supermagnete

Recommended safe distances for neodymium magnets

Various objects are sensitive to the static magnetic fields of permanent magnets. We will provide you with information on the type of equipment where the disruption is only temporary as well as devices which will be permanently damaged.

Object	Magnetic field damaging at:	S-45-30-N (strength 69 kg)	S-20-10-N (strength 11 kg)	S-15-08-N (strength 6.2 kg)	S-10-03-N (strength 1.8 kg)	S-06-02-N (strength 740 g)
High-quality magnetic card (credit card, ATM card)	40 mT (= 400 G)	46 mm	19 mm	15 mm	9 mm	6 mm
Cheap magnetic card (parking garage, admission ticket)	3 mT (= 30 G)	134 mm	55 mm	42 mm	24 mm	15 mm
Pacemaker new	1 mT (= 10 G)	201 mm	82 mm	62 mm	35 mm	22 mm
Pacemaker old	0.5 mT (= 5 G)	257 mm	104 mm	80 mm	43 mm	28 mm
Mechanical watch, non-magnetic pursuant to ISO 764	6 mT (= 60 G)	103 mm	42 mm	32 mm	18 mm	12 mm
Mechanical watch, not non-magnetic	0.05 mT (= 0.5 G)	571 mm	230 mm	176 mm	98 mm	61 mm
Hearing aid	20 mT (= 200 G)	63 mm	26 mm	20 mm	12 mm	7 mm
Hard drive	Unclear					

Unproblematic electronic devices and objects

- Camera, mobile phone, smart phone: No danger for storage medium
- Vehicle key: No danger
- USB stick, memory cards: No danger
- CD, DVD: No danger

Pacemaker and heart defibrillator

A pacemaker or heart defibrillator is implanted in people with heart rhythm disturbances. These devices are implanted under the skin in the chest area. They produce electrical impulses, which regulate the activity of the heart, if the patient's body cannot produce these regular impulses itself anymore or if cardiac fibrillation occurs.

A static magnetic field can cause pacemakers and heart defibrillators to switch into special mode. The characteristics of special mode can be programmed and are determined by the manufacturer. A physician can initiate a controlled switch into special mode with a strong permanent magnet. He does that to

- control pacemaker and heart defibrillator
- set a determined frequency for some cycles (independent from the actual need of the body)
- disable certain functions of the defibrillator

As soon as the magnet is removed, the pacemaker or heart defibrillator starts working normally again.

Newer pacemakers switch into special mode at 1 mT, older models already at 0,5 mT (=5 gauss). Therefore, you need to adhere to the safe distances to permanent magnets outlined in the table above.

Hearing aid

The following components of modern hearing aids may react to static magnetic fields:

- The speakers
- The coils responsible for the wireless communication between two hearing aids or between hearing aid and remote control

A magnetic field strength of 200 mT or above can cause permanent damage.
A magnetic field strength from 20 to 200 mT can cause temporary malfunction. Such malfunction may include:

- Distorted acoustic signal
- Strongly reduced remote control reach
- Collapse of the bidirectional radio link hearing aid <->hearing aid or hearing aid <-> accessory (e.g. Bluetooth audio relay)

Magnetic card

There are expensive and cheaper versions when it comes to cards with magnetic stripes ("magnetic cards").

High-quality magnetic stripes can be found on credit or ATM cards. They are dark-brown or black and it takes 0,4 tesla (0,4 tesla = 400 mT = 4 000 gauss) to demagnetise them. But already a third of this field strength is enough to partially delete magnetic stripes so that they can't be properly read anymore. At a tenth of the demagnetisation field strength (coercive field strength), meaning 40 mT, there is no danger of damages anymore.

Cheaper magnetic stripes are light-brown and frequently used on parking garage or admission tickets. These stripes are much more sensitive. It takes only 30 mT to demagnetise them. Field strengths of up to 3 mT certainly do not cause any harm.

Mechanical watch

A strong magnetic field can magnetise parts of mechanical watches, like for instance the spiral spring. The parts then react to other steel parts in the clockwork or to the clock case. This may lead to the watch being fast or slow.

Most of the standard watches now follow the ISO 764 standard and are "non-magnetic". Such watches need to be able to resist a magnetic field of 60 gauss (=6 mT), which means that after being exposed to this magnetic field they can only be off by a maximum of 30 seconds per day. Some manufacturer offer especially designed non-magnetic watches that can withstand up to 1 000 gauss.

It is difficult to indicate a safe distance for not non-magnetic watches. If you want to be on the safe side, you should keep as much distance for the magnetic field to equate only to the natural Earth's magnetic field of about 0,05 mT.

If a mechanical watch was magnetised by accident and doesn't work properly anymore, you can bring it to a watch maker. He can demagnetise it with a special demagnetisation device, which creates an alternating magnetic field.

Analogue quartz watches can be disturbed by a strong magnet, because the strong magnetic field interferes with the motor. They might all of a sudden be fast, slow or stop working altogether. But as soon as the magnet is removed and the time is corrected, the quartz watch should be working normal again.

Hard drive

You can find much contradictory information regarding this topic. Hard drive manufacturers themselves don't like to talk about it. But generally, hard drives are much more resistant to big magnets than expected. The hard drive coating usually provides a high level of coercivity. This means you would have to bring a very large magnet very close to a hard drive in order to delete files. As long as you don't unscrew the top cover of the hard drive, you won't be able to get close enough. A strong magnetic field, however, can damage mechanical components of the hard drive. A magnet can, for instance,

- block the motor of the reading head
- influence the position of the writing head or
- damage the writing head

All the above may lead to irreparable damages.

Hard drives of PC's, laptops and notebooks: A magnet is hardly a danger for hard drives built into a desktop computer because you cannot get close enough. Compact hard drives of laptops and notebooks, on the other hand, are more vulnerable to permanent magnets as they are generally located near the bottom cover plate. We cannot provide safe distances due to lack of data and different hard drive designs, but even our biggest magnet should not be able to damage a hard drive at a distance of 20 cm.

Intentional deleting: If you intend to permanently erase data on a hard drive, using a permanent magnet is not a suitable method. Instead, you should use special file deletion software that completely overwrites the hard drive multiple times.

Unproblematic electronic devices and objects

Digital camera, mobile phone, iPhone, iPod, iPad, tablet, etc.

Cameras, mobile phones, smartphones and tablets contain non-magnetic storage media. Therefore, static magnetic fields near those devices cannot delete data. We even offer a magnetic mobile phone mount in our online shop.

However, it cannot be ruled out that very strong magnetic fields might magnetise and possibly damage mechanical parts or the built-in speakers of these devices. When in doubt, keep these devices away from strong magnets.

Vehicle key

A static magnetic field does not damage a vehicle key or the built-in transponder for the anti-theft device. Therefore, you can hang your car key on a magnetic board without hesitation.

USB stick, memory card

USB sticks and memory cards (CompactFlash, SecureDigital, etc.) are not magnetic data carriers and will therefore not be damaged by static magnetic fields.

CD, DVD

CDs and DVDs sticks are not magnetic data carriers and will therefore not be damaged by static magnetic fields.

Read more online at: https://www.supermagnete.ch/eng/faq/distance

Watch a video on this topic: https://www.youtube.com/watch?v=5KOGybFXDwk.