and power packages through 3D CT reconstruction. At sub-micron resolution, any motion between source, sample and detector becomes a volumetric artifact. The DVIA-P removes it.

Mask Aligner

Mask-to-wafer overlay, held steady.

Mask aligners require sub-micron registration between mask and wafer during exposure. Building vibration corrupts overlay accuracy and reduces yield. The DVIA-P delivers the stable platform exposure tools depend on.

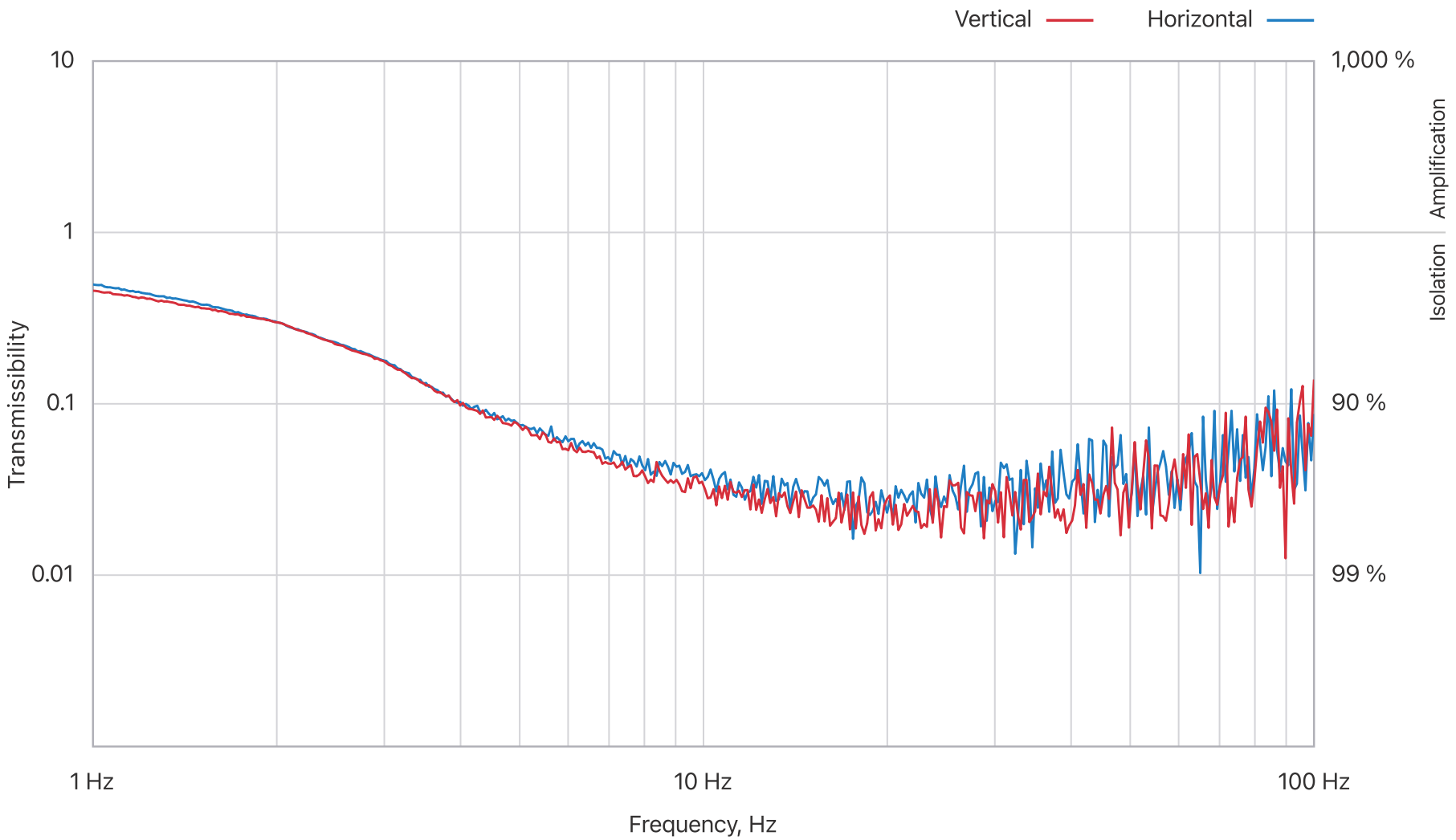
In-line 3D AFM

Picometer topography. 24/7 on the fab floor.

In-line 3D AFM delivers picometer-scale topography on the active fab floor—a physical probe against the wafer, 24/7. At a noise floor below 35 pm, any relative motion between tip and sample is the measurement error. The DVIA-P removes it.

Performance

The DVIA-P delivers 70 % vibration isolation at 2 Hz and 90 % or more from 4 Hz to 150 Hz.



*Typical transmissibility of a DVIA-P system, anchored to the published specification: 70 % isolation at 2 Hz and 90 % from 4 Hz.
Measured performance varies with floor conditions, payload, isolator configuration and tuning—an installation measurement report verifies isolation on your floor.

Specifications

Model	DVIA-P550	DVIA-P1000	DVIA-P2200	DVIA-P4000	DVIA-P7000	DVIA-P10000	DVIA-P20000
Isolator dimensions, W × D × H (mm)	215 × 160 × 170	240 × 240 × 170	350 × 350 × 110	420 × 420 × 110	450 × 450 × 120	400 × 465 × 240	645 × 600 × 284
Maximum payload (kg)	550	1,000	2,200	4,000	7,000	10,000	20,000
Max. actuator force, vertical	4,400 N	8,200 N	18,000 N	34,000 N	58,000 N	83,600 N	186,000 N
Max. actuator force, horizontal	390 N	780 N	780 N	1,300 N	2,200 N	2,200 N	5,800 N
Actuators	6 × pneumatic servo-valve actuators						
Sensors	9 × accelerometer · 6 × displacement sensor						
Degrees of freedom	6 (X, Y, Z, θx, θy, θz)						
Control	Acceleration feedback · Position feedback · Floor feedforward · Stage feedforward						
Active isolation range	0.5–150 Hz						
Isolation performance	70 % at 2 Hz · ≥ 90 % at 4 Hz and above						
Settling time	< 1 s						
Position accuracy	±10 µm (static)						
Power supply	AC single phase · 100–240 V · 100 W						
Clean dry air (CDA)	5–6 bar · 250 L/min						
Host interface (FDC)	SECS/GEM — HSMS (E37) · SECS-II (E5) · GEM (E30) · RS-232 monitoring application						
Controller	Digital signal processor · 19-channel 16-bit A/D · 10-channel 24-bit D/A · six-axis decoupled control						
Certification	CE						

*Isolator dimensions are per module. Custom footprints, higher payloads and support frames are available on request.

*Specifications are subject to change without notice.

Choosing the right model.

Three inputs decide the configuration: payload, footprint and stage dynamics.

01

Payload

Start from the total mass on the isolators—tool, frame, loader and options—and choose the model whose rated payload covers it. When the weight distribution over the support points is unknown, or the center of gravity is off-center, step up one size: a 2,000 kg tool with an offset center of gravity goes on the DVIA-P4000, not the P2200.

02

Footprint and height

Isolator modules sit at the tool's support points. Module size and the height available under the base —from 110 mm on the DVIA-P2200 and P4000 to 284 mm on the P20000—decide the placement and whether a custom support frame is needed.

03

Stage dynamics

Moving mass, velocity, acceleration, stroke and duty cycle of the wafer stage set the settling requirement. Share the stage profile and the trigger or position signal available from the tool controller, and DAEIL tunes the stage feedforward to it.

Quick reference

550 kg	DVIA-P550
1,000 kg	DVIA-P1000
2,200 kg	DVIA-P2200
4,000 kg	DVIA-P4000
7,000 kg	DVIA-P7000
10,000 kg	DVIA-P10000
20,000 kg	DVIA-P20000

What we need from you

- Tool model, footprint drawing and support-point layout
- Total payload and weight distribution (or center of gravity)
- Height available under the tool base
- Stage moving mass, velocity, acceleration, stroke and duty
- Required vibration criterion (e.g. VC-C) and settling target
- Floor vibration survey—or let DAEIL measure it
- CDA and single-phase power at the installation site

Tell us your instrument model and facility conditions. We'll engineer the configuration.

DAEIL SYSTEMS

A world where vibration never limits discoveries.

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