GLOSSARY

Anisotropic – Isotopic

When a magnetic material is pressed in a magnetic field this magnetic material is called preferentially oriented and anisotropic. When this magnetic material is not pressed in a magnetic field, it is called isotropic. Later on, isotropic magnetic material can be magnetised in all directions, anisotropic only in the preferential direction. The remanence (Br) of anisotropic magnetic material is (in preferential direction) about twice as high as the remanence isotropic magnetic material (see figure 1).

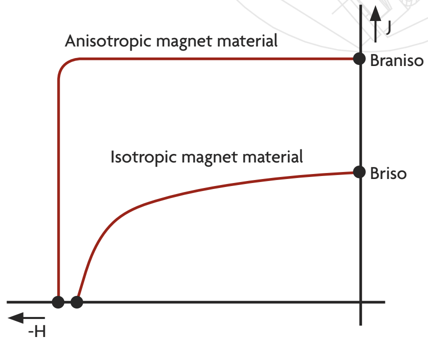


Figure 1: demagnetisation curve of isotropic and anisotropic magnetic material. **2**

B

See magnetic induction.

(BH)max

See maximum energy density.

Br

See remanence.

Coercivity, Normal HcB

The necessary field strength to make the magnetic induction in a magnetic material (see demagnetisation curve). Unit A/m or Oe.

Coercivity, Intrinsic HcJ

The necessary field strength to make the polarisation of a magnetic material (see demagnetisation curve). Unit A/m or Oe.

Curie Temperature

Temperature above which magnetism completely disappears. Units °C or K among others.

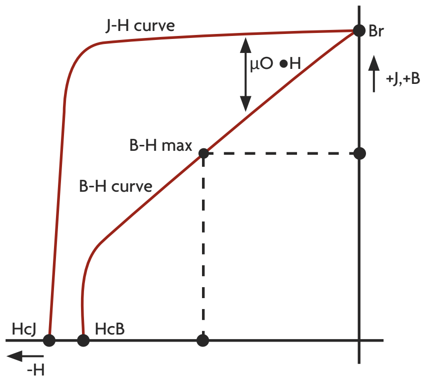
Demagnetisation Curve

(2^{nd} quadrant of the hysteresis curve). The demagnetisation curve of a magnetic material is determined by putting the magnetic material in a closed system, and by generating a magnetic field by means of coils first magnetising the material to saturation (+H) and then demagnetising (-H). During this process the polarisation of the magnetic material (J) is measured. The magnetic induction B in the magnet is calculated by means of the following formula:

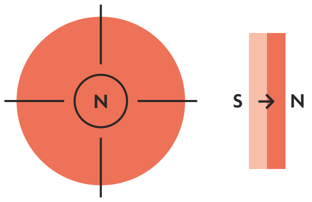
B= j + µO•H

in which J = polarisation of material (share of material)

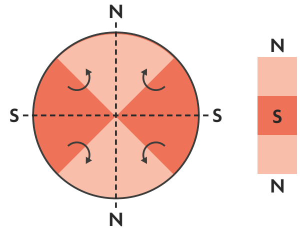
µO•H = Share of field



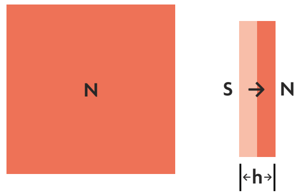
Common Options for Magnetism



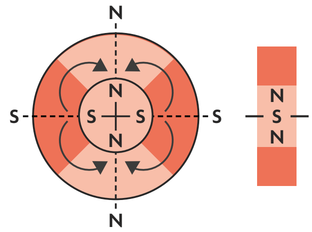
Axially magnetised
- speakers
- holding devices
- magnetic switches
- insert gas switches



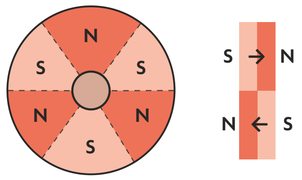
Multiple pole magnetised on outer surface picture shows 4-pole configuration
- dynamos
- motors
- concentric ring
- couplings



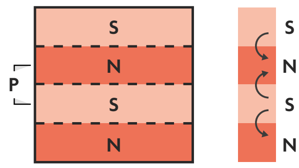
Magnetised through the height (h)
- filtering systems
- clamping devices
- magnetic chokes
- switches



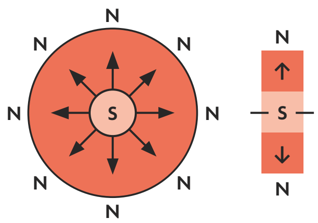
Multiple pole magnetised on outer surface picture shows 4-pole configuration
- concentric ring
- couplings
- motors



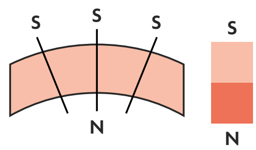
Axially magnetised in segments with alternating poles
- synchronous motors
- disc coupling



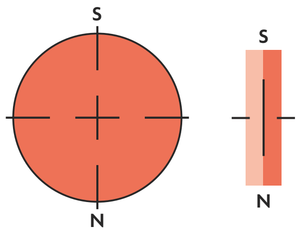
Laterally magnetised in lines on surface (P=pole distance)
- holding devices
- magnetic chokes



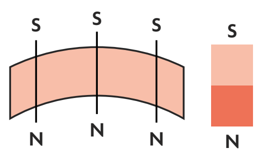
Radially magneised
- holding magnets
- couplings (limited sizes available)



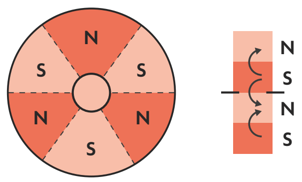
Radially magnetised
- motors



Magnetised through diameter
- synchronous motors



Diametrical magnetised
- motors



Laterally magnetised on surface picture shows 6-pole configuration
- disc coupling
- holding devices

Flux Density

See magnetic induction.

General Properties

	Ferrite	NdFeB	SmCo	AlNiCo
Max. temperature of use Tw (°C)	225	80 -230	250	450
Reversible temperature coefficients; aBr (%/°C)	-0.20	0.9 - -0.12	-0.03 - -0.05	-0.03
Reversible temperature coefficients; aHcJ (%/°C)	+0.20 / +0.50	0.45--0.85	-0.03 --0.5	+0.02
Curie temperature Tc (°C)	460	310 - 380	700-800	850
Density (103 x kg/m3)	4.5 - 5.1	7.4 - 7.6	8-8.5	7.3

Quantities and Units

A few widely used quantities with their units used most used:

Quantity	Units	Relation Between Units
B	T (Tesla)	1T = 10000 G
Magnetic Induction	G (Gauss)	1KG = 0.1 T
BH	J/m^3 (Joule/meter^3)	7.96 kJ/m3 = 1MGOe
Energy Density	GOe (Gauss ∘ Oersted)	
H	A/m (Amps/meter)	79.6 KA/m = 1 kOe
Magnetic Field Strength	Oe (Oersted)	

HcB

See coercivity, normal.

HcJ

See coercivity, intrinsic.

Irreversible Loss, Recoverable

Permanent loss of magnetism due to too high temperatures. Only remagnetisation can restore the loss.

Irreversible Loss, Irrecoverable

Permanent loss of magnetism due to too high temperature or oxidation. This loss is irrecoverable and cannot be remagnetised.

Isotropic

See anisotropic.

J

See magnetic polarisation.

Magnetic Induction, B

Magnetic ordering in a material as a result of a magnetic field (H) and/or magnetic material (J) or: The number of magnetic field lines per unit area. Units: Including Tesla and Gauss.

Magnetic Polarisation, J

Share of material to the magnetic induction.
Units: Including Tesla and Gauss.

Magnetic Field Strength, H

Magnetic power resulting in magnetic induction.

Maximum Energy Density (BH)max

Biggest possible product of B and H on the demagnetisation curve (see demagnetisation curve). In general, the following holds: the bigger the (BH)max of magnetic material, the smaller might be the volume. The "-" mark is usually left out in specifications.
Units: kJ/m3 and MGOe.

Example: The volume of a GSN35 magnet can be +10 x smaller than the volume of a GSF33H magnet and still have the same application.

Maximum Application Temperature

Indication of the maximal temperature at which the magnetic material can be used with limited irreversible losses.

Permanent Magnet

A magnet which completely or partially keeps its magnetism after being magnetised.

Permeability

The capacity of material to conduct magnetism. The permeability of vacuum (μo) is 12.56•10-6
T/(A/m) or 1 G/Oe.

Remanence Br

Magnetic induction in magnetic material when the field strength is zero (H=0) and after saturation (see demagnetisation curve). Units: Including Tesla and Gauss.

Temperature Coefficient (Br and HcJ)

This indicates the reversible change (in percentage) of Br or HcJ in case of temperature change. The values depend on the kind of material, the quality and temperature among other things

Free Poles

The field lines leaving the magnet go back to the magnet through the air.