

HYPHEN[™]

BUILD - TEST - OPTIMIZE



Hyphen helps you accurately predict how your products will measure up in the real world.

BECAUSE NO DESIGN IS FINAL

Based in Kitchener-Waterloo, Ontario—in the heart of Canada’s technology triangle—**Hyphen** is a full service, rapid prototyping and environmental testing center.

Hyphen has the sophisticated technologies to help you through every stage of product development—whether your goal is to test the performance of a design concept, reduce development time, or improve product quality and safety.



Tension/compression testing



Sound testing

All these capabilities in one location will help kick your product development into high gear. We'll provide the continuity and quality you need to keep business moving.

Rapid prototyping services:

- Selective Laser Sintering (SLS)
- Stereolithography (SLA)
- Polyjet
- Fused Deposition Modeling (FDM)
- 3, 4, 5-axis CNC machining centers

Environmental testing services:

- Vibration
- Thermal
- Tension and compression
- Sound
- Shock and drop
- Electromagnetic compatibility (EMC)



▲ A model playground is built using SLA 3D printing technology. Technicians clean and remove the model's lattice-like support structure. It is then finished and painted to replicate the real thing.

RAPID PROTOTYPING

Hyphen's wide range of additive manufacturing technologies and metal-working processes can produce almost any 3D shape.



▲ Add color by painting or dyeing, plate your model with metallic finishes, or add inserts and other hardware to create a fully assembled product



Jar and lid
PolyJet

You can use a combination of prototyping technologies to build your part—each offers unique advantages.

Here, we've blended the strengths of our four main technologies.



Body
SLA

Buttons
FDM

Base
SLS

Hyphen – best-in-class technology

Our team of specialists understands the unique applications of each of the technologies and will help you select the best fit for your needs.

PolyJet

Has the advantage of 107 digital materials that are blended while parts are printed. Each part may have up to 14 distinct material properties. PolyJet is **Hyphen's** recommended option for small parts and/or over molded parts or parts with rubber-like property requirements.

SLA

Models and prototypes created using SLA are rigid, strong and durable. You get a good balance of feature resolution, surface smoothness, speed, accuracy and material properties. Of all of **Hyphen's** technologies, SLA has the largest capacity, and for large parts, it is generally the fastest.

FDM

Hyphen turns to FDM for projects that need the material properties of thermoplastic materials or lightweight, high-strength parts. FDM offers the closest representation of the final injection-molded part.

SLS

Constructs 3D-printed parts from nylon (polyamide) that is strong, tough and durable. SLS is ideal for snap-fit and press-fit interlocks. This process is **Hyphen's** recommended solution for functional prototypes and manufactured parts that need strong material properties.

3D prototypes let you touch and interact with your design and observe details only possible from a physical model.

We'll help you communicate your ideas and evaluate your concepts with high quality, accurate prototypes. Our comprehensive prototyping services can shorten the time it takes to work through design iterations and assembly issues. That means you'll save on lead times and control the cost of your product development.

Hyphen specialists will work with you every step of the way, from process selection through to application:

- Validate fit and function
- Produce models that look and feel like the real thing
- Verify design function and performance.

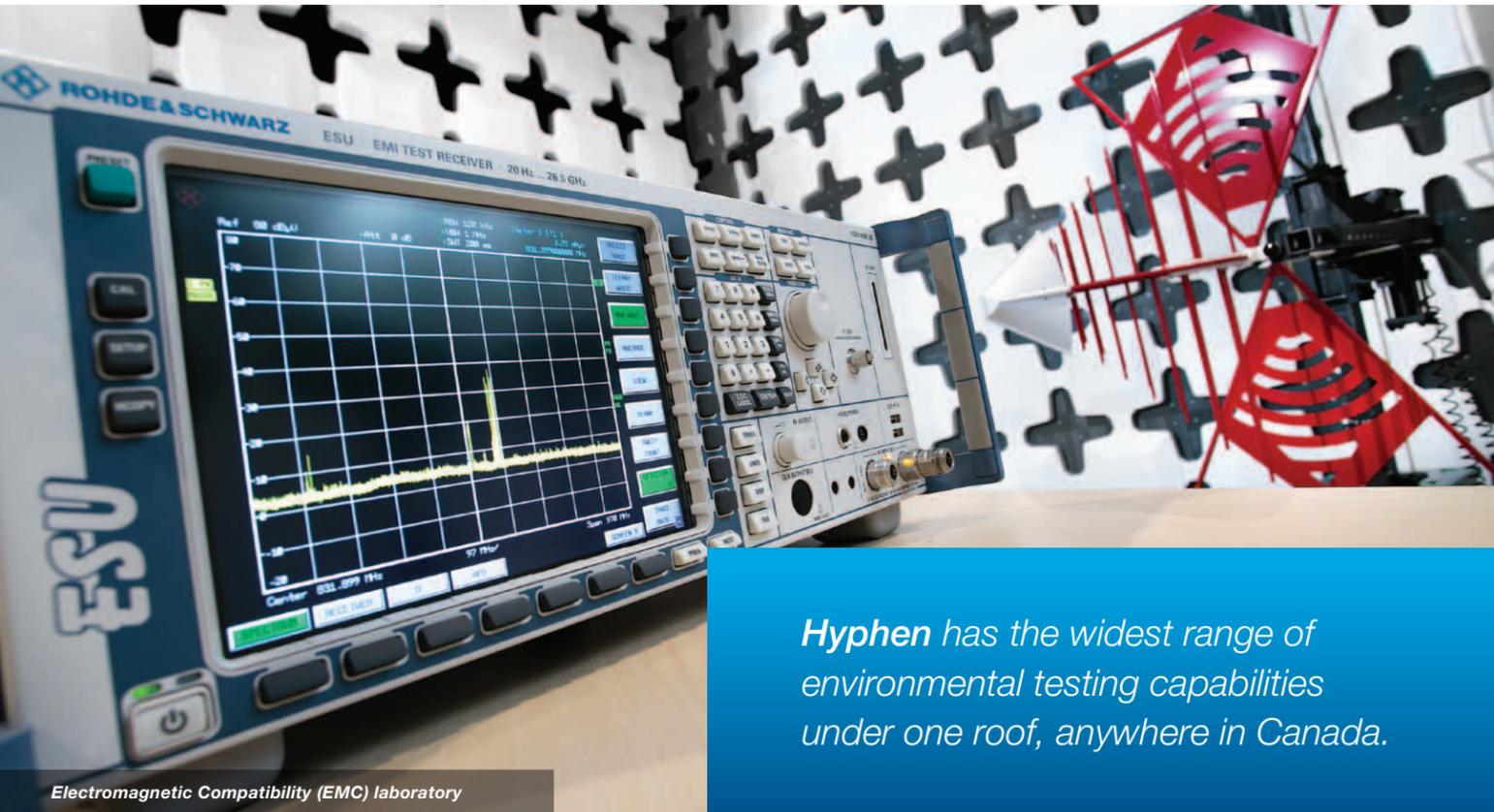
You can even build parts for low-volume production.

Functional	Presentation	Concept	Form and fit	Low volume production

*With **Hyphen**, your design's complexity doesn't result in longer lead times or higher costs. Parts are delivered quickly and cost effectively, since no tooling is required.*

Upload your CAD model and unleash your creativity.

ENVIRONMENTAL TESTING



Hyphen has the widest range of environmental testing capabilities under one roof, anywhere in Canada.

Electromagnetic Compatibility (EMC) laboratory



Use **Hyphen's** testing laboratory to identify potential field failures and testing issues early in the product development cycle, and mitigate risks. Our fully-equipped facility can simulate a variety of tests and meet a wide range of industry standards.

Services include

Vibration – **Hyphen** has one of the largest head expanders and slip tables available for outside use in Canada. Vibration frequencies range from 5 to 2300 Hz and up to 75Gs.

Sound – We have a full and hemi-anechoic (convertible) sound chamber with cut off at 85Hz and 19dBA ambient.

EMC – Our three meter, semi-anechoic electromagnetic compatibility (EMC) chamber can perform full-scan radiated emissions testing at frequencies up to 40 GHz.

Thermal – We have a range of chambers from 40-600 ft³ with temperature ranges from -65°C to 1200°C and up to 95% humidity.

Tension/compression – **Hyphen** can perform tension testing up to 22,000lbs (100kN) and compression testing up to 50,000lbs (222kN).

Predict how your products will perform in real-world environments.

Troubleshoot on the spot with our comprehensive testing services.

Electrical testing

Hyphen's Electromagnetic Compatibility (EMC) laboratory can perform radiated electromagnetic noise compatibility to FCC, Industry Canada, CISPR, and several IEC and EN standards.

Our staff will perform the testing and provide support for troubleshooting any EMC problems the testing reveals.

Hyphen's capabilities cover:

- EMC Radiated and conducted emissions
- EMC Immunity with surge, EFT and ESD generators

Mechanical testing

Find out if your design will meet all of its mechanical requirements. Our team of experts will provide analytic testing services and full reporting for a wide range of mechanical testing.

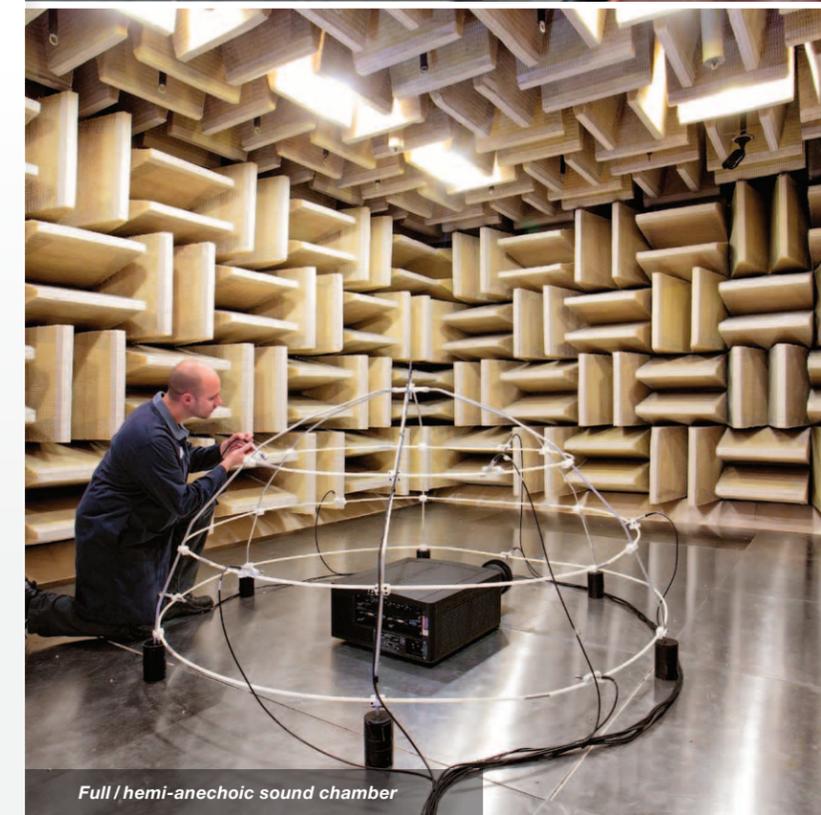
Our top-of-the-line equipment and instrumentation can handle a variety of mechanical testing procedures and requirements. It's easier than ever to get the answers you need to benefit your project.

Hyphen's capabilities cover:

- Package testing
- Modal analysis
- Sine and random vibration testing
- Shock pulse and impact/drop tests
- Sound pressure/sound power/sound quality measurements
- Operating and non-operating temperature tests
- Tensile and compression failure load limits



Vibration testing



Full / hemi-anechoic sound chamber



A Christie® enterprise

As a division of Christie Digital Systems Canada Inc., **Hyphen** is able to extend a long history of expertise to our customers. With more than 80 years of technological firsts and a long list of product awards, Christie® is recognized around the world for its excellence in manufacturing superior, dependable visual display solutions.

The **Hyphen** team of professionals have firsthand experience in shortening lead times and project-design cycles. More than any other provider, we understand how prototyping and testing can optimize product designs and get them to market faster. That's why we invest in the best technologies and instrumentation.

Located in the Christie worldwide center for advanced manufacturing—a registered ISO 9001 and ISO 14001 facility, **Hyphen** adheres to the Kaizen Lean Manufacturing philosophy, focusing on continuous improvement and the 5S methodology.

hyphenservices.com

Throughout our history we've learned a lot; mostly, how important it is to listen and provide our customers with the most reliable, innovative and affordable solutions possible. We're excited to share our expertise and help you get to market faster.



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For the most current information about Hyphen's services and solutions, please visit hyphenservices.com

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