

# DFM 1

## Digital Fluxmeter

Integral measurement of permanent magnets

Driftfree software integration

Absolute difference value

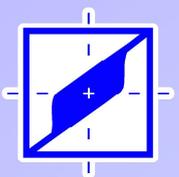


2 - 8 pole rotor test

4 digit display

Max. resolution 0.1  $\mu$ Vs

Upper and lower limits



**ECKEL** Magnet Test Equipment

## Digital flux meter DFM 1

A fluxmeter measures the magnetic flux of a magnetized magnet by integration of the voltage induced in the measuring coil by movement of the magnet.

The digital flux meter ECKEL DFM 1 represents a new generation of integrating flux meters. Unlike all other "electronically" (i.e. analogue) integrating flux meters with digital output of the integration voltage, at the DFM the input voltage is digitally sampled and then integrated by software.

The test input is digitized by means of a 14-bit A/D converter and with a sampling rate of 0.625 ms (1,600 measurements per second). The high sampling rate is also ensuring high accuracy at high speed measurements. The evaluation and update of the display output is also performed at that frequency. The input voltage is totalled at an integration width of 32 bit in the microcontroller. This allows for a high resolution.

The DFM 1 flux meter performs a highly accurate drift-free flux measurement without any calibration and at maximum errors of less than 0.5%. It is optimized for quality assurance applications performed at manufacturers and users of permanent magnets with a minimum magnetic flux of 100  $\mu$ Vs; for example, magnet segments used for manufacturing fractional-horsepower motors or loudspeaker magnets.

The range of measurement is up to 8191  $\mu$ Vs with a resolution of 1  $\mu$ Vs on a 4-digit display. Below 1000  $\mu$ Vs resolution is 0.1 $\mu$ Vs. This range of measurement is related to the magnet and it already considers the number of turns. Seven different input ranges from maximum 93.75 mV to 6 V can be selected. Overload and low modulation are displayed to obtain a high signal-to-noise ratio.

The DFM 1 can be used both as a lab measurement device and as a device which is used at assembly lines. It includes all features necessary for the use in full automatic quality inspection and rejection systems. »Reset« and »Hold« can be controlled remotely. The result is checked with adjustable upper and lower limits and it triggers one of three relays for controlling the sorting equipment.

The lower and upper limit can be adjusted from 0 to 8000  $\mu$ Vs  
10, 20, 50 and 100 can be selected as the number of turns of the measuring coil.  
For adaptation to reference magnets, a calibration relative to the internal reference of 0.500 to 2.000 can be adjusted.  
All parameters can be set via push button. The parameters can be stored in the EEPROM and are loaded automatically as soon as the unit is switched on.  
The DFM 1 has an analogue output (1mV /  $\mu$ Vs) for a standard graph plotter or an oscilloscope and has a printer connector for a standard printer.

Further the DFM 1 offers the absolute function. This function displays the absolute peak value between two extreme values. It is used to measure the flux of turning rotors. For this application the rotor must be turned far enough to guarantee a complete polarity change at each coil. The displayed value corresponds to the difference between the largest negative and the largest positive flux during a rotation.

Also the DFM 1 is can calculate the average flux value of all poles for 2 up to 8 pole motors. When turning the motor the poles are detected and counted automatically. After a full turn the average value is shown.

Due to the combination of the microcontroller and an internal voltage reference, the operation of the DFM is completely maintenance-free. Appropriate algorithms allow for an automatic internal calibration and for a fully automatic internal absolute drift compensation by means of continuously tracking the drift parameters, which is impossible for even the best analogue integrators.

The use of intelligent software rather than expensive hardware components leads to a smaller size of only 180x185x65 mm and to a more attractive price.