



**Preferred partner
for the bonded
neo industry**





- Magnet Manufacturing
China
UK
- Compound/Powder Manufacturing
China
Thailand
- Sales & Marketing
China
Germany
Japan
- South Korea
Singapore
Taiwan
- UK
USA
- R&D Center
Singapore
- Global Engineering Teams
China
Thailand
USA
UK
- Warehouse
Germany
USA

POWERING THE FUTURE WITH MAGNEQUENCH

Magnequench (MQ) is a pioneer at the forefront of the magnetic materials industry, constantly innovating to push the boundaries of technology. Since our inception, we have been driven by a singular mission: to develop, manufacture, and supply high-performance rare earth magnetic materials and solutions that meet the evolving needs of our customers. Our expertise spans across critical, highly technical sectors such as electronics, automotive, home appliances, medical, and industrial, with products and solutions that exceed the expectations of a diverse customer base.

The Magnequench Advantage – Our core strength lies in our ability to produce high-quality precision magnets tailored to the unique requirements of motor makers across various industries. We understand the intricacies of each sector we serve, and deliver bespoke solutions that integrate seamlessly with our customers' objectives. Over decades of innovation and advanced R&D, we have mastered the art of creating magnets and magnet assemblies that set the standard for excellence.

Leading Magnet Innovation – Our relentless pursuit of excellence is fueled by constant innovation. Our advanced R&D capabilities drive us to deliver high-quality magnets and magnet assemblies that are superior in performance, reliability, and durability. Our commitment to innovation ensures that we remain at the cutting edge of the magnetic materials industry, delivering solutions that

empower our customers to achieve higher performance inside their motors and sensors.

Project Development Support – Our expert team of material, magnet, and motor engineers takes a finely tuned, tailored approach to project development. We understand that each market and client has unique needs, so we dedicate ourselves to providing customized support that addresses each project's specific challenges and opportunities. This commitment ensures that our customer's projects are poised for success from concept to completion.

Sustainability and Responsibility – Prioritizing sustainable practices throughout our operations with ethically sourced rare earth materials and eco-friendly manufacturing processes.

We are deeply committed to our customers; we speak the same language, understand their unique challenges and opportunities, and work closely with them to help them achieve their goals. We are the ideal partner to leverage the power of magnetic technology.

Together, we are powering the future of the industry.



THE MAGNEQUENCH ADVANTAGE



MAKING THE BUILDING BLOCKS OF SUSTAINABLE TECHNOLOGIES

At Magnequench, we take sustainability seriously. Using ethically-sourced raw materials, our state-of-the-art facilities create magnets and magnet assemblies that are vital to our sustainable future. Each facility strives to optimize environmentally-friendly practices – reducing waste, recycling, and reusing materials. Where feasible, we adopt green measures such as the use of renewable energy, and processing wastewater to render it safe.

These EcoVadis-accredited facilities are located at strategically diverse locations, ensuring uninterrupted supply and business continuity for us and for our customers.



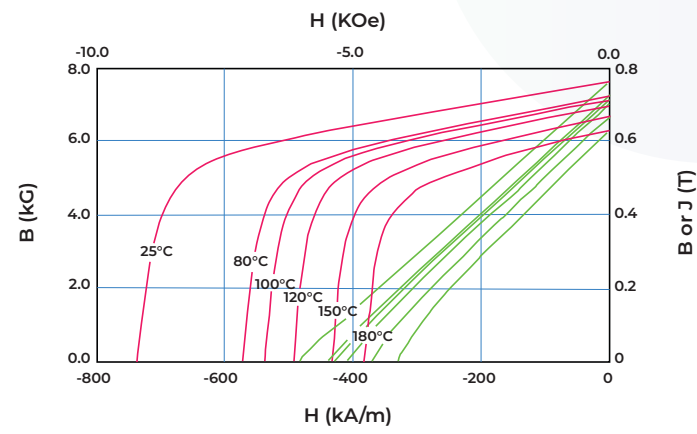
MAGNETIC PROPERTIES

| Magnet grade | Density (g/cm ³) | Residual induction, B _r | Coercive force, H _{cb} | Intrinsic coercivity, H _{ci} | Energy product, (BH) _{max} |
|----------------|------------------------------|------------------------------------|---------------------------------|---------------------------------------|-------------------------------------|
| | | mT (kGs) | kA/m (kOe) | kA/m (kOe) | kJ/m ³ (MGOe) |
| MQ1-13 | 6.4 - 6.6 | 770 - 830 (7.7 - 8.3) | 480 - 550 (6.0 - 6.9) | 675 - 800 (8.5 - 10) | 96 - 112 (12.0 - 14.0) |
| MQ1-12 | 6.2 - 6.4 | 740 - 800 (7.4 - 8.0) | 470 - 530 (5.9 - 6.7) | 675 - 800 (8.5 - 10) | 92 - 99 (11.5 - 12.5) |
| MQ1-11L | 6.1 - 6.3 | 740 - 800 (7.4 - 8.0) | 390 - 454 (4.9 - 5.7) | 520 - 640 (6.5 - 8.0) | 84 - 92 (10.5 - 11.5) |
| MQ1-11 | 6.1 - 6.3 | 720 - 780 (7.2 - 7.8) | 445 - 510 (5.6 - 6.4) | 675 - 800 (8.5 - 10) | 84 - 92 (10.5 - 11.5) |
| MQ1-10H | 5.9 - 6.1 | 640 - 700 (6.4 - 7.0) | 420 - 485 (5.3 - 6.4) | 875 - 995 (11 - 12.5) | 72 - 80 (9.0 - 10.0) |
| MQ1-10L | 5.9 - 6.1 | 730 - 790 (7.3 - 7.9) | 375 - 440 (4.7 - 5.5) | 520 - 640 (6.5 - 8.0) | 80 - 88 (10.0 - 11.0) |
| MQ1-10 | 5.9 - 6.1 | 670 - 730 (6.7 - 7.3) | 420 - 485 (5.3 - 6.1) | 675 - 800 (8.5 - 10) | 76 - 84 (9.5 - 10.5) |
| MQ1-9H | 5.8 - 6.0 | 620 - 680 (6.2 - 6.8) | 414 - 477 (5.2 - 6.0) | 875 - 995 (11.0 - 12.5) | 68 - 76 (8.5 - 9.5) |
| MQ1-9 | 5.8 - 6.0 | 630 - 690 (6.3 - 6.9) | 400 - 460 (5.0 - 5.8) | 675 - 800 (8.5 - 10.0) | 68 - 76 (8.5 - 9.5) |
| MQ1-8 | 5.9 - 6.1 | 610 - 670 (6.1 - 6.7) | 365 - 430 (4.6 - 5.4) | 600 - 715 (7.5 - 9.0) | 60 - 68 (7.5 - 8.5) |
| MQ1-8H | 5.8 - 6.0 | 620 - 680 (6.2 - 6.8) | 400 - 454 (5.0 - 5.7) | 756 - 875 (9.5 - 11.0) | 68 - 76 (8.5 - 9.5) |
| MQ1-7 | 5.9 - 6.1 | 560 - 620 (5.6 - 6.2) | 335 - 400 (4.2 - 5.0) | 600 - 715 (7.5 - 9.0) | 52 - 60 (6.5 - 7.5) |
| MQ1-6 | 5.9 - 6.1 | 540 - 600 (5.4 - 6.2) | 335 - 400 (4.2 - 5.0) | 480 - 600 (6.0 - 7.5) | 44 - 56 (5.5 - 7.0) |
| MQ1-5 | 5.9 - 6.1 | 510 - 570 (5.1 - 5.7) | 270 - 335 (3.4 - 4.2) | 560 - 675 (7.0 - 8.5) | 40 - 48 (4.5 - 6.0) |
| MQ1-4 | 5.9 - 6.2 | 420 - 500 (4.2 - 5.0) | 263 - 318 (3.3 - 4.0) | 560 - 675 (7.0 - 8.5) | 28 - 40 (3.5 - 5.0) |
| MQ1-3 | 5.9 - 6.1 | 310 - 470 (3.1 - 4.7) | 263 - 318 (3.3 - 4.0) | 560 - 675 (7.0 - 8.5) | 20 - 32 (2.5 - 4.0) |

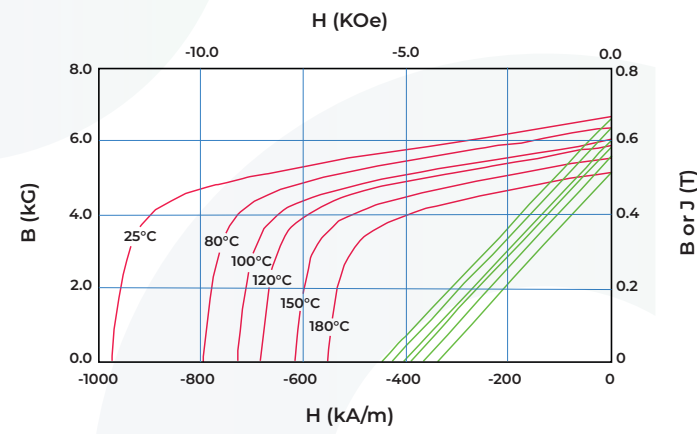
| Temperature coefficient of B _r | Temperature coefficient of H _{ci} | Curie temperature | Max. operating temperature | Magnetizing field to ≥ 95% saturation | Recoil permeability μ _r |
|---|--|-------------------|----------------------------|---------------------------------------|------------------------------------|
| %/°C | %/°C | °C | °C | kA/m (kOe) | |
| -0.09 | -0.34 | 289 | 120 - 130 | 1600 (20) | 1.2 |
| -0.10 | -0.34 | 370 | 120 - 130 | 1600 (20) | 1.2 |
| -0.09 | -0.36 | 309 | 80 - 120 | 1600 (20) | 1.2 |
| -0.09 | -0.33 | 289 | 130 - 140 | 1600 (20) | 1.2 |
| -0.12 | -0.34 | 306 | 140 - 180 | 1600 (20) | 1.2 |
| -0.11 | -0.52 | 345 | 80 - 120 | 1600 (20) | 1.2 |
| -0.13 | -0.38 | 289 | 130 - 140 | 1600 (20) | 1.2 |
| -0.12 | -0.31 | 306 | 140 - 180 | 1600 (20) | 1.2 |
| -0.11 | -0.36 | 273 | 130 - 140 | 1600 (20) | 1.2 |
| -0.13 | -0.29 | 246 | 130 - 140 | 1350 (17) | 1.2 |
| -0.14 | -0.34 | 260 | 150 - 160 | 1600 (20) | 1.2 |
| -0.17 | -0.29 | 219 | 140 - 150 | 1270 (16) | 1.2 |
| -0.17 | -0.28 | 225 | 100 - 120 | 1200 (15) | 1.2 |
| -0.14 | -0.34 | 246 | 130 - 140 | 1350 (17) | 1.2 |
| -0.13 | -0.32 | 184 | 130 - 140 | 1270 (16) | 1.2 |
| -0.16 | -0.33 | 184 | 120 - 140 | 1270 (16) | 1.2 |

MAGNETIC PROPERTIES

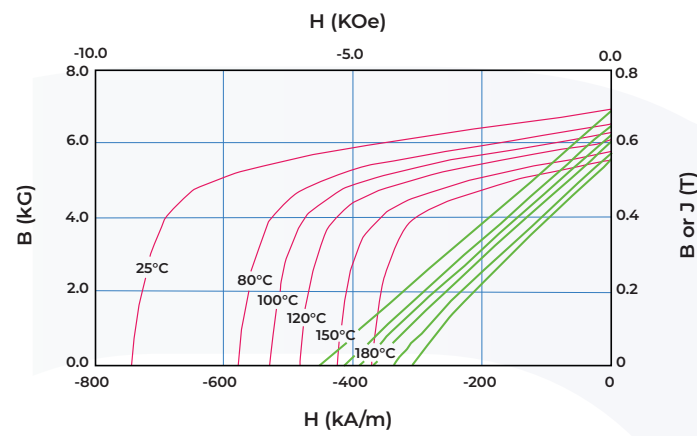
MQ1-12



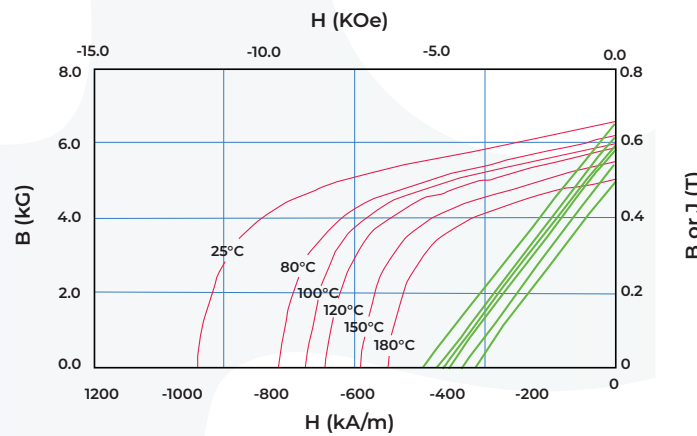
MQ1-10H



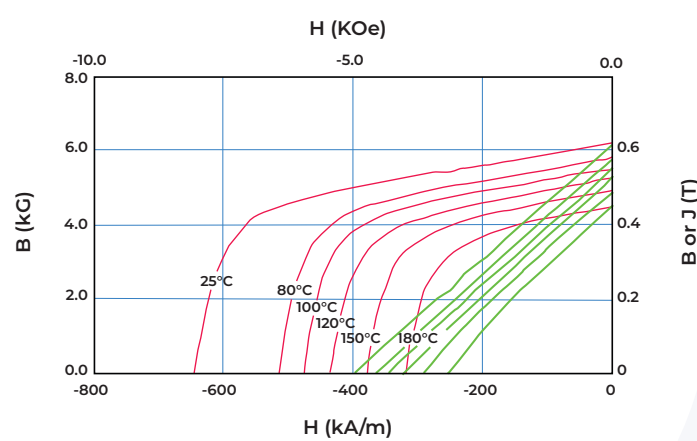
MQ1-10



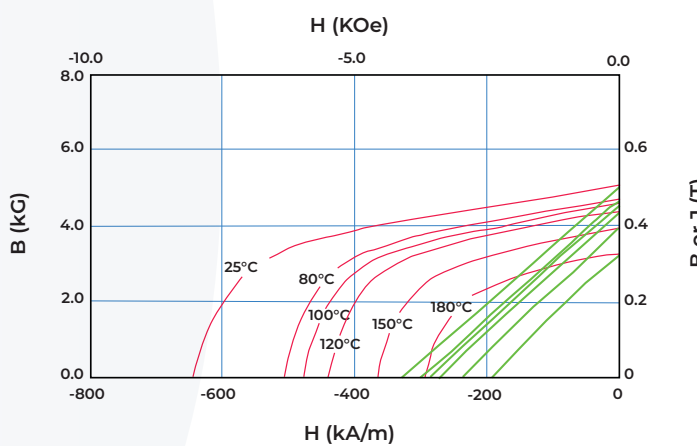
MQ1-9H



MQ1-8

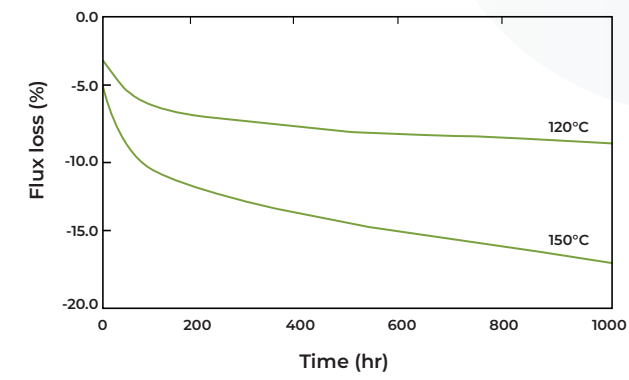


MQ1-5

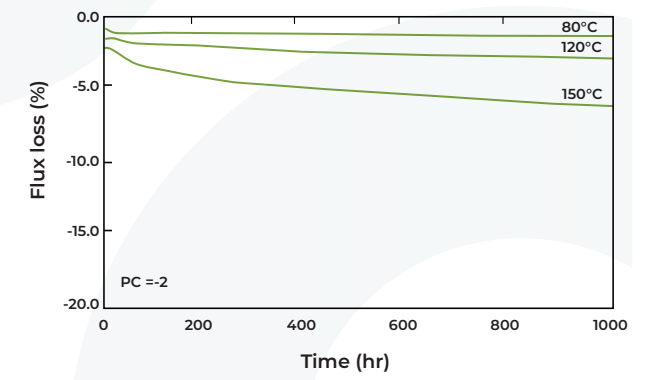


TOTAL FLUX LOSS

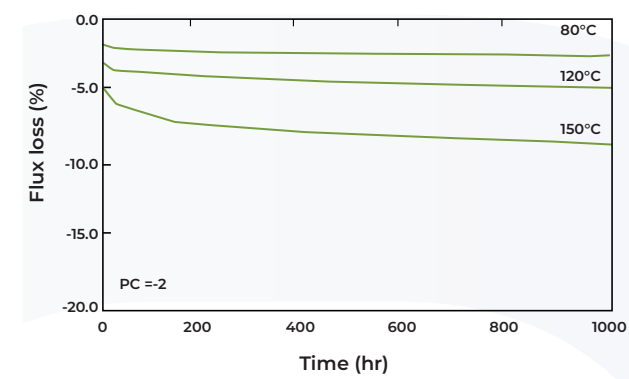
MQ1-12



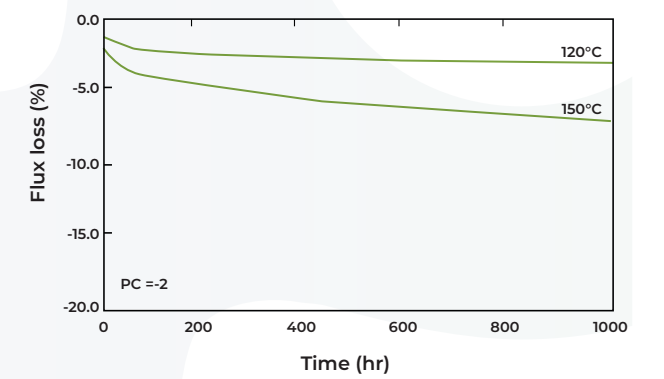
MQ1-10H



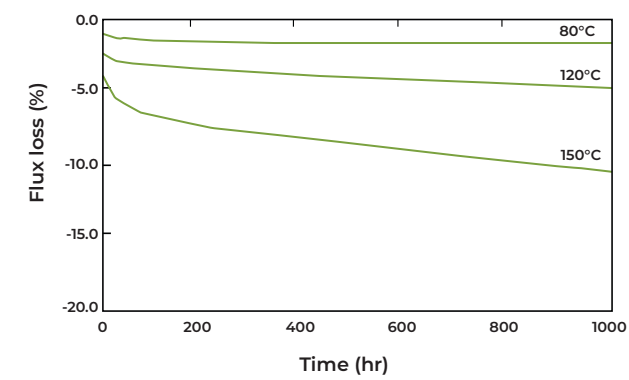
MQ1-10



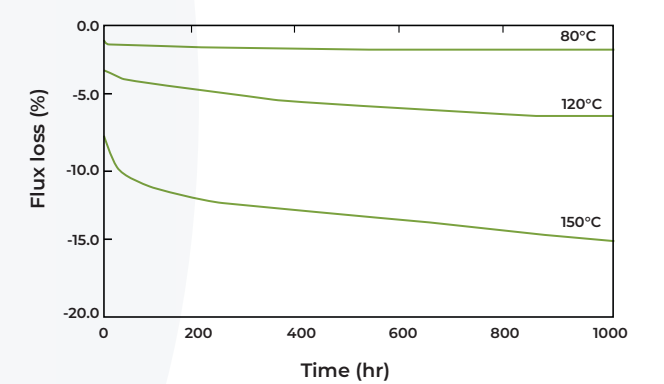
MQ1-9H



MQ1-8



MQ1-5

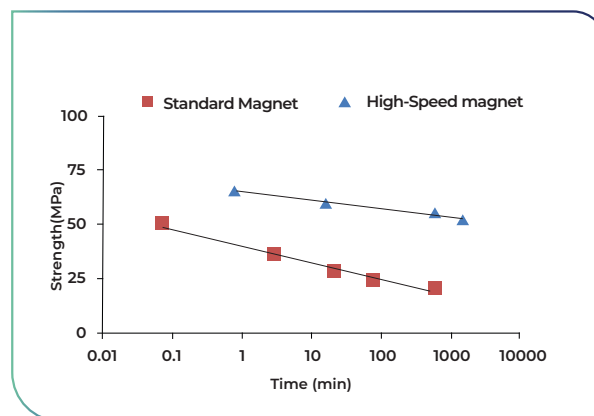


MECHANICAL PROPERTIES

| Items | Conditions | Value | Standard | Sample size (mm) |
|---|------------|-------|-----------------|---------------------|
| Coefficient of linear expansion (*10 ⁻⁶ /°C) | 20°C-100°C | 10 | GB/T 4339-2008 | Φ6.0*20 |
| | 20°C-100°C | 13 | | |
| Electrical resistivity (μΩ*m) | / | 45 | GB/T 351-1995 | 134*29*2 59*14*2 |
| Bending strength (MPa) | 23°C | 59 | GB/T-228.1-2010 | 30*6.4*5 |
| Modulus (GPa) | 23°C | 17 | GB/T-22315-2008 | |

Magnequench's high-strength MQ1™ magnets can withstand high-speed rotation at specified temperatures without cracking or breaking. This eliminates the need for an extra sleeve to protect the magnet, reducing material and processing costs, while also reducing the effective air gap, which generates better motor performance.

| Magnet types | Crush strength (MPa) | | | |
|--------------------|----------------------|------|-------|-------|
| | Room temperature | 80°C | 120°C | 150°C |
| Regular magnets | 128 | 111 | 46 | 25 |
| High-speed magnets | 144 | 125 | 118 | 105 |



The attributes of magnets and shafts contribute to dynamic balance within the motor, with meticulous dimension control playing an important role too.

The assembly process contributes significantly to achieving balanced radial forces, reducing motor vibration and enhancing the user experience, particularly in handheld devices. At Magnequench, we are committed to supply assemblies with guaranteed precise dimensions, optimizing performance even at high speeds.

TYPES OF ASSEMBLIES

Magnequench assemblies help enhance operational efficiencies by minimizing process steps and reducing required manpower for our customers. We help streamline operations so you require fewer resources to manage your suppliers while achieving more consistent quality. We can also incorporate design enhancements and evaluate

process visibility. Apart from cutting down on expenses, this expedites the development cycle, reducing time to market. With stringent quality controls yielding tighter tolerance in MQ1™ magnets and assemblies, Magnequench's customer-specific magnet systems help to improve motor cost-performance at all levels.



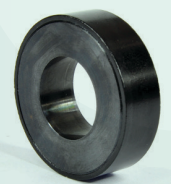
Stator assembly

TYPE: PRESS FITTING

TYPE: GLUE ASSEMBLY



Stator assembly



Rotor assembly



Compression molded magnet with plastic gear

TYPE: OVER-MOLDING

TYPE: OVER-MOLDING

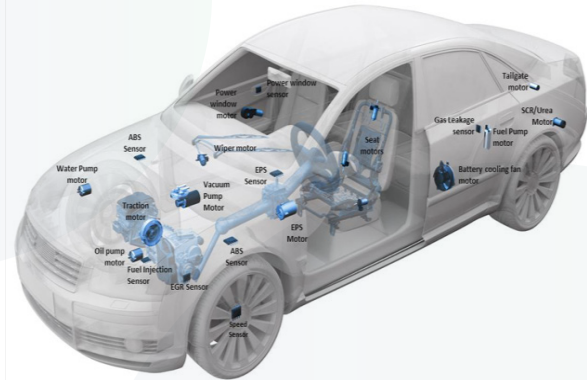


Compression molded magnet with plastic back and shaft

AUTOMOTIVE

MQ1™ magnets play a versatile and increasingly critical role in the automotive industry. They support functionality and comfort within the vehicle cabin and are integral in systems like electric pumps for thermal management.

Some of the examples where MQ1™ magnets are employed are; seat adjustment motors, tailgate/trunk motors, sunroof motors, door open/close motors, windshield wiper motors, sliding door motors, electric water/oil pumps, and sensors.



COOLING FANS

MQ1™ magnets are crucial for the operation of fan motors, where dynamic balance is not merely a feature but an essential requirement. Magnequench offers customers high-precision magnets that enhance dimensional tolerances, improving dynamic balance. This leads to quieter and more stable fan operation, boosting efficiency and substantially prolonging the motor's lifespan.



HOME APPLIANCES

MQ1™ magnets are vital components in today's household devices, including vacuum cleaners, refrigerators, hair dryers, and residential HVAC circulation pumps. These magnets offer superior performance, especially when paired with Magnequench innovative compounds (MQEP™) — higher glass transition temperatures, and the elevated mechanical strength required for motor operation at speeds exceeding 150,000 rpm.

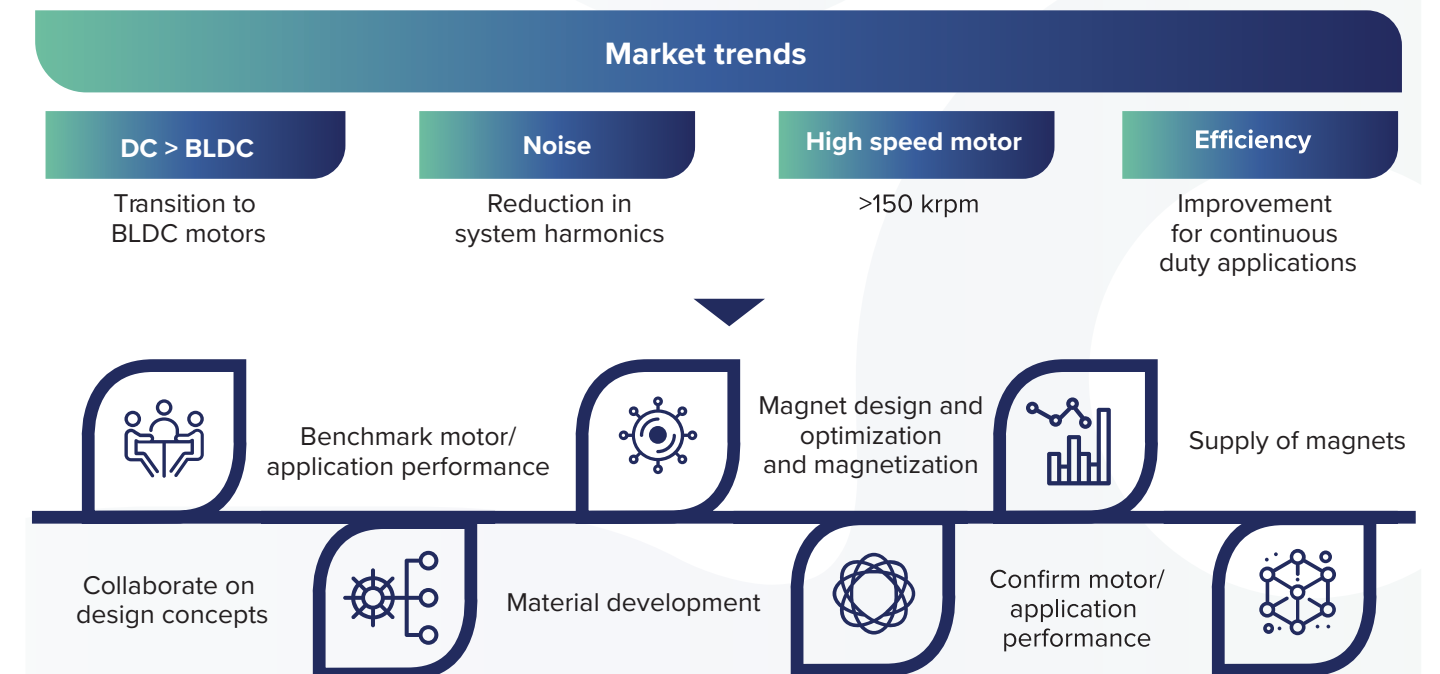
These powerful, yet lightweight and compact magnets are especially suitable when available space is at a premium. Smaller motors keep hairdryers easy to hold without compromising airflow. And the compact design of fan motors in refrigerators helps maximize storage space.



APPLICATION SUPPORT

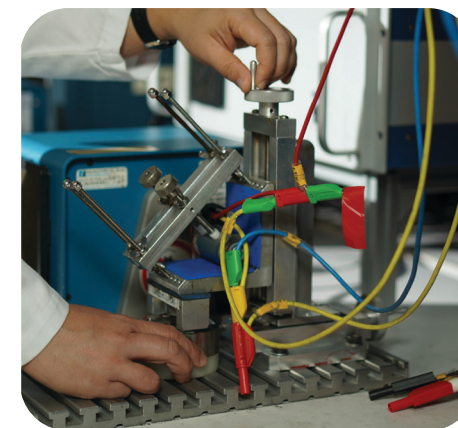
Our Application Development team works closely with customers to design and supply cost-optimized bonded neo magnets. This integrated development mindset helps fuel innovation, reduce costs, and improve product quality

of electric motors. When companies collaborate from the start of product development, synergies are discovered that allow for better alignment with new technologies and materials.

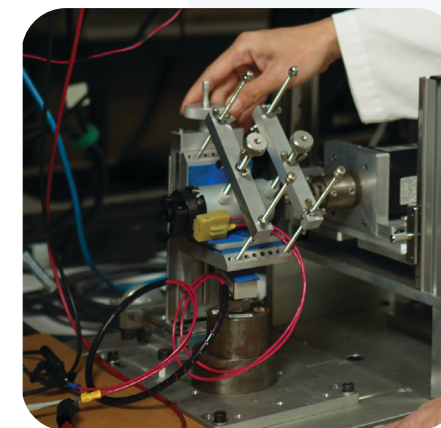


MOTOR PERFORMANCE EVALUATION

The Magnequench Technology Center is fully equipped to evaluate motor performance.



LOAD CHARACTERISTICS



BACK EMF

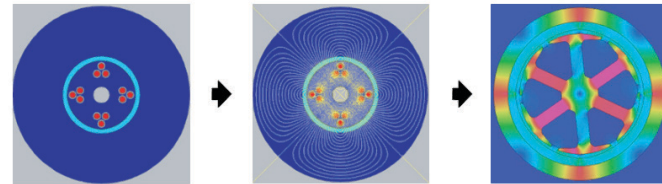


COGGING TORQUE

MAGNETIZATION EXPERTS

Magnequench's magnetization expertise is related to optimizing the use of isotropic bonded neo powder (MQP™), saving significant time and effort for our customers. Our profound understanding of conversion powders to magnets and extensive expertise in magnetization enable us to efficiently minimize the amount of magnetic material required for a specific motor design. This not only helps reduce the material cost but is also pivotal in addressing challenges related to magnets, such as cogging torque. It enhances motor performance and diminishes noise, vibration, and harshness (NVH) levels. By tapping into our specialized magnetization skills, we deliver our clients improved efficiency, cost-effectiveness, and superior performance in their motor applications.

Magnequench has pioneered the development of the first finite element magnetization solver for bonded, underscoring our leadership in innovation. Our application team, with decades of experience in designing magnetization fixtures and modeling the magnetization process, leverages the precision of finite element software.

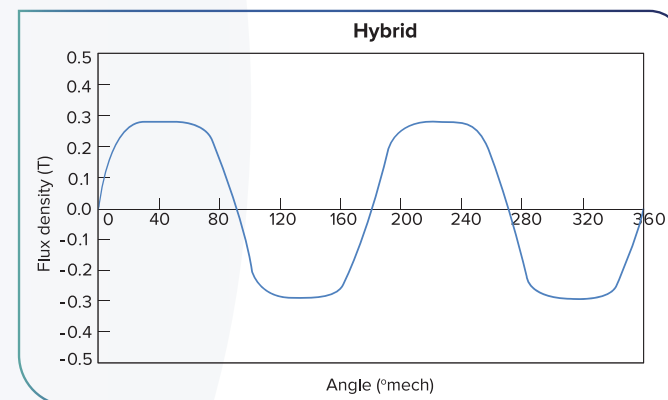
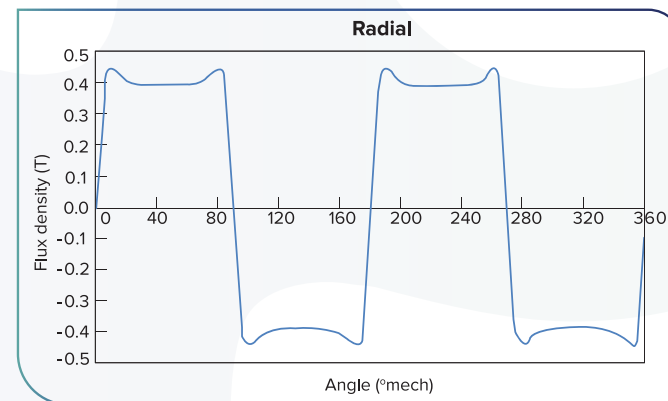
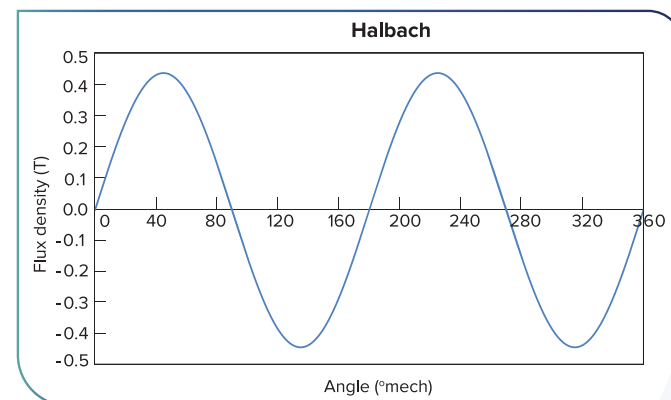


MAGNETIZATION PROFILE

MQ1™ magnets offer a unique advantage – we can supply our customers with magnetized magnets with different magnetization patterns.

The selection of a target magnetization pattern is an important motor design criterion; a proper match between the drive strategy and flux pattern is crucial to harness the full potential of the magnets.

1. Radial – resulting in rectangular airgap flux density waveform;
2. Halbach – resulting in sinusoidal airgap flux density waveform, and;
3. Hybrid – the airgap flux density waveform will be in between rectangular and sinusoidal.

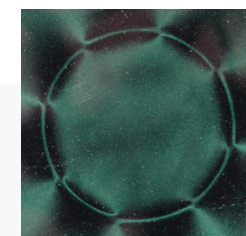


MAGNETIZATION FIXTURES

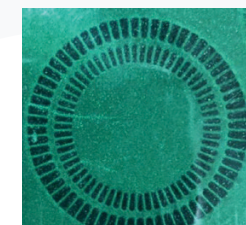
Designing the magnetization fixture and estimating the magnetization profile using finite element analysis is critical in bridging the gap between designers' assumptions and reality. A magnetization fixture design is both an art and a science, involving decisions like magnetization energy required based on magnet type, size and location of conductor, number of turns/slot, and use of back iron during the magnetization process. It is very important to achieve a fully saturated magnet, as a partially saturated magnet results in lower air gap flux, lower motor performance like back-emf, developed torque, stall torque, and efficiency. The partially magnetized magnets are also more susceptible to demagnetization and leads to a higher flux loss at elevated temperatures.



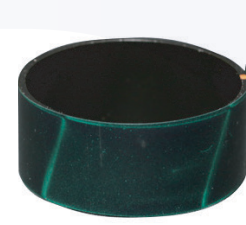
Magnet magnetized at inner periphery



Magnet magnetized at outer periphery



Sensor magnet



Skewed magnetization on magnet

MAGNETIZATION PATTERNS

MQ1™ magnets can be magnetized in complex patterns, enabling the development of motors with advanced performance characteristics.





HIGH-SPEED MAGNETS FOR HOME APPLIANCE INDUSTRY

Magnet assemblies for ultra high-speed greater than 150,000 rpm motors used in home appliances - Compression bonded neo-ring MQ1™ and rotor assembly with 4P magnetization

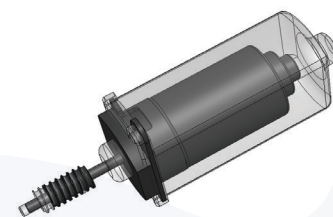
The rotor can spin at ultra-high speeds greater than 150,000rpm, this impressive performance can be maintained at a maximum temperature of 100° Celsius. Additionally, due to the low conductivity of the bonded magnet, the magnet has almost no internal eddy current loss, enhancing motor performance.



CM MAGNETS FOR FAN MOTOR APPLICATIONS

Precision magnets for cooling fan motors used in electronic and electrical components

MQ1™ magnets for energy-efficient fans. Advanced powder and compound technology coupled with cutting-edge manufacturing technology offers customers a magnet with superior dynamic balance; the result is a significant reduction in mechanical wear, noise, and vibration and an increase in the service life of the motor. These high-performance magnets are integral to the function of motors across a diverse range of applications, including 5G communication towers, personal computing devices, data center servers, and electric vehicles.

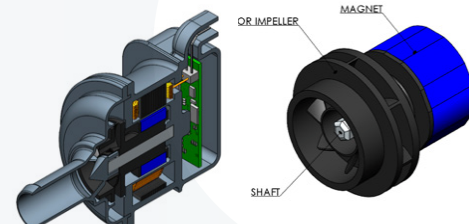


CM MAGNETS FOR ACCESSORY MOTORS

Magnets for accessory motors used in automotive

MQ1™ magnets and magnet assemblies for superior comfort and functionality within a vehicle. MQ1™ magnets support passenger cars to achieve higher comfort and functionality by reducing the overall weight and size of the motors – motor companies can achieve a weight reduction of nearly 40% with a size reduction of almost 36% compared to a ferrite design.

(Seat motors, trunk/tail-gate motors, window-lift motors, slide-door motors, and various other motors within the cabin).



ROTOR ASSEMBLIES FOR AUTOMOTIVE PUMPS

Bonded magnets for automotive pumps

Rotor Assemblies for Automotive pumps – MQ1™ magnets over molded with PPS, Impeller, and shaft. Automotive pump designs using MQ1™ magnets have lower active material, reduced size weight, and greater assembly flexibility compared to sintered IPM design pumps.

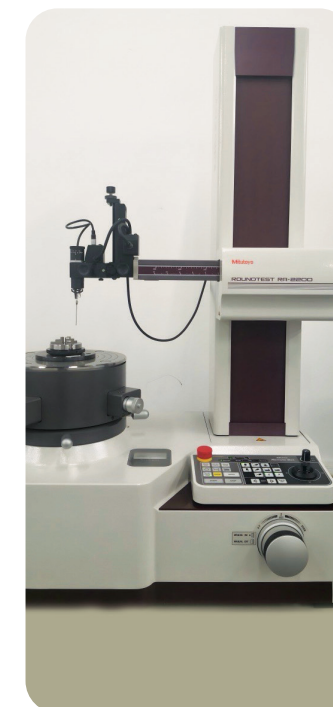
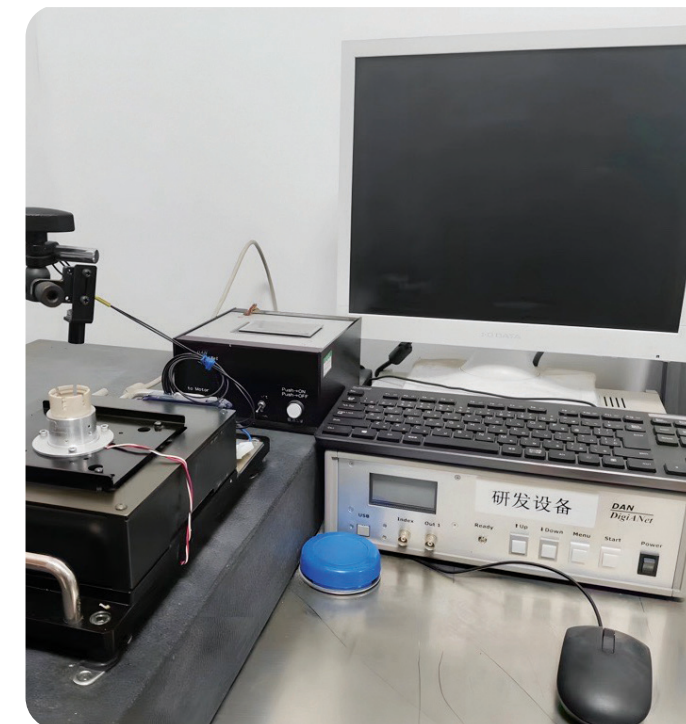
In addition, cooling pumps with brushless DC motors can be designed with a higher number of magnetic poles on a magnet and a tailored magnetization profile to enable lower noise and vibration.



OUR AWARDS & RECOGNITION



TESTING EQUIPMENT



| Properties | Equipment |
|---|-------------------------------------|
| Magnetic properties | Hysteresis graph tracer |
| Flux, flux pattern and flux loss | Flux meter |
| | Flux pattern scanner |
| Density | Density balance |
| Crushing strength at room temperature and elevated temperature | Multifunction test machine |
| Corrosion resistance | Pressure cooker test machine |
| | Salt spray test machine |
| | Temperature & humidity test chamber |
| Magnet dimensions/properties change after programmed thermal cycles | Thermal shock test machine |
| Dimension measurement | Coordinate measuring machine |
| | Precise image measuring instrument |
| | Laser scan micrometer |
| | Pneumatic scan micrometer |
| Dynamic balance | Active fan balancing machine |
| | Motor balance measuring instrument |
| Revolutions per minute (RPM) | High speed rotation test |
| Appearance | Crack detector |
| Cleanliness | Liquid particle counter |
| Runout | Deflection instrument |



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