

# IP Magnet

The "IP" in IP Magnet stands for (I)ntegrated (P)owder magnet. It is an encapsulated magnet type. It is unique and innovative and a highly corrosion resistant system in a 100% sealed enclosure, so that exposure to chemicals, water and gasses is an option.

The system can in other words run as wet runner and is maintenance free. A patent application has been granted on the IP-magnet.

### Uniqueness of the IP Magnet

The uniqueness of the IP Magnet is a higher magnetic strength and eco-friendliness, but also the cost savings in production, material, finishing, assembly and better tolerance.



Figure 1: IP Magnet with isotropic NdFeB powder.

The higher magnetic strength means higher efficiency at the same volume - results have shown up to 20% improvements in magnet strength - or new design possibilities at a smaller volume.

With for example lesser magnet material there will be savings on material as well as saving on production, finishing and assembly because there are fewer production steps, no heat treatment and no manual handling. With the unique processing method, there will also be low eccentricity and no or less balancing making tolerance demands more economical and easier to fulfill.

### Processing method

Unique for the processing method is that no epoxy is necessary for binding the powder or the complete magnet to the shaft. There is no need

for a costly heat treatment process and the manual assembly process is completely avoided.

Everything can run fully automatic, which is very valuable for high volume production. Production without epoxy is also more eco-friendly – There is no human contact with epoxy, which is known to provoke allergic reactions.

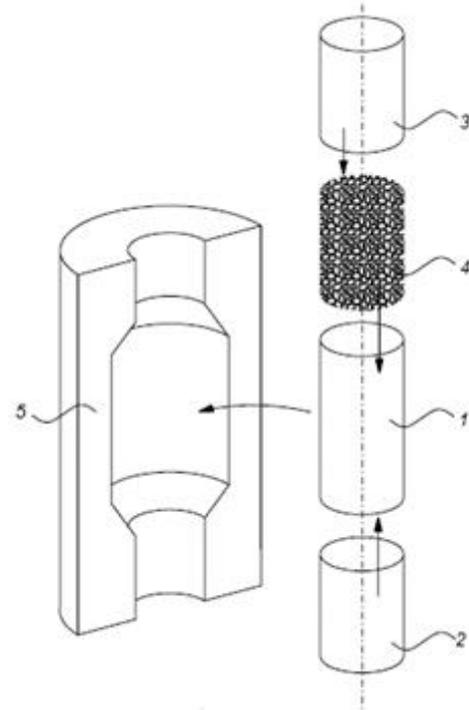


Figure 2: IP Magnet process

### Effectiveness

Important for the design and effectiveness of the magnet system and thus the motor is that with no binder, there is more room for magnet powder, which will increase the strength of the magnet (at the same volume) or decrease the size of the magnet and the motor (when keeping the same motor power).

Results of testing of the IP magnet compared to an epoxy-bonded magnet can be seen in the table below.

Description	Powder %	Density g/cm <sup>3</sup>	Remanens [T]
Pure powder	100.0%	7.62	0.98
IP Magnet	90.6%	6.90	0.89
Epoxy bonded	77.5%	5.91	0.76

Table 1: Properties based on MQP-16-7-11277-070 powder.

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## Sintex® Magnetic Technologies

Furthermore, the binder is known to corrode the surface of the NdFeB magnet powder, which is why IP-magnets without binder are more stable through time. There is simply no chemicals (from the binder or the environment) left to react with.

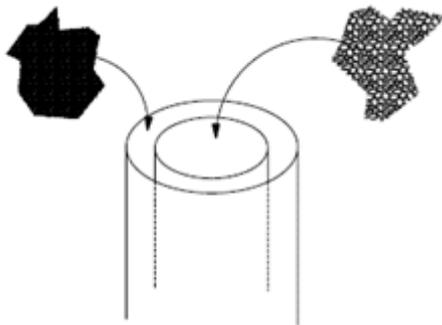
Mechanically the stainless sleeve strengthens the rotor considerably. This allows higher speed on the rotors, which can also decrease the size of the whole motor.

### New design possibilities

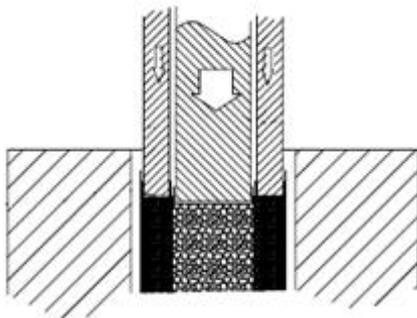
New design possibilities are further enhanced with the IP-magnets possibility to mix different compound and composite materials such as magnet and iron.

In PM-rotors, the flux can only pass magnet material and soft magnetic materials. Generally speaking when the flux lines flow in a magnetic material, the flux will increase, and when flowing in soft magnetic material the flux will be maintained. So if the flux has to flow long distances in the rotor (i.e. in 2 or 4 poled motors) the use of soft magnetic material as back iron could be important.

The IP-magnet can be made as a compound between iron powder in a small diameter working as back iron and on the outside of this magnet powder. An example on this is shown in figure 3 and 4.

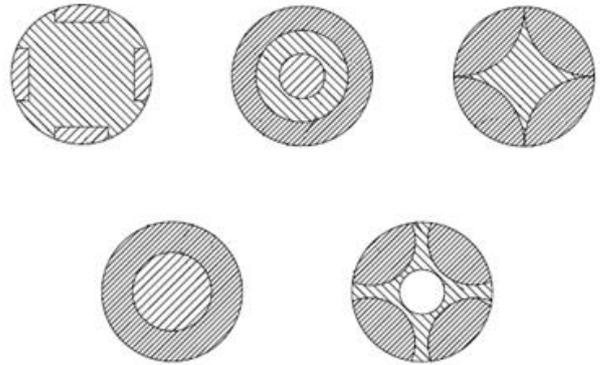


**Figure 3: Iron powder and magnet powder in different areas of the rotor.**



**Figure 4: Compression of both iron powder and magnet powder in one process.**

The below figure illustrate examples on some of the different possible methods of combining magnet powder and iron powder in order to maximise the output and efficiency of the system



**Figure 5: Examples of material combinations**

### More information

Sintex a/s is able to offer customised components in a range of different materials depending on customer requirements.

Contact us for more information about IP Magnet or other types of SMC materials. You can also refer to the technical data sheets for other material types.

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