

## Introduction

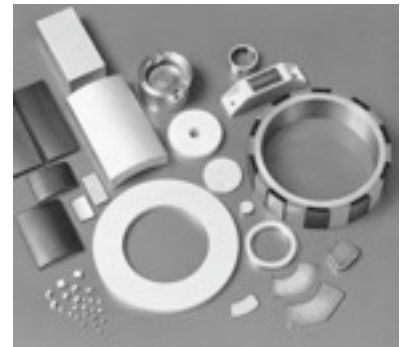
**Vacuumschmelze Corporation**, under the trade marks VACOMAX® & VACODYM® have been producing SmCo & Nd-Fe-B sintered rare-earth permanent magnets for several decades. **VAC** is now Europe's leading supplier of robust, powerful, permanent magnets & magnetic systems. Through a program of partnership with it's clients, **VAC** is continually developing innovative magnetic products.

## Permanent Magnets

The product range of **VAC**'s rare-earth magnets covers a carefully balanced program of materials with different magnetic properties. As a result, it is relatively easy to select a material suitable for any specific application.

VACODYM® is the group of alloys offering the highest energy densities available today. In the "6 Series", comprising VACODYM® 633, 655, 677 and 688, magnets are available for motor applications in particular that can be used under normal ambient conditions without additional surface coating. The VACODYM® 669 closes a gap in the coercivity field strength between VACODYM® 655 and VACODYM® 677. VACODYM® 642 is a low-cost material variety with good corrosion properties and slightly reduced remnant induction. A corrosion-stable series of alloys optimised in terms of characteristic values has also been developed for air-gap systems, in particular for Disk Drive applications, the main application of Nd-Fe-B.

The magnets of the "7 Series" with VACODYM® 722, 745 and 764 are characterised by particularly high remnant induction. Further advantages of this new group of alloys can be found in the lower temperature dependence of the remanence and coercivity field strength in comparison to the conventional Nd-Fe-B alloys. Moreover, the manufacture of larger magnet cross sections is possible.



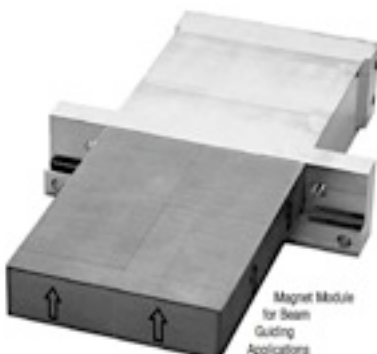
VACOMAX® is our permanent magnet material of rare-earths and cobalt. These magnets feature especially high coercivities with simultaneously high saturation and excellent temperature and corrosion stability. VACOMAX® magnets are suitable for high temperature applications up to 350 °C.

## Magnet Systems

**VAC** has many years of experience in the manufacture of permanent magnets and in the design of magnetic circuits. They use powerful calculation programs for the analysis and design of magnet systems. These include 2D and 3D field calculations using the finite elements method. Their use greatly helps to cut the development time of any system.

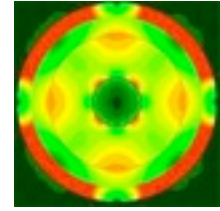
Accordingly, as well as single magnets, **VAC** increasingly supplies complete magnet systems to customer's specifications.

The use of soft magnetic materials as system components, such as VACOFLUX® and VACOFER®, means customer-specific requirements can be met within the finest tolerances. Furthermore, correct fitting and magnetisation of the systems is possible in many cases only if the magnets and other system components are assembled directly by the magnet manufacturer.



## Applications Know-how

As a manufacturer of both soft magnetic and permanent magnetic materials, **VAC** has outstanding knowledge of the material properties as well as the possibilities for processing them. The company uses this knowledge in application development & to provide expert customer advice in designing permanent magnet systems.



Magnetic field distribution in a 4-pole motor

## Some Applications for VAC magnets & Systems

### Electronic Article Surveillance (EAS)

One of the most widespread systems of EAS is the Acousto-Magnetic system in which items are marked with a magnetic strip that can be deactivated before leaving the store. In close co-operation with the customer, **VAC** has developed a new amorphous VITROVAC alloy in order to optimise the sensor properties whilst maintaining low raw material and processing costs.

### Magnetic Shielding

For bio-magnetic research of the magnetic fields created by the tiny electrical currents in the active nerves of the human heart or brain it is a must to eliminate disturbing external magnetic fields to the highest degree possible. To do this **VAC** in collaboration with SIEMENS AG and PTB created *THE BEST MAGNETICALLY SCREENED ROOM ON EARTH*.

### Motors & Generators

Servomotors, DC motors, linear motors & heavy-duty motors (e.g. motors for ships' propulsion and wind turbine generator systems) utilise predominately VACODYM magnets except where high temperatures are experienced in which case VACOMAX is the material of choice. A further application is small power & fractional horsepower motors, e.g. bell type armature & dental motors.

### Automotive Engineering & Sensors

Sensors to measure engine, gear & wheel rotation speed (e.g. ABS systems), acceleration (e.g. ESP, airbags) or position (e.g. throttle, valve, injection systems, crankshaft, camshaft & fuel gauges) are equipped with VAC magnets depending on the requirement for temperature & corrosion stability. VACODYM magnets are also used in electro & hybrid motor vehicles as well as in engine management systems.



### Magamp Technology

By combining materials expertise and applied knowledge, **VAC** developed the world's first low-cost and loss-optimised Magnetic Amplifier controllers. These are now used in computer switch mode power supplies to stabilise the output voltages. Traditional transistors are too lossy for this application so the Magamp choke takes on the position of the transistor as a magnetic switch. **VAC** made Magamp technology accessible to modern mass markets.

### Magnetic Resonance Imaging (MRI)

In precise medical analysis equipment VACODYM permanent magnets are used that have high remnant magnetism alongside super-conducting & other electrically excited systems. Their main advantage is low energy consumption, weight saving & maintenance free construction.

### Magnetic Couplings

These are preferred in automation & chemical processing technology as they ensure a permanent hermetic separation of different media. VACOMAX magnets are used for higher temperature applications.

### Measuring Instruments

In this field the applications range from electronic scales through pulse meters to NMR-analysis equipment. Depending on the construction principle, systems using armatures or rotors fitted with VACODYM or VACOMAX magnets are selected.