UE3040400 WALTENHOFEN'S PENDULUM

EXPERIMENT PROCEDURE

- **Investigate the braking of a Waltenhofen pendulum due to eddy currents in a uniform magnetic field.**
- **Demonstrate the suppression of eddy currents in a disc with slots.**

REQUIRED APPARATUS

Quantity	Description	Number	
1	Waltenhofen's Pendulum	**1000993**	
1	Tripod Stand 150 mm	**1002835**	
1	Stainless Steel Rod 750 mm	**1002935**	
1	Universal Clamp	**1002830**	
1	DC Power Supply 0 – 20 V, 0 – 5 A (230 V, 50/60 Hz)	**1003312**	**or**
	DC Power Supply 0 – 20 V, 0 – 5 A (115 V, 50/60 Hz)	**1003311**	
1	U Core	**1000979**	
1	Pair of Pole Shoes	**1000978**	
1	Pair of Clamps	**1000977**	
2	Coil D with 1200 Taps	**1000989**	
1	Set of 15 Safety Experiment Leads, 75 cm	**1002843**	

OBJECTIVE

Demonstrate and investigate how an eddy-current brake works

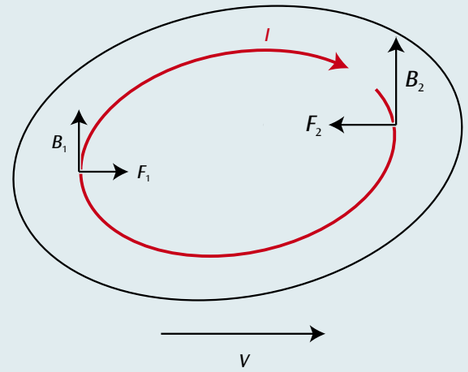
SUMMARY

In a metal disc moving through a uniform magnetic field, eddy currents get induced. The uniform magnetic field exerts a force due to these currents that causes the disc to slow down.

BASIC PRINCIPLES

When a metal disc moves through a uniform magnetic field each section of the disc experiences constantly changing magnetic flux and an eddy voltage is induced therein. This causes electrical eddy currents to flow all over the disc. These are subject to Lorentz forces within the magnetic field that act to slow down the motion of the disc. These eddy currents are drastically reduced if the metal disc has slots in it. This means that the current has to flow from one segment to the next by a more circuitous route. Such a disc is slowed down only slightly.

The emergence and suppression of eddy currents can be clearly demonstrated using a Waltenhofen pendulum. This includes a partially slotted metal disc that oscillates inside a uniform magnetic field.



Eddy current I in a metal disc moving at speed v through a uniform magnetic field B_1, B_2 with Lorentz forces F_1 and F_2 acting on both limbs of the eddy. The force acting against the motion is greater than that operating in the same direction.

EVALUATION

When a metal disc without slots moves through the uniform magnetic field, its oscillation is damped. The damping increases with the magnitude of the magnetic field. Eddy currents are induced within the disc and the magnetic field itself exerts a force as a result that opposes the motion (cf. Lenz's law).

If the slotted disc moves through the field, the damping of the motion is only slight since it is much more difficult for the eddy currents to form.