

**P 2.3.3**

**Conversion of mechanical energy**

P 2.3.3.1 Converting mechanical energy into heat energy – recording and evaluating measured values manually

P 2.3.3.2 Converting mechanical energy into heat energy – recording and evaluating measured values with CASSY

**CASSY-S**



Converting mechanical energy into heat energy – recording and evaluating measured values manually (P 2.3.3.1)

Energy is a fundamental quantity of physics. This is because the various forms of energy can be converted from one to another and are thus equivalent to each other, and because the total energy is conserved in the case of conversion in a closed system.

These two experiments show the equivalence of mechanical and heat energy. A hand crank is used to turn various calorimeter vessels on their own axes, and friction on a nylon belt causes them to become warmer. The friction force is equivalent to the weight  $G$  of a suspended weight. For  $n$  turns of the calorimeter, the mechanical work is thus

$$W_n = G \cdot n \cdot \pi \cdot d$$

$d$ : diameter of calorimeter

This results in an increase in the temperature of the calorimeter which corresponds to the specific heat capacity

$$Q_n = m \cdot c \cdot (\vartheta_n - \vartheta_0)$$

$c$ : specific heat capacity,  $m$ : weight,  $\vartheta_n$ : temperature after  $n$  turns

To confirm the relationship

$$Q_n = W_n$$

the two quantities are plotted together in a diagram. In the first experiment, the measurement is conducted and evaluated manually point by point. The second experiment takes advantage of the computer-assisted measuring system CASSY.

Cat. No.	Description	P 2.3.3.1 (a)	P 2.3.3.1 (b)	P 2.3.3.2
388 00	Equivalent of heat, basic apparatus	1	1	1
388 01	Water calorimeter	1	1	1
388 02	Copper-block calorimeter with heating coil	1	1	1
388 03	Aluminum-block calorimeter with heating	1	1	1
388 04	Large aluminum-block calorimeter with heating coil	1	1	1
388 05	Thermometer for calorimeters	1		
388 24	Weight with hook, 5 kg	1	1	1
666 190	Digital thermometer with 1 input		1	
666 193	Temperature sensor NiCr-Ni		1	1
524 010	Sensor CASSY			1
337 46	Forked light barrier, infra-red			1
524 045	Temperature box (NiCrNi/NTC)			1
524 034	Timer box			1
501 16	Multicore cable, 6-pole, 1.5 m long			1
524 200	CASSY Lab			1
300 02	Stand base, V-shape, 20 cm			1
300 40	Stand rod, 10 cm			1
300 41	Stand rod, 25 cm		1	1
301 07	Simple bench clamp		1	1
301 11	Clamp with jaw clamp		1	1
	additionally required:			
	1 PC with Windows 95/NT or higher			1