



MASTERING MAGNETIC SHIELDING

VAC – YOUR PARTNER FOR ADVANCED MAGNETIC SOLUTIONS

WHAT IS VACOSHIELD BY VAC?

VACOSHIELD® OFFERS HIGH-PERFORMANCE MAGNETICALLY SHIELDED ROOMS (MSR) optimized for applications such as MEG measurements based on sensors, namely optically pumped magnetometers (OPM), superconducting quantum interference devices (SQUID), and nitrogen-vacancy centers (NV). These rooms provide the best in shielding performance to ensure accurate measurements and minimal interference.

**THE VAC-
ADVANTAGE**

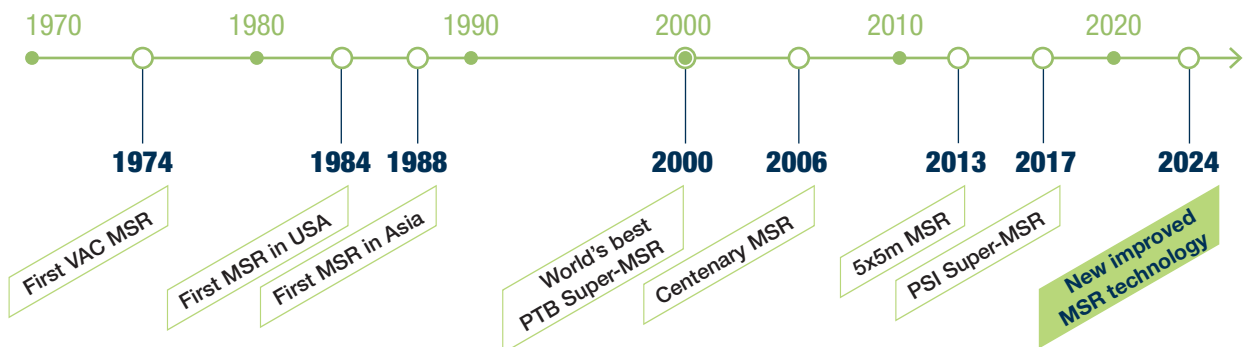
LEADING THE WORLD IN MAGNETIC MATERIALS

VAC is the world market leader for special magnetic materials and their use in various applications. The company boasts unsurpassed vertical integration from in-house alloy production to technical support and service on the spot.

50 YEARS OF EXPERIENCE: Development, engineering, and customer support in the field of magnetically shielded rooms.

PROVEN TRACK RECORD: More than 180 designed and installed magnetically shielded rooms worldwide.

PRESTIGIOUS CLIENTS: Reference projects at renowned institutes such as Physikalisch-Technische Bundesanstalt (PTB), Paul Scherrer Institute (PSI), and Massachusetts Institute of Technology (MIT).



OUR EXPERTISE: UNMATCHED EXPERIENCE AND MANUFACTURING CAPABILITIES

- VERTICAL INTEGRATION** → Extensive vertical integration from raw material to the finished solution
- EXPERTISE IN SHIELDING** → Experience in application and the need for shielding
- MSR PRODUCTION** → 50 years of MSR production
- DEDICATED SUPPORT** → A team of engineers, physicists, and designers providing competent advice and support to customers
- RECOGNIZING LIMITS** → Through decades of collaboration with the world's best scientists, VAC can reliably guide customers to the most appropriate shielded room

PRECISION PERFECTED

ENGINEERING EXCELLENCE IN MAGNETIC SHIELDING

VAC sets the standard for magnetic shielding with advanced technology and extensive expertise. Using in-house developed and manufactured specialized alloys, we deliver superior solutions with exceptional magnetic properties. Our comprehensive manufacturing process ensures top quality, backed by 50 years of experience and over 180 projects worldwide.

TECHNICAL LEADERSHIP AND ADVANCED MANUFACTURING

VACOSHIELD offers unparalleled technical leadership by utilizing a wide variety of raw materials to compose more than 170 alloys with outstanding properties. This in-depth materials know-how, paired with high application competence, enables VAC to deliver outstanding solutions.

VAC's advanced manufacturing capabilities include the production of MSR sheets from its own melts in a quality-controlled process. In addition, VAC has its own equipment for optimum final magnetic annealing in a hydrogen atmosphere, ensuring the highest quality standards.

EXTENSIVE VERTICAL INTEGRATION AND PROVEN EXPERIENCE

From raw material to the finished solution, VACOSHIELD ensures high quality at every step through extensive vertical integration. With 180+ projects completed worldwide, VAC's regional MSR engineering and sales teams in the US, Europe, and Asia provide local product development support, ensuring tailored solutions for every need.

BESPOKE SOLUTIONS AND HIGH SHIELDING FACTORS

VACOSHIELD provides a modular MSR system with a short assembly time. Customized solutions are also available for special applications, offering reliable quality with very high shielding factors far above the warranted values.

EFFICIENT SETUP, ADVANCED FEATURES, AND FLEXIBILITY

VACOSHIELD ensures an efficient setup and assembly with short lead times of 4 months for standard MSR sizes. The modular systems allow for a 2-week assembly time. All MSR's are prepared for state-of-the-art degaussing with pre-installed coils, and offer the flexibility for on-site modifications and MSR relocation.

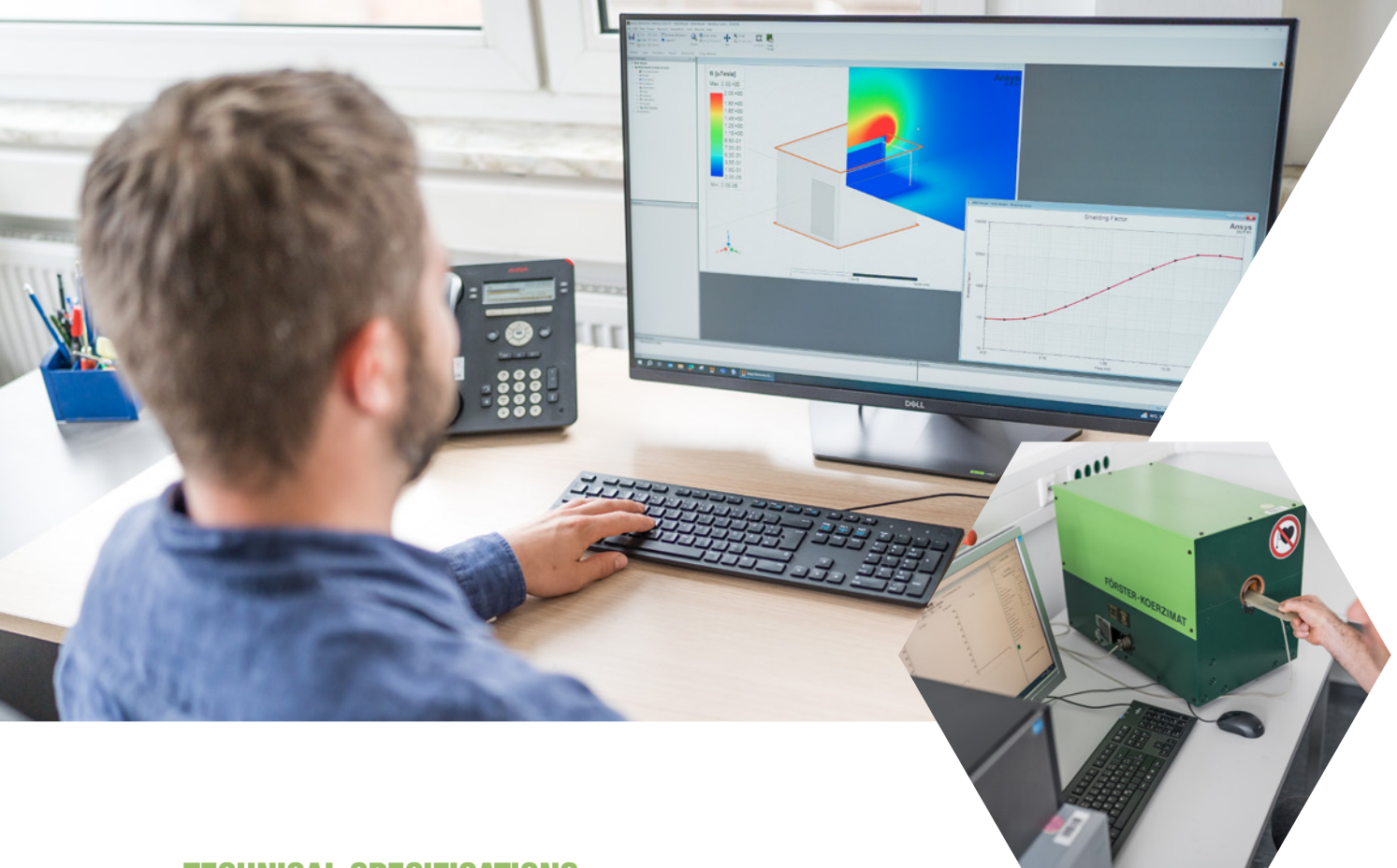
GLOBAL SUPPORT AND USER-FRIENDLY DESIGN

VACOSHIELD is supported by experienced assembly and service teams for worldwide installations. VAC MSR's incorporate easy to handle and reliable pneumatic doors. This global support ensures that VACOSHIELD solutions are accessible and user-friendly, catering to a wide range of applications and customer requirements.



UNBEATABLE ADVANTAGES OF VAC TECHNOLOGY:

- **MODULAR MSR SYSTEM WITH SHORT LEAD TIMES**
Quickly available standard formats for typical applications, as well as custom MSR.
- **FAST SETUP WITHIN 2 WEEKS**
Efficient and fast installation to meet your project deadlines.
- **LOW WEIGHT MSR FOR FLEXIBLE INSTALLATION**
Easily installable at higher levels, providing versatile application options.
- **DEGAUSSING-PREPARED MSR**
State-of-the-art magnetic field control with pre-installed degaussing coils.
- **RELIABLE PNEUMATIC DOORS**
User-friendly and reliable access solutions for your MSR.
- **WARRANTY ON MSR PRODUCTS AND SHIELDING FACTORS**
Proven quality and performance.
- **ON-SITE MODIFICATIONS AND MSR RELOCATION**
Flexible options to modify and relocate your MSR as needed.



TECHNICAL SPECIFICATIONS

UNBEATABLE SHIELDING: THE VACOSHIELD DIFFERENCE

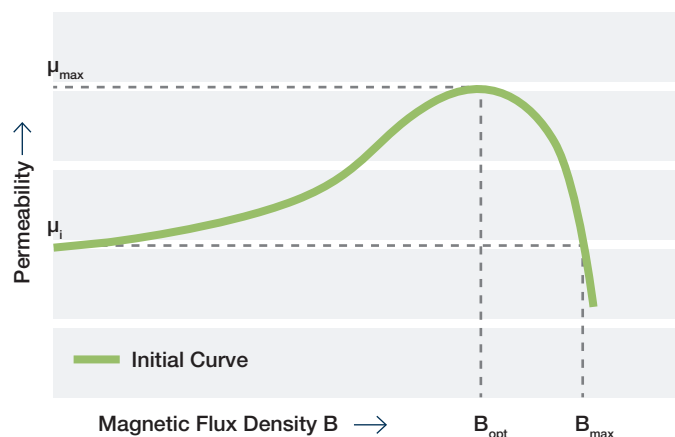
The shielding factor is defined as the ratio of the magnetic field outside and inside the shielding. VAC uses soft magnetic 80 % NiFe materials such as VACOPERM or MUMETALL for shielding.

SHIELDING PERFORMANCE

EACH SOFT MAGNETIC MATERIAL has a saturation-dependent course of the permeability μ_r . The permeability of 80 % NiFe material in shielded rooms depends on its magnetic flux saturation. The initial permeability, already high at low magnetic fields, increases with modulation up to a maximum, then decreases significantly as the material saturates.

These properties directly affect the shielding factor, which also depends on the modulation. Therefore, the shielding factor must be defined with precise measurement conditions to ensure the MSR performance in real applications.

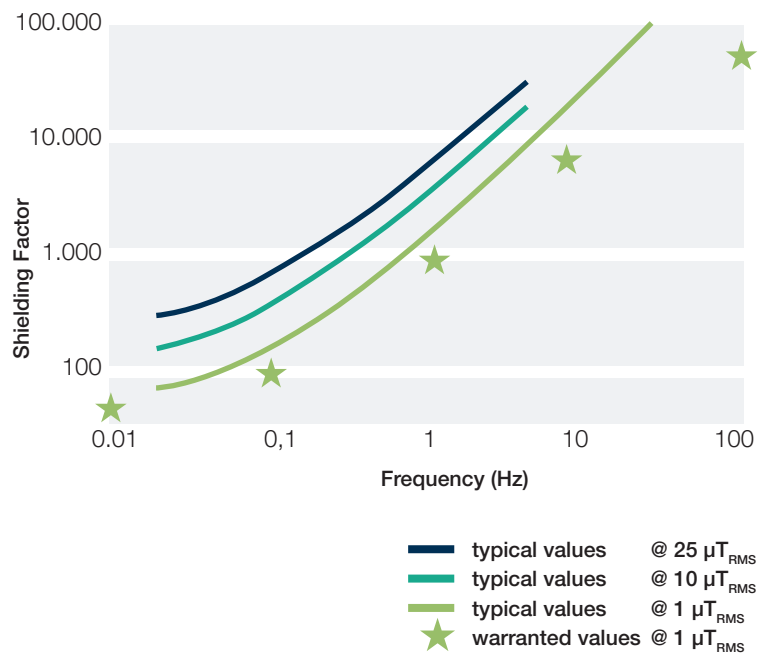
PERMEABILITY COURSE OF A SOFT MAGNETIC CRYSTALLINE MATERIAL



SHIELDING FACTOR TEST

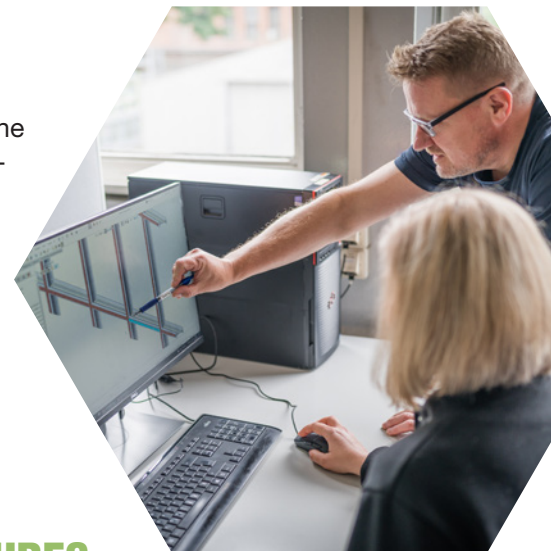
THE SHIELDING FACTOR OF AN MSR depends significantly on the amplitude of the magnetic interference fields. Common customer applications require a high attenuation with small interference field. VAC's test procedure is specifying a magnetic flux density of $1 \mu T_{RMS}$ as the reference value in the center of the MSR. This test provides customers with the necessary information about how well even weak interference fields can be shielded. At higher flux densities the typical shielding values are larger by factors, see figure.

SHIELDING PERFORMANCE DEPENDING ON THE FLUX DENSITY



MINIMAL RESIDUAL FIELDS AND EFFECTIVE DEMAGNETIZATION

IMMEDIATELY AFTER INSTALLATION, VERY LOW RESIDUAL FIELDS in the order of typically $B \leq 30 \text{ nT}$ already prevail inside a shielded room. By degaussing of the soft magnetic layers in the walls, lower residual fields can be achieved. VAC equips its shielding rooms with demagnetization coils, enabling customers to perform the demagnetization process. Leading researchers have achieved residual fields in the order of $B < 1 \text{ nT}$ inside VAC's magnetically shielded rooms.



MODULAR AND CUSTOMIZABLE WALL STRUCTURES

VACOSHIELD MSRs HAVE A MODULAR DESIGN and can be customized in terms of size, shell thickness, and the number of shells. For most applications, 2-shells of a high permeability alloy (VACOPERM) are sufficient. VACOSHIELD Plus with an adapted shell is used for more demanding locations. For very high requirements, the VACOSHIELD Premium 3-layer MSR can be used. Multiple-layer MSRs for special projects are also part of the VAC portfolio. For very high requirements bespoke MSRs are offered.

NEXT-GENERATION MSR TECHNOLOGY

OPTIMIZED DESIGN FOR ULTIMATE SHIELDING EFFICIENCY

Since 2024, VAC has revolutionized MSR technology with significant advancements in magnetic shielding. The introduction of the newly developed alloy VACOPERM HP has enhanced shielding factors by 60% for both low and high frequencies. With an optimized panel design, VACOSHIELD rooms now provide high shielding factors from DC to 1 kHz, combined with exceptionally low spatially homogeneous residual fields. These innovations are available in both, standard sizes and bespoke solutions, ensuring optimal performance for various applications.

60%

**SHIELDING FACTOR IMPROVEMENT
FOR LOW AND HIGH FREQUENCIES**



**VACOPERM HP:
NEWLY DEVELOPED ALLOY**



**OPTIMIZED
PANEL DESIGN**



**DIFFERENT MSR
SIZES AVAILABLE**



**OUTER COLOR
CUSTOMIZABLE**

APPLICATIONS

MINIMIZING MAGNETIC FIELDS

VACOSHIELD is ideal for environments where minimal magnetic fields are essential.

SENSOR DEVELOPMENT AND TESTING:

Ultra-sensitive magnetic field sensors are developed and tested in high-performance shielded environments like BMSR-2 Berlin, Germany.



MAGNETOENCEPHALOGRAPHY:

Sensing brain activity by means of SQUID or OPM technology.

FUNDAMENTAL PHYSICS EXPERIMENTS:

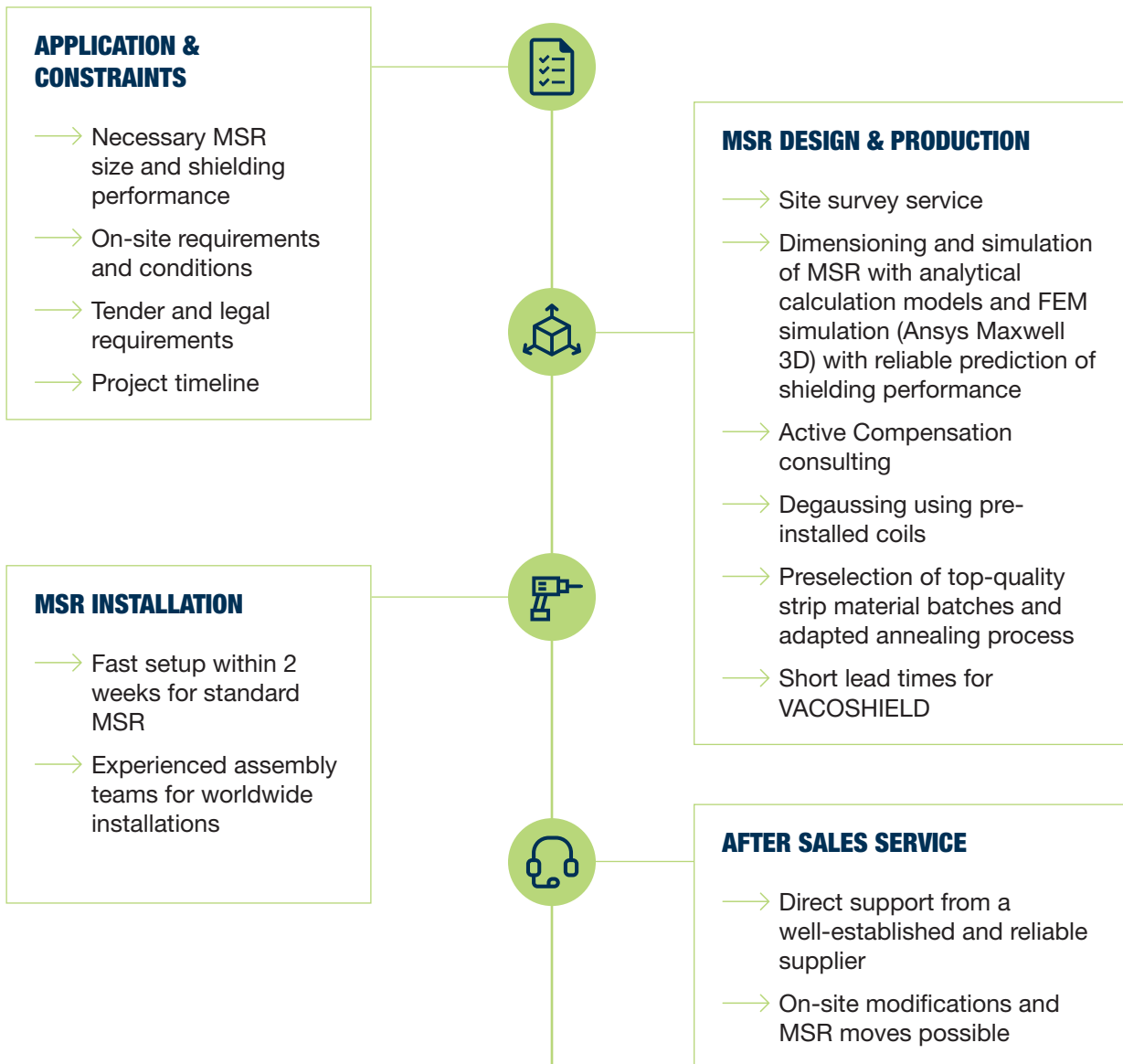
Essential for experiments requiring absolute control over magnetic fields, such as the search for an electric dipole moment of the neutron (nEDM) at PSI Villingen, Switzerland.

EVERYTHING FROM
A SINGLE SOURCE

DEDICATED SOLUTIONS FOR YOUR REQUIREMENTS



VAC's team of engineers, physicists, and designers accompany the customer from the initial planning phase to the construction of the shielded room and beyond, providing service and support for customers at every stage.



PROVEN EXPERTISE – WORLDWIDE SUCCESS

A world map with a dark blue background and white outlines of continents and countries. Three regions are highlighted with yellow text: North America, Europe, and Asia-Pacific.

***> 60 MSRs
IN USA AND
CANADA***

***> 80 MSRs
IN EUROPE***

***> 40 MSRs
IN ASIA-PACIFIC***

180+

***MORE THAN 180 DESIGNED AND
INSTALLED MAGNETICALLY SHIELDED
ROOMS WORLDWIDE***

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More Information



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