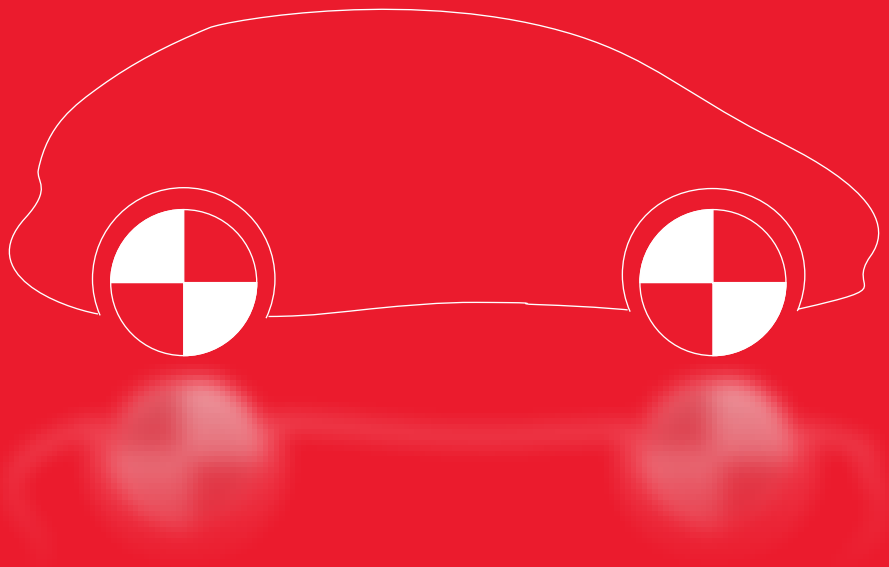
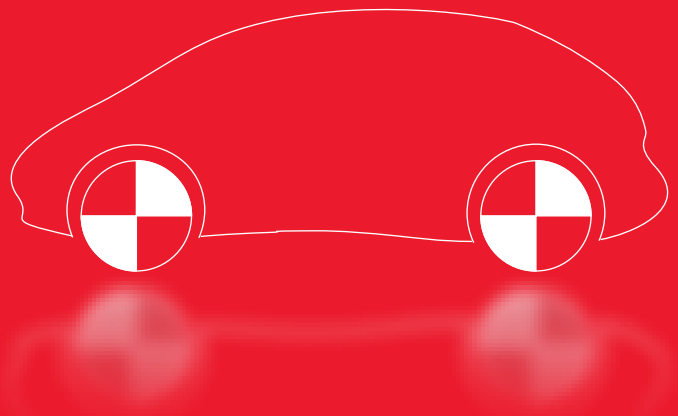


# Automotive

ViPAC

# ViPAC Automotive

- Environmental Testing
- Thermal Shock Testing
- Vibration & Shock Qualification Testing
- Vehicle Emissions Testing
- Vehicle & Homologation Testing
- Vibro-Acoustic and Finite Element Modelling



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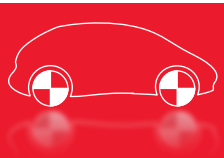
# ViPAC Automotive



## Environmental Testing

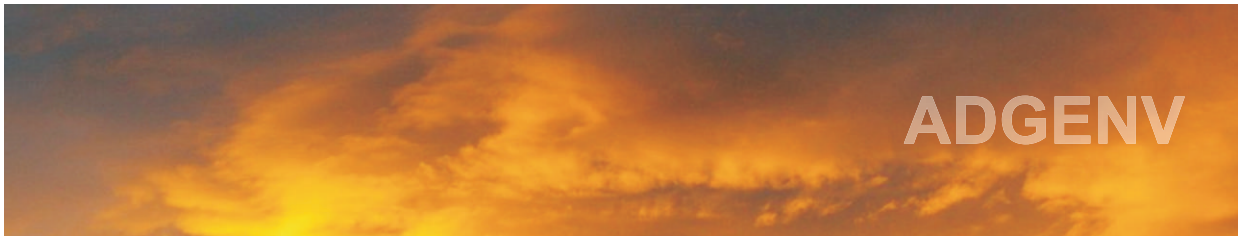
Vipac's Automotive Group offers a variety of test facilities covering a broad range of testing requirements such as thermal testing, vibration and shock testing, water and dust ingress protection. As a fully independent company, Vipac is contracted by many companies to provide confidential testing services for a wide range of products - motor vehicles, automotive components, aerospace and defence electronic equipment, general consumer goods (whitegoods, mobile phones, etc) and industrial components (controllers, actuators, etc). Testing can be carried out to a variety of Standards, including AS, ASTM, MIL STDs (810E/F/G), ISO, DEF and automotive standards such as those from Ford, Holden, and Toyota. From basic qualification to customised R&D testing procedures Vipac's Environmental Laboratory offers a flexible, customer centric service, regardless of project size.

### Services

- Vibration & Shock Testing
- Combined Temperature & Vibration Testing
- Temperature & humidity Testing
- Water & Dust Ingress Protection Testing
- Driving Sand & Dust Testing
- Salt Corrosion Testing
- Solar Radiation Testing
- Drop Testing
- Hardness Testing
- Flammability Testing
- Testing to Client Specific Requirements

### Test Standards

- AS
- IEC
- EN
- IP Code
- ASTM
- MIL STDs
- UNEEC
- ISO
- DEF-STN
- Automotive Standards




# Environmental Testing

### Climatic testing

- Vipac's large Environmental Test Chamber, measuring 14m long x 5.5m wide and 4.5m high, is certified to test through a temperature range from -5°C to +60°C and humidity from 40% to 95%. It incorporates a 30 lamp CSI solar simulator, allowing any sunlight condition to above 1120W/m2 to be reproduced. Diurnal cycling can also be conducted.
- The High Temperature Chamber (2.2mx2mx2m) provides for testing from ambient to 250°C.
- The Balanced Temperature & Humidity Chamber (3mx3mx3m) allows testing from 20% to 95% RH and from -40°C to +150°C.
- A variety of smaller chambers covering dry heat, humidity and temperature shock cycling, are available for testing of smaller products or parts.

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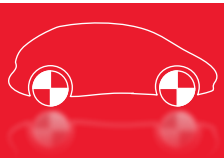
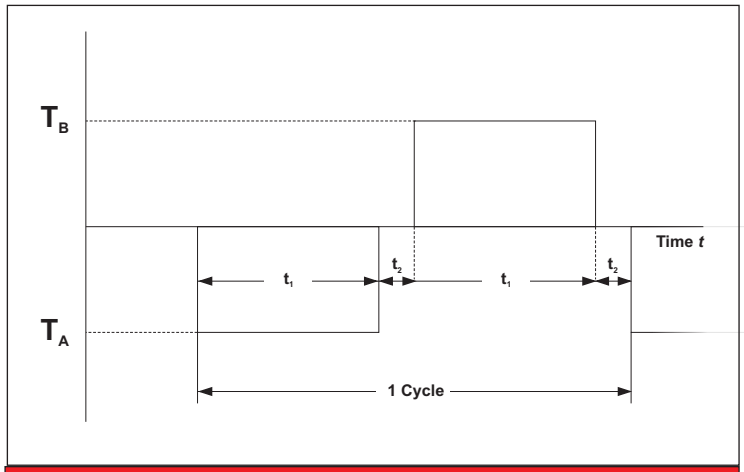
# ViPAC Automotive



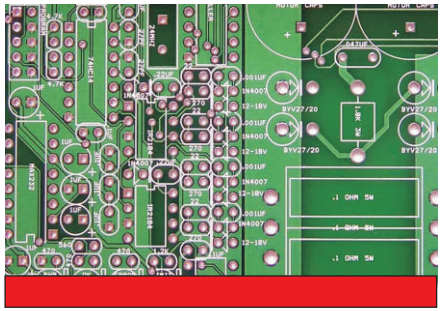
## Thermal Shock Testing

Vipac's expertise in environmental testing allows us to simulate conditions that will provide detailed knowledge on how the product will operate and survive in its final environment.

Thermal Shock Testing is designed to thermally shock and stress the product as a result of rapid temperature change from extreme cold to hot environments. Product flaws are soon identified through accelerated aging of the material allowing you to align your products with the requirements of field use before they go into series production.




**Typical Thermal Shock Profile**




# Thermal Shock Testing

### Thermal Shock Facility

- Thermal Shock Chamber: -80°C to +220°C <30 sec transfer time
  Chamber Size: 625mm x 460mm x 410mm

### The Science Behind It!

For general electrical components the acceleration mechanism for reliability is a function of the thermal coefficient of expansion of the materials used in the device under test (DUT). Along with the difference between the temperature extremes (deltaT) of the test environment, this coefficient determines the stresses introduced in the DUT and the reliability acceleration that is exhibited. Thermal shock conditions are produced by rapidly moving the DUT between two temperature extremes, and typically require that the transition time between the extremes is less than 5 minutes, thereby creating a shock condition. The time the DUT must remain at a temperature extreme before reaching equilibrium can vary from a few minutes to an hour, depending on the method of producing the temperature extremes, the capacity for heat transmission, and the mass of the DUT. Considering that the number of cycles for a complete test can range from hundreds to thousands of cycles, this equilibrium time is very significant.

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# ViPAC Automotive

## Vibration & Shock Qualification Testing

Vipac Engineers & Scientists Ltd is an independent engineering Research & Development consultancy with offices located throughout Australia, South-East Asia and the Middle East.

With over 30 years experience Vipac provides innovative, cost-effective, reliable and confidential services to a wide variety of clients and industries.

Thanks to our dedicated team of engineers and scientists' diverse range of knowledge and expertise, Vipac remains one of the partner of choice for many Australian and Overseas clients supporting the drive to great product design and reliability.

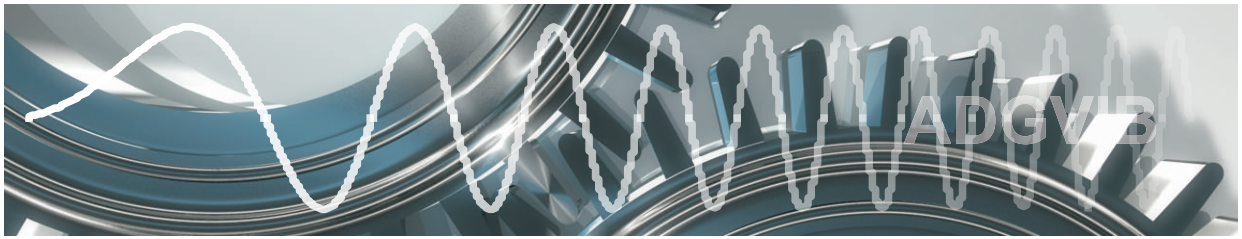
From basic qualification to customised R&D testing procedures Vipac's Vibration Laboratory offers a flexible, customer centric service, regardless of project size.

## Services

- Product Qualification Testing
- Durability Testing
- Troubleshooting
- Research & Development
- Calibration & System Audit

## Test Standards

- AS (Australian Standards)
- BS (British Standards)
- Automotive Standards
- ISO
- IEC
- EN
- DEF-STN
- MIL-STD-810E/F/G
- MIL-STD-167A
- RTCA/DO-160E



# Vibration & Shock Qualification Testing

## Equipment:

### Test Cell 1 - Electrodynamic (ED) Shaker Facility:

**ED Shaker:**

- Force: 26KN
- Stroke: 1 Inch
- Frequency Range: 5 Hz - 2000 Hz
- Test Sample Mounting Options: Slip Table
- Digital Vibration Controller: Sine, Random, Random on Random, Sine on Random, Classic Shock

**Climatic chamber:**

- Temperature range: -40°C to 140°C
- Internal dimensions: 1200x800x800mm

### Test Cell 2 - Electrodynamic (ED) Shaker Facility:

**ED Shaker:**

- Force: 26KN
- Stroke: 1 Inch
- Frequency Range: 5 Hz - 2000 Hz
- Digital Vibration Controllers: Sine, Random, Random on Random, Sine on Random, Classic Shock

**Climatic chamber:**

- Temperature range: -40°C to 140°C
- Internal dimensions: 1200x800x800mm

### Test Cell 3 - Electro-Hydraulic (EH) actuator Facility:

**EH Actuator:**

- Force: 147 KN
- Total excursion: 300mm
- Frequency range: 0.01 - 300Hz

### Dedicated Shock Testing Facilities:

**Shock Table 1:**

- Acceleration: 600g @ 1.5ms
- Lifting Capacity: 900Kg

**Shock Table 2:**

- Acceleration: 2000g
- Lifting Capacity: 200Kg

**Horizontal Shock Table (10deg Incline):**

- Acceleration: 80g
- Lifting Capacity: 200Kg

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# ViPAC Automotive

## Vehicle Emissions Testing

Vipac Engineers & Scientists' new Emissions Test Cell incorporates the only “fully transient” heavy duty chassis dynamometer in Australia capable of testing a full range of vehicles from passenger cars through to prime movers.

Tests are carried out over a variety of internationally recognised Vehicle Emission & Fuel Consumption Standards (generally applied to light-duty vehicles – e.g. ADR79/01 & 81/01, Euro III/IV, IM240, EEC98/69, FTP, JAS). It offers the added flexibility of being able to undertake customised development testing, as well as research projects on heavy duty trucks and buses.


# Vehicle Emissions Testing

### Services

- Product Certification
- Back to Back Testing
- Fuel Consumption Testing
- Research & Development
- Calibration

### Test Standards

- AS (Australian Standards)
- SAE
- Australia Design Rules (ADR)
- UNEEC

Vipac Cold Start Chamber (Vehicle courtesy of Crossover Car Conversions)


Vipac Heavy and Light Duty Transeint Chassis Dynamometer

### CELL 1

Vipac Heavy Duty 4WD chassis dynamometer is a fully transient facility capable of undertaking a variety of standard certification and support Research & Development testing. The dynamometer guarantees total road simulation under both acceleration and deceleration conditions.

- Twin 48" roller design (FWD, RWD, AWD)
- Complies with all worldwide light-duty emissions and fuel consumption standards
- Full road load inertia simulation for heavy-duty vehicles up to 25,000Kg equivalent inertia
- Heavy duty mode maximum speed of 120Km/h
- Light duty mode maximum speed of 160Km/h
- Up to 600kW of maximum load absorption

### CELL 2

Vipac Light Duty 2WD chassis dynamometer is capable of undertaking a variety of standard certification and support Research & development testing. The facility is also set-up to support climatic conditions, for example to satisfy Euro III Type VI cold start certification testing.

- Twin 20" cradle type dynamometer (Froude-Consine CD60 2WD)
- Complies with all worldwide light-duty emissions and fuel consumption standards
- Full road load inertia simulation for light duty vehicles up to 3,500Kg GVW
- Maximum speed of 160Km/h
- Maximum load absorption of 60kW
- Environmental temperature control between -10°C and +40°C

State of the art Horiba and Signal emissions analysis benches are available in both CELL 1 and CELL2 to support Constant Volume Sampling (CVS) certification work and Real Time RAW/DILUTE analysis.

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# ViPAC Automotive

## Vehicle & Homologation Testing

Vipac's staff are experienced in all facets of vehicle homologation and certification programs to UN-ECE, EEC, FMVSS, JIS and ADR standards.

After the completion of any tests, Vipac's staff can submit the required documentation to the relevant authorities to facilitate a quick turn-around of the homologation process.

Vipac has access to dry weather proving grounds with variable surfaces to conduct a variety of vehicle testing regime including NVH and Brake performance.


# Vehicle & Homologation Testing

### Australian Design Rules

- UN-ECE Regulations
- FMVSS Specifications

### NVH (Noise Vibration Harshness)

- Dynamic mapping of noise and vibration sources
- Internal & external noise measurements

### Brake System Analysis

- Brake system evaluation - Absolute performance, back-to-back comparison, fade monitoring & evaluation, energy dissipating performance, temperature monitoring.
- Problem identification & solution.
- ADR Testing

### Data Logging

- Multi-channel data acquisition (acceleration, pressure, strain, pitch/roll, steering wheel effort and more)
- Vehicle Fingerprinting/benchmark campaigns
- Long duration data logging

### Services

- Product Certification
- Back to Back Testing
- Research & Development
- Troubleshooting


Interior Binaural Noise Recording


Heavy Vehicle Track Testing

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# ViPAC Automotive

**Vibro-Acoustic and Finite Element Modelling**

Vibration and noise in structures such as motor vehicles, boats, buildings or trains can be difficult to predict due to the large numbers of components in the structure.

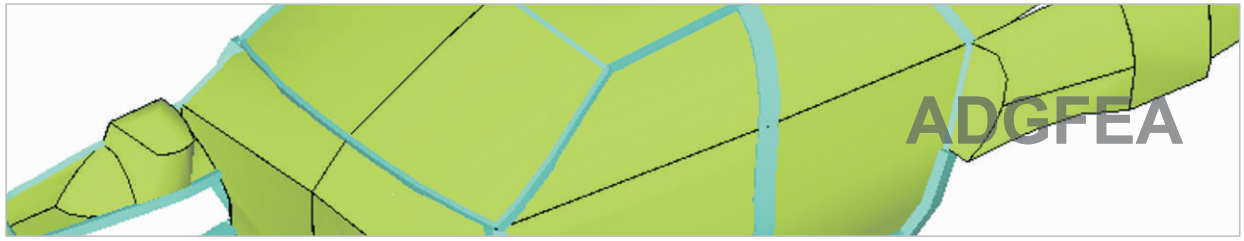
VIPAC's Analysts are expert in the use of computer models utilised to predict the inherent Noise and Vibration characteristics of such environments.

By Using Statistical Energy Analysis (SEA), large and/or complex structures can be reduced to manageable design problems allowing the study of optimum vibration and noise reduction solutions.

VIPAC Analysts are also experienced in Finite Element (FEM) and Boundary Element (BEM) methods. These tools are employed to target detailed prediction of low to mid frequency noise and vibration phenomena. VIPAC uses ANSYS and RAYON solvers, along with custom processing routines written in MATLAB.

## Services

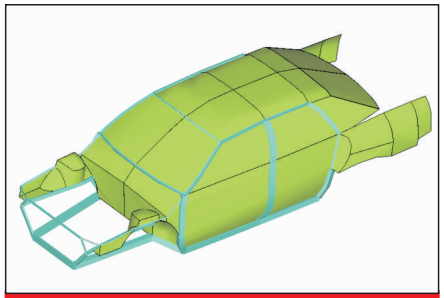
- Statistical Energy Analysis (SEA)
- Finite Element Modelling (FEM)
- Boundary Element Modelling (BEM)
- Modal Analysis




# Vibro-Acoustic and Finite Element Modelling

**Statistical Energy Analysis**

SEA was developed in the 1960's in order to predict vibration levels in space vehicles. At the time the computing power was not available to solve a Finite Element model of such large structures. SEA is an energy based method and relies on the inherent variability present in all structures to make predictions of the average noise or vibration level of a structure. By balancing the vibration or noise energy levels within a structure predictions of the vibration response can be efficiently predicted. The method has been validated for all sorts of systems from spacecraft to skyscrapers.
SEA is a high frequency method, that is it assumes that the vibration or noise is equally distributed within each segment of the structure, this is in contrast to low frequency Fes methods were the vibration or noise level varies significantly within a single part of the structure.
By using the VA-one software ViPAC Engineers and Scientists can combine SAE, FEM and BEM methods to predict noise and vibration over the entire frequency range, this can encompass low frequency response to machinery or ground disturbance such as trains up to high frequency noise such as wind noise inside automobiles or vibration from fluid flow within pipes.



SEA Model

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# ViPAC Automotive

## Contact Details


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