Operating the hot-air engine as a heat pump and a refrigerating machine (P 2.6.1.3)

**P 2.6.1**

## Hot-air engine: qualitative experiments

P 2.6.1.3 Operating the hot-air engine as a heat pump and a refrigerating machine

| Cat. No. | Description | P 2.6.1.3 |
|---|---|---|
| 388 182 | Hot-air engine | 1 |
| 388 19 | Thermometer | 1 |
| 347 35 | Experiment motor | 1 |
| 347 36 | Control unit for experiment motor | 1 |
| 388 181 | Immersion pump 12 V | 1* |
| 521 230 | Low-voltage power supply | 1* |
| 667 194 | Silicone tubing, int. dia. 7 x 1.5 mm, 1 m | 2* |
| 604 307 | Can, 10 l | 1* |

* additionally recommended

Depending on the direction of rotation of the crankshaft, the hot-air engine operates as either a heat pump or a refrigerating machine when its flywheel is externally driven. When the displacement piston is moving upwards while the working piston is at bottom dead center, it displaces the air in the top part of the cylinder. The air is then compressed by the working piston and transfers its heat to the cylinder head, i.e. the hot-air motor operates as a heat pump. When run in the opposite direction, the working piston causes the air to expand when it is in the top part of the cylinder, so that the air draws heat from the cylinder head; in this case the hot-air engine operates as a refrigerating machine.

The experiment qualitatively investigates the operation of the hot-air engine as a heat pump and a refrigerating machine. In order to demonstrate the relationship between the externally supplied mechanical power and the heating or refrigerating power, respectively, the speed of the electric motor is varied and the change in temperature observed.