

HM 240.06

Heat transfer at a cylinder in transverse flow



The illustration shows a similar unit

Description

- **forced convection on the cylinder**
- **cooling curve and heat transfer coefficient**
- **accessory for HM 240**

The aim of this basic experiment is to determine the heat transfer coefficients, a specific indicator, from the cooling curve. Cooling curves describe the temperature compensation between a body and its surroundings, as a function of time.

Used in conjunction with HM 240, the HM 240.06 accessory makes it possible to record the cooling curve of a cylinder in air flow. The accessory includes an oven and a copper cylinder. The large copper cylinder is heated in the oven to approximately 120°C. Then, the heated cylinder is placed in HM 240's intake pipe and cooled in an air flow.

A temperature sensor is fitted inside the cylinder. The convective heat transfer on the cylinder can be determined from the cooling rate.

The experiment can be performed for various flow rates. The measured values are analysed using the HM 240 software.

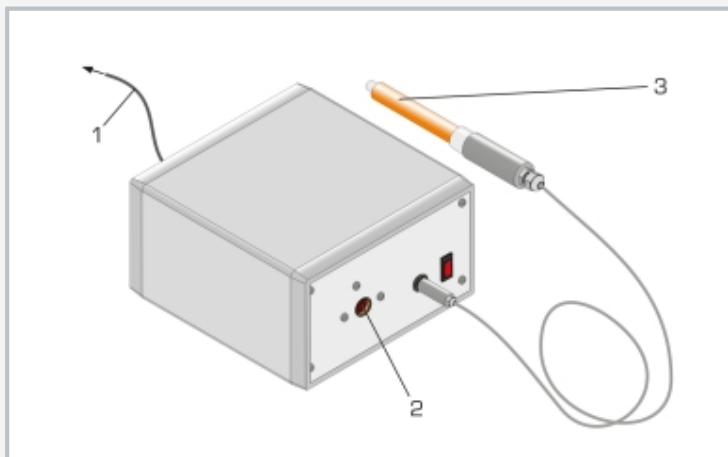
HM 240.06 is part of a series that allows experiments on the principles of incompressible air flow. The software for data acquisition and visualisation makes the experiments especially clear and enables fast execution of experiments with reliable results.

Learning objectives/experiments

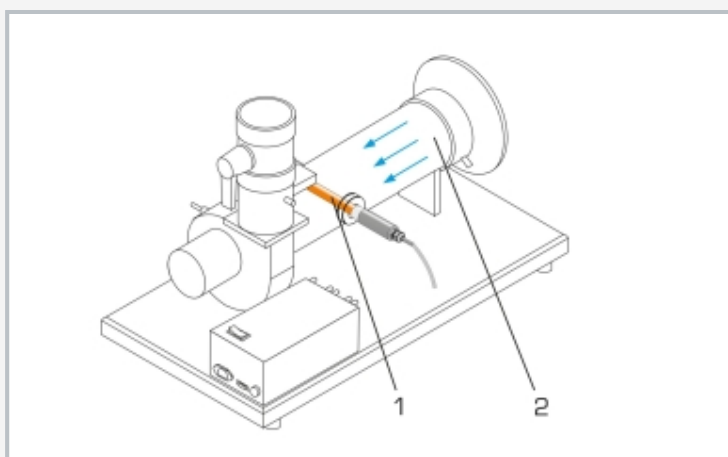
- in conjunction with HM 240
 - ▶ recording a cooling curve
 - ▶ determining the heat transfer coefficients from the cooling curve

HM 240.06

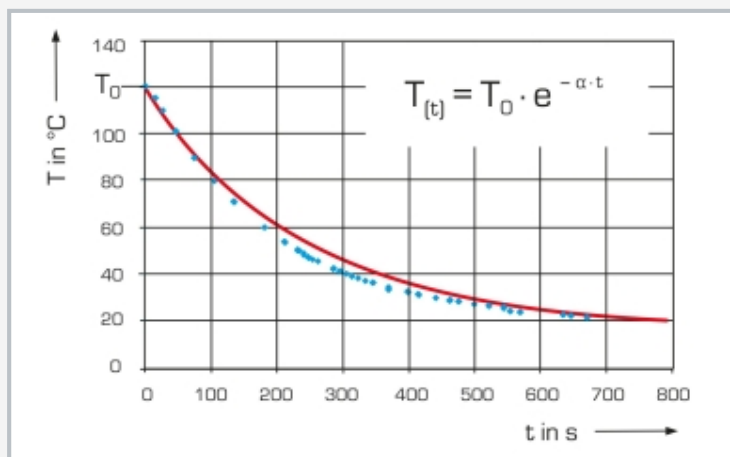
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1 connection to HM 240, 2 opening of the oven, 3 copper cylinder



Experimental setup with HM 240
1 heated cylinder from HM 240.06, 2 HM 240



Cooling curve of the cylinder: blue: measured values, red: theoretical cooling curve;
T temperature, t time, α heat transfer coefficient, T_0 temperature at time $t=0$

Specification

- [1] convective heat transfer of a cylinder in an air-flow tube
- [2] accessory for HM 240
- [3] copper cylinder with integrated temperature sensor
- [4] cylinder is heated in the oven to approximately 120°C
- [5] oven keeps the temperature constant
- [6] display and analysis of the measured values using the software in HM 240

Technical data

Oven

- heating power: 100W

Cylinder

- material: copper
- length: 120mm
- outer diameter: 20mm

Measuring ranges

- temperature: 0...200°C

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase

LxWxH: (oven): 270x260x160mm

Weight: approx. 5kg

Scope of delivery

- 1 oven
- 1 cylinder
- 1 set of instructional material

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Required accessories

HM 240

Principles of air flow