

# World first

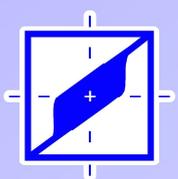
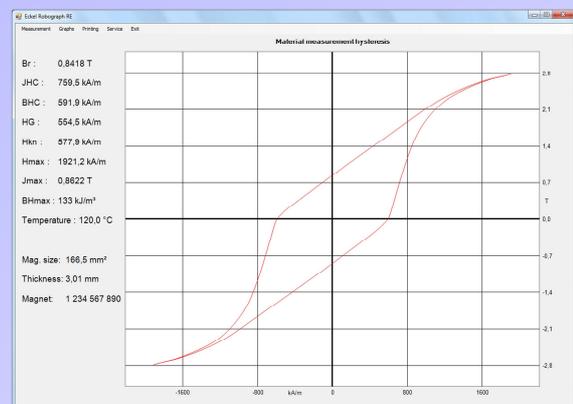
## The NEW Robograph RE

Fully digital Rare Earth hysteresisgraph with motorized electromagnet yoke and coil



Material and flux measurement  
Optional heating up to 200°C

Very high accuracy  
Compact design



# ECKEL

## Magnet Test Equipment

# ECKEL Robograph RE

**Digital high performance measuring system for hysteresis and demagnetisation measurement of hard magnetic materials like material and flux measurement of flat samples and flux measurement of ferrite segments according to BOSCH standard.**

After 15 years of worldwide success since the introduction of Robograph 2 ECKEL presents the new Robograph RE (Rare Earth). With complete new digital technology the Robograph RE sets new standards in hysteresis and demagnetisation measurement of hard magnetic materials.

While functions of flux hysteresis measurement of ferrite segments according to Bosch specification with some improvements mainly stay the same as with the Robograph 2, new ways are opened for measurement of flat samples of Rare Earth, AlNiCo or ferrite material. Also flux measurement of flat samples with air gap is possible.



ECKEL Robograph RE

The software of the Robograph RE allows for a signal processing like offset correction, switching of amplifications and time outs during measurement, which would not be possible with analogue systems. The extraordinary signal quality of the Robograph RE nevertheless allows an evaluation without any direct signal conditioning or filtering. Thereby repeatability is improved to better than 0.1% (if magnet stays in fixture). Thus the result is shown with one more digit as usual (0.1  $\mu$ Vs, 0.1 mT and 0.1 kA/m resolution).

By evaluating data via software the Robograph RE benefits permanently from performance enhancements which are provided by software updates. Also firmware of the Robograph RE can be updated by the user. Adequate programs will be provided at our website.

The Robograph RE is self-calibrating at all input amplifications and has a reference signal output to perform an external calibration and certification using any calibrated multimeter.

Resolution, repeatability, speed and easy handling of the Robograph RE have never been reached before. The Robograph RE software needs a Windows operating system and is available in English and German.

## Technical specification:

2 controlled 700 VA bipolar power current sources suitable for continuous operation with thermal protection and forced ventilation

Sampling of 4 measuring inputs with up to 2.000 Hz at 24 bit resolution

Measurement of the complete hysteresis within a minimum of 8 seconds with approximately 10.000 dots.

Max. measuring error: +/- 0.2 %. Magnets must be inserted carefully!

Typical device-related measuring error: < 0.1%

Power supply: 1.600 W, 230 V or 115 V

Dimensions: 19", 3HE (height units), W47 x L44 x H17 cm

Small measuring yoke: Modulation up to approximately +/- 1.000 kA/m at magnet thickness of 6 mm

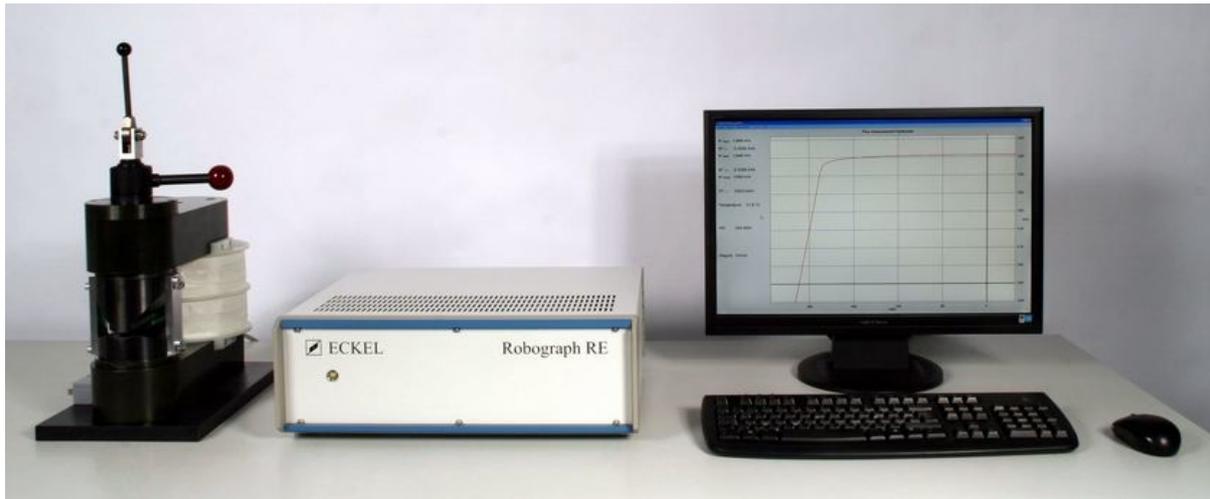
Large measuring yoke: Modulation up to approximately +/- 2.100 kA/m at magnet thickness of 2 mm

Temperature proof for pole shoe temperatures up to 200 °C

Microcontroller executed motor control and sensor evaluation

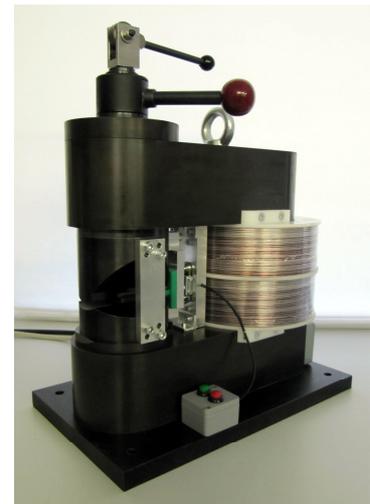
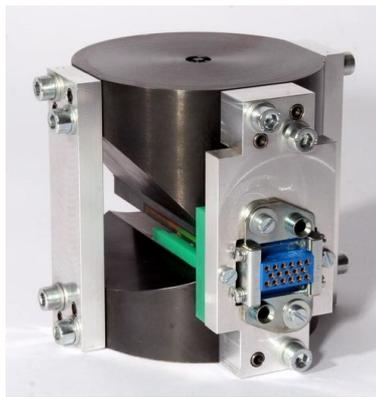
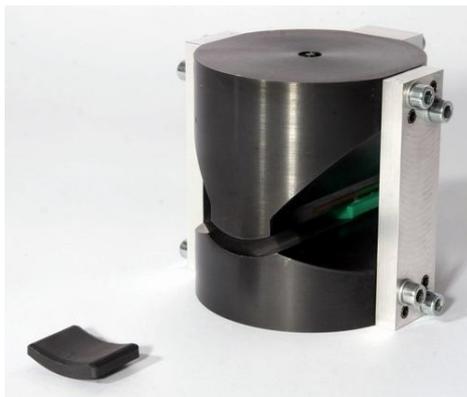
Data transmission to Robograph RE via RS232 at 115.000 Kbit/s

## Flux hysteresis measurement of ferrite segments according to Bosch specification



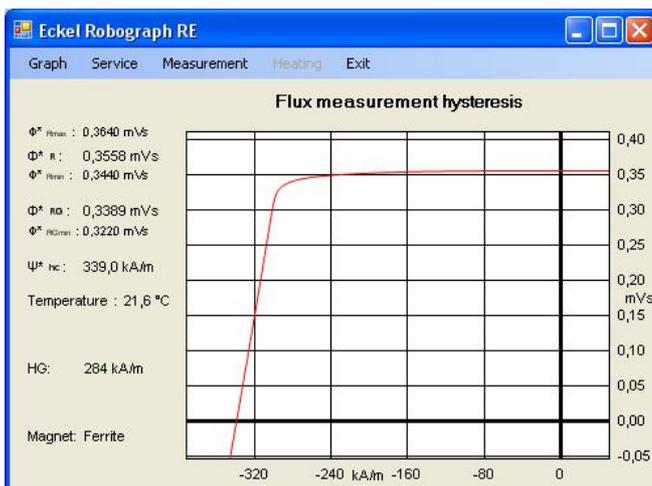
Robograph RE for flux hysteresis measurement of ferrite segments

With the flux measurement according to Bosch test specification No. 3 139 918 950 for non-destructive flux measurement of magnetic segments the segment is held inside a measuring fixture which resembles the individual pole housing and is magnetized in both directions beyond the saturation point. The magnetic flux is measured by means of a surrounding coil and the magnetic field is measured by means of a Hall probe. Full hysteresis is always measured.



New flux measurement fixture and electromagnet yoke

Changing the fixtures is now a matter of seconds. To open the yoke only one movement is necessary. The new fixture has an inbuilt hall probe and a special plug, connecting coil, Hall probe and parameter EEPROM to the Robograph RE. The magnet segment has no longer to be fixed by plastic stripes but is perfectly fixed with a bolt, pushed down by one sweep of the hand.

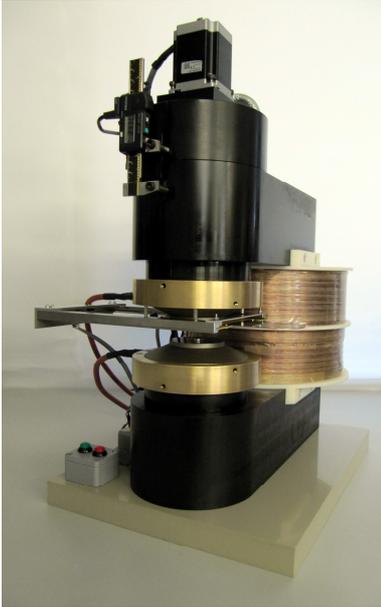


The new yoke can also be used with the old fixtures of Robograph 2. It is not necessary to change all fixtures.

As results of the flux measurement the remanence flux  $\Phi^*_R$  and the remanence flux  $\Phi^*_{RG}$  after an opposing field  $H^*_G$  are indicated. Also the value  $H_{GF(80)}$  can be evaluated. These values are compared to the limit values which have been calculated for this magnet. By default a demagnetisation curve with display of tolerances is shown.

Demagnetisation of a ferrite segment

## Measurement of flat magnets (ferrite, AlNiCo and Rare Earth)

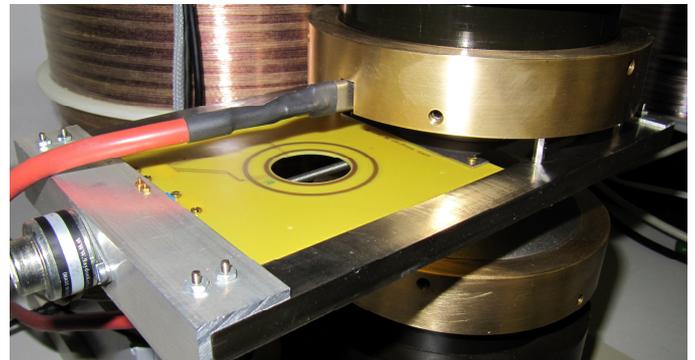


Motorized big yoke for Rare Earth

With the big yoke also Rare Earth magnets and other flat samples can be measured. Standard measurement is material measurement ( $B_r$ ,  $H_G$ ,  $BH_C$ ,  $jH_C$ ,  $B \cdot H_{max}$ ) as hysteresis or demagnetisation. But also flux measurement (result in mVs) is possible with or without air gap.

The yoke holds a pair of flat heatable pole shoes made from cobalt steel with a saturation of 2.35 T. The usable diameter is 63 mm by default. Other sizes are possible on request. The pole shoes are used in combination with a J-compensated surrounding coil. For evaluation surface area of the sample must be known and must be constant over thickness. Thickness is recorded automatically.

Depending on sample thickness maximum field is up to 2.100 kA/m. A  $jH_C$  can be evaluated up to 1.800 kA/m.



Motorized coil

The surrounding coil consists of a 7-layer PCB with 2 printed coils and an integrated Hall probe. The coil is calibrated by a PTB certified comparison coil. For compensation of field widening at larger air gap a thickness dependent calibration is performed.



ECKEL Robograph HC

The pole shoes can be heated up to 200 °C by using the Robograph HC (Heat Control). The Robograph HC has two independent regulated DC current sources of up to 700 VA. After some minutes the Robograph HC reaches the selected temperature and keeps it constant also during measurement for +/- 0.1 °C. The temperature is acquired by Platinum surface sensors.

The measurement is completely automatic even with heating up. Coil and yoke are motorized and equipped with sensors. The yoke is controlled by the Robograph RE via serial interface (RS232).

Sample rate, measurement speed and maximum field strength are selectable. Hysteresis, demagnetisation and 2-quadrant demagnetisation (with magnetisation at the beginning) with or without inner loops can be selected. Also New Curves of unmagnetized magnets can be recorded. Even back-coupled functions with constant  $dB/dt$ ,  $d\Phi/dt$  or  $dH/dt$  as well as temperature coefficient evaluation are available.

Measurement time and number of samples are depending on the selected parameters. Measurement time is between 8 and 150 seconds. The number of samples is set to about 10.000 samples for a complete hysteresis.

Evaluation and display of the result take less than one second. All results that can be calculated from a hysteresis or demagnetisation curve can be displayed. If desired a tolerance can be set for all results. Of course all results can be archived, printed and exported.