

PAULSTRA



Paulstra Magnet Encoders HD Line

A Jewel for your car



Magnetism an energy as old as the earth



- We all live on a Giant Magnet.

Once a time, in the antique times, Greeks thought it was a soul in some inanimates materials : Amber (*elektron* in greek) and the stone they found near the city Magnesie.

In China soothsayers used magnetic properties for magic divinations.

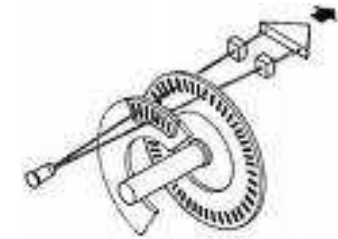
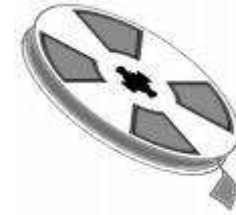
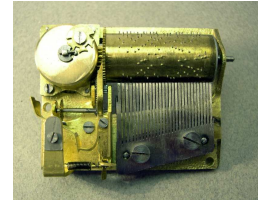
Then just as the occident enter the Christian era chinese sailors started to use compass.





Evolution of the technologies

- **M** ECHANICS
- **A** COUSTICS
- **T** HERMIC
- **C** HEMISTRY
- **E** LECTRICITY
- **M** AGNETISM
- **O** PTICS



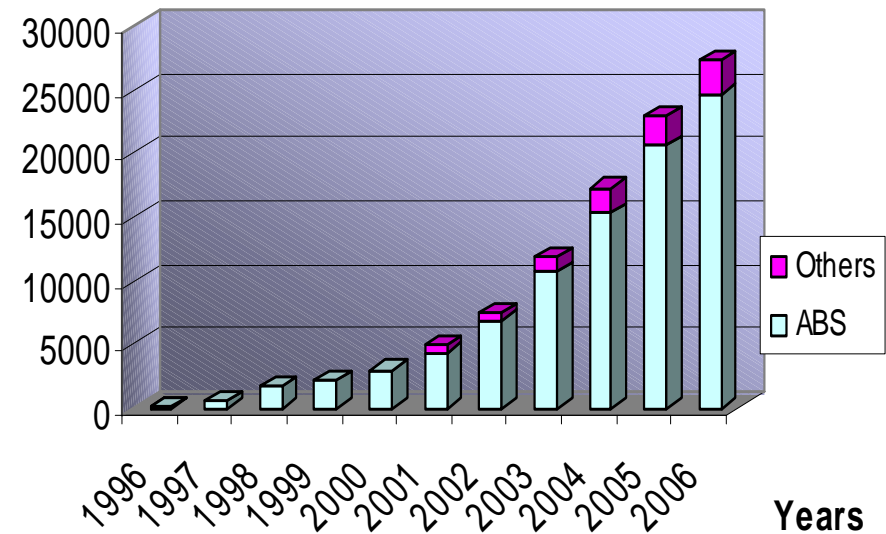


Paulstra mastery for Magnet Encoders



- **98%** of our sales for the car industry
- **10 years** mass production experience
- **100 millions** parts sold

Encoders sales (*1000 parts per year)



- Failure rate **lower than 1ppm** on field for ABS Encoders



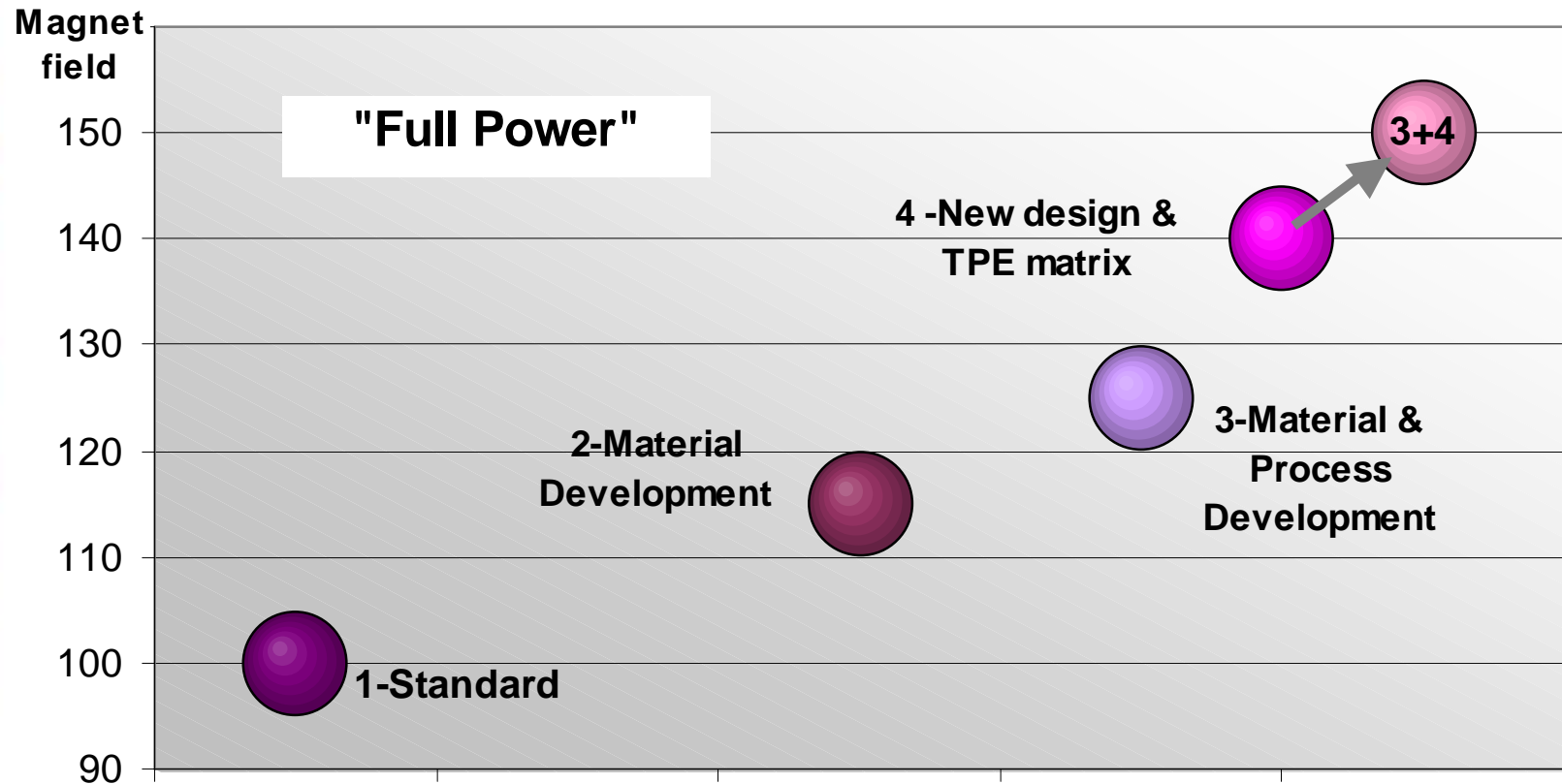
User Requirements



- Strong magnet fields
- High accuracy of the signal
- Large temperature range
- Easy integration in compact designs
- High robustness
- Costs savings



High Magnet Fields





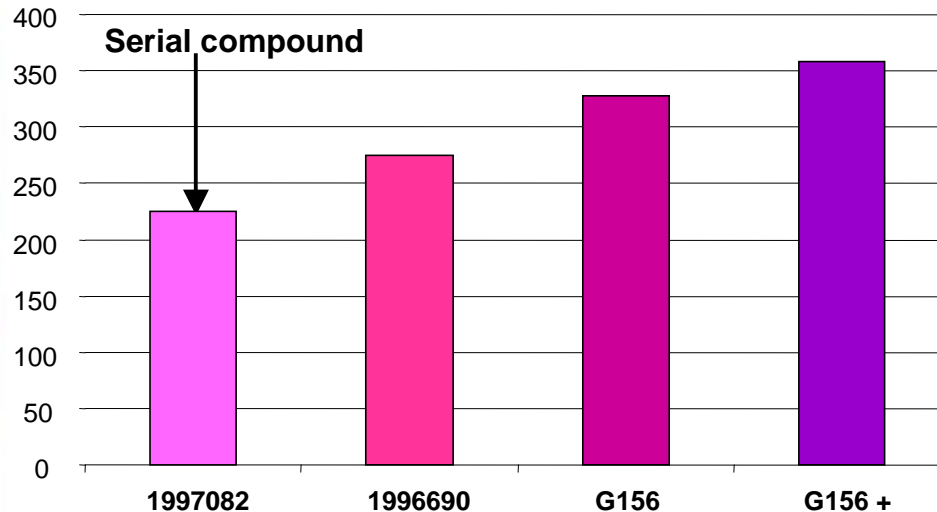
Magnetic Flux Density



● Material Development

Multipolar magnetization

B on part
in Gauss



1997082 / Br 0.168T

G156 / Br 0.210 T :

Remanent field on parts > +20%

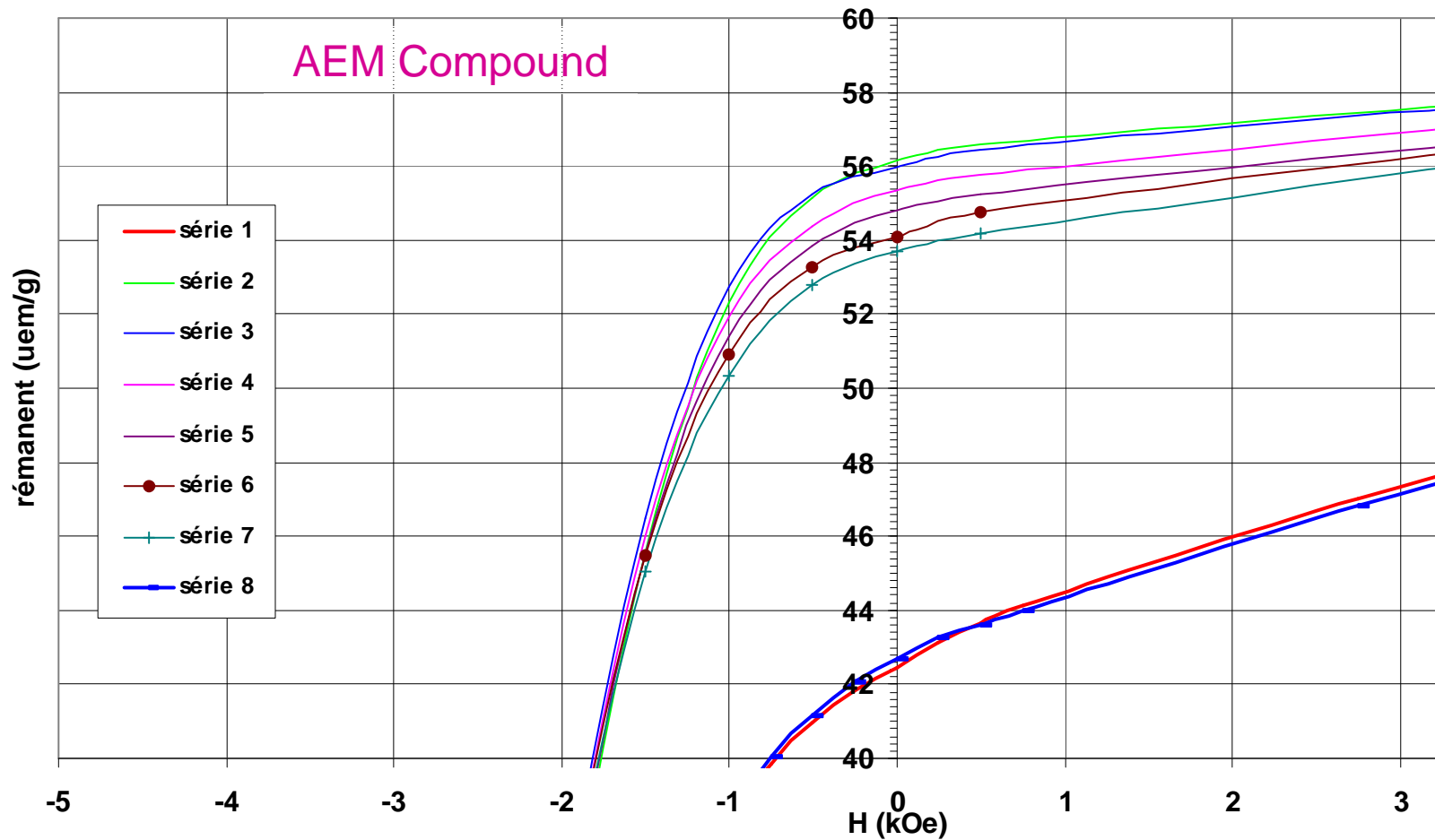
G156+ / Br 0.243 T :

Remanent field on parts > +30%

Magnetic flux density



● Process development



Estimated benefit → 30%

The missing link



Plastic Magnet

- High remanent Magnet field
($> 0,24$ Tesla)
- High Temperature withstanding
(140°C)
- Complex shape design
- Good Processability



Rubber Magnet

- High Elasticity
- Resistance to shocks and vibrations
- High temperature withstanding
(180°C)
- Good signal accuracy
(Pitch error $< 1\%$)
- Very strong rubber
to metal bonding process
- Integration of Sealing function



The missing link



● TP MAGNET Encoder

High Magnetic performance

> 0,24 Tesla

Mechanical robustness

9% Elongation at brake

High Temp. Withstanding

150° C

High Robustness

Strong TP/metal bonding system

Complex shape design

Good processability



Cost savings



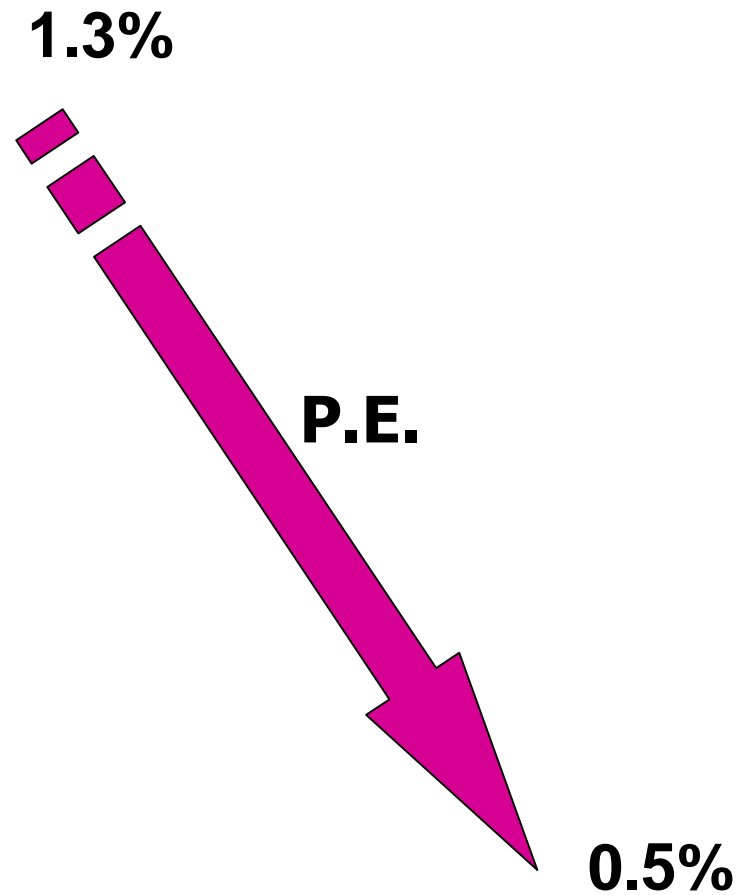


Signal Accuracy



● Improvement ways for precisions

- Material homogeneity
- Remanent Magnet Field
- Magnetizing means
- Control means



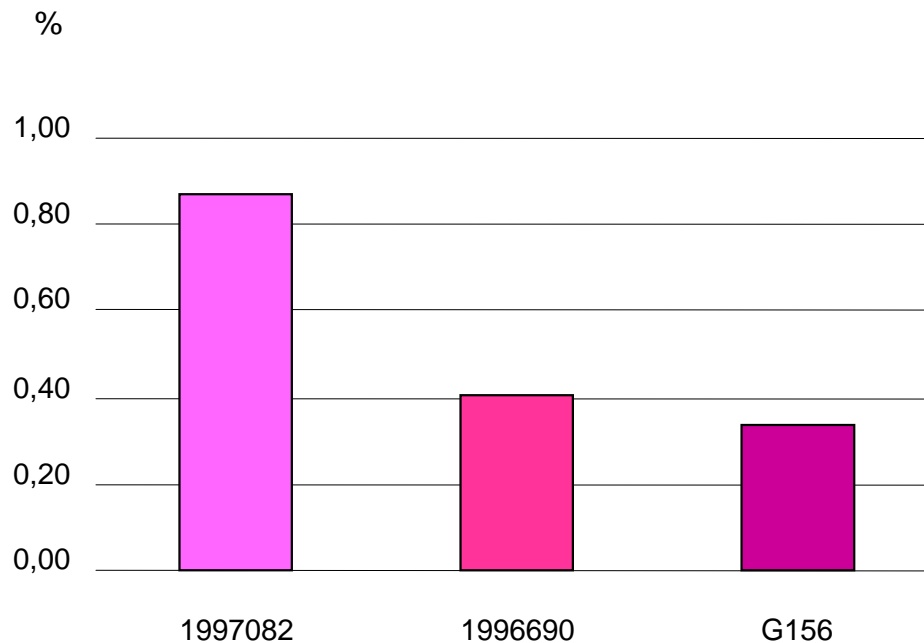


Signal Accuracy



● Influence of recipe

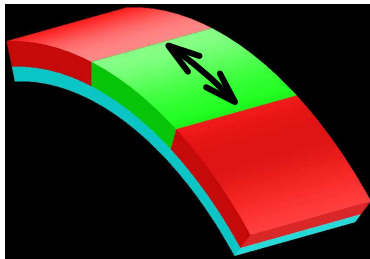
Improvement of field with filler loading strongly lead to improvement of pitch error



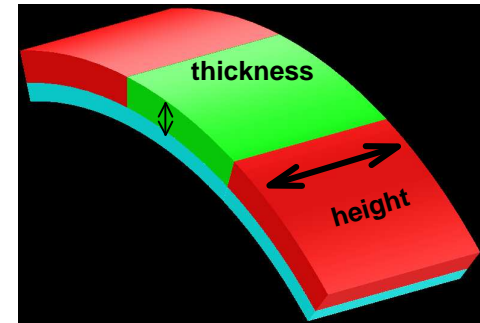
Pitch error
48 Pole pairs-PW=2.3mm

Design evolution

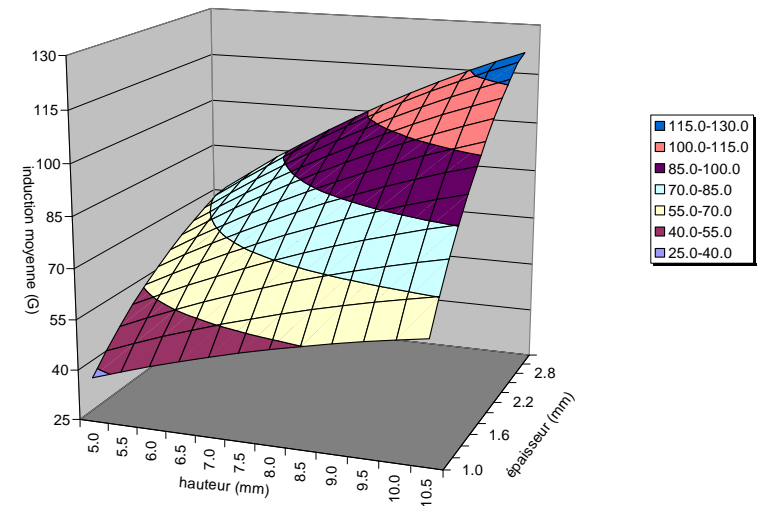
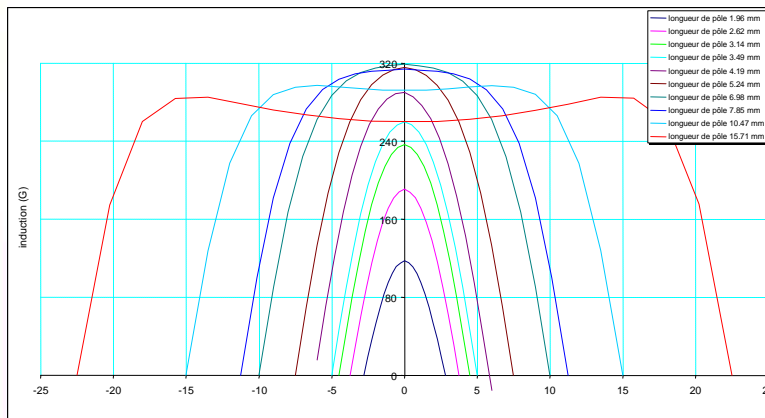
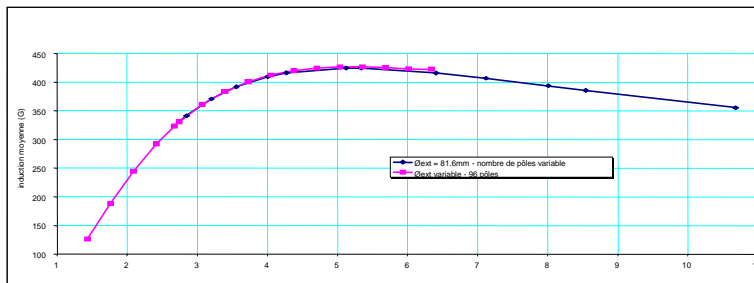
● Parametric study



Pole width factor



Thickness & height factors





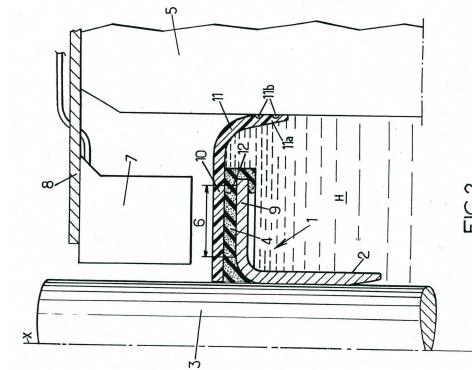
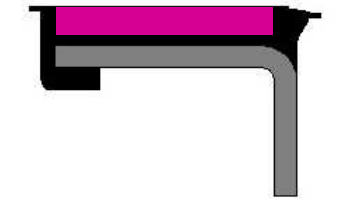
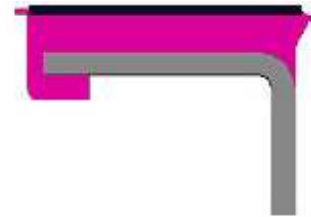
New designs



Encoder G II



Protected Encoder



TP Encoder => Cost savings 10%



Thank you for your attention,

**We are glad to welcome you
on our stand 2208**