

# Thermodynamics at GUNT

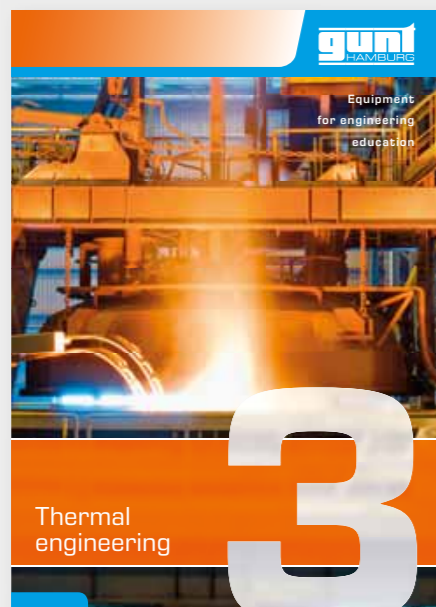
Thermal engineering comprises the discipline of thermodynamics and the specialisation of energy technology.

Thermodynamics as a general study of energy is a fundamental science of technology. It is a fundamental subject in almost all technical courses of study and training.

Thermodynamics is particularly important for energy engineering, e.g. in the planning, construction and operation of power plants. It also plays a key role in the design of fluid machinery such as turbines, compressors, internal combustion engines or drive mechanisms.

In order to cover the extensive topic of thermodynamics comprehensively, GUNT has distinguished the subject areas from each other and compiled them in two catalogues:

The main catalogue is catalogue 3 **Thermal engineering**. One important field of thermodynamics is **refrigeration and air conditioning technology**. GUNT has dedicated catalogue 3a to this topic.



Courses of study, all engineering sciences, e.g.

- mechanical engineering
- environmental engineering
- applied natural sciences
- industrial engineering
- civil engineering and architecture
- energy engineering
- process engineering



Training in the field of

- refrigeration technology
- mechatronics
- air conditioning technology

Courses of study

- mechanical engineering
- supply engineering
- civil engineering
- environmental engineering
- refrigeration technology
- building services engineering
- facility management
- climate engineering

## Why "thermal engineering"?

Thermal engineering involves more than pure thermodynamics. In thermal engineering, it is necessary to take account of connections and interrelationships with other disciplines/teaching fields. The example of an internal combustion engine below shows which knowledge from other disciplines is necessary for understanding and design.

**Thermodynamics:** 1<sup>st</sup> and 2<sup>nd</sup> principle, phase change, heat transfer, energetic balancing

**Electrical engineering**  
Ignition: by electrical energy

**Process engineering**  
Mixture of substances: liquid fuel is mixed with air in the carburettor and becomes gaseous

**Chemistry**  
Conversion of matter: in the combustion chamber, the chemically bound energy of the fuel is released by conversion of matter, fuel becomes exhaust gas

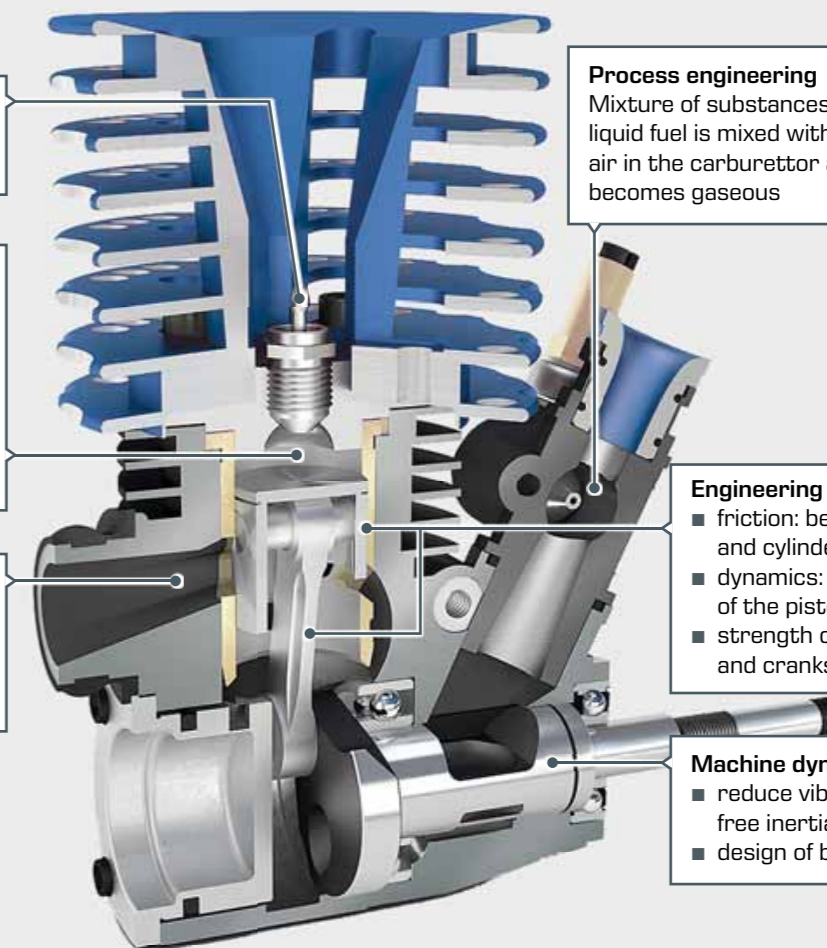
**Fluid mechanics**  
Flow of compressible fluids: fuel and air are added, exhaust gases are discharged

**Engineering mechanics**

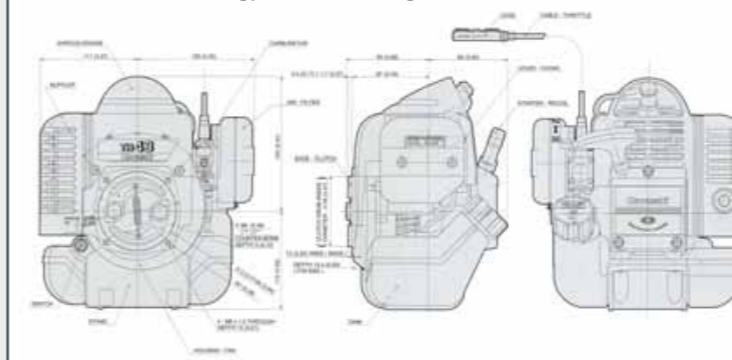
- friction: between piston and cylinder wall
- dynamics: due to motion of the piston rod
- strength of piston rod and crankshaft

**Machine dynamics**

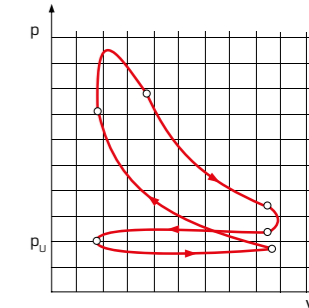
- reduce vibrations due to free inertia forces
- design of bearings



**Engineering design**  
Functional and energy-efficient design



**Computing and information technologies**  
For cyclic processes for internal combustion engines, e.g. the Seiliger process





# Thermodynamics at GUNT

## Structure of the catalogue

Catalogue 3 is divided into five chapters. Firstly, the basics of thermodynamics are discussed as an introduction to the topic. The next section deals with application and practice.

When compiling the **Thermodynamics** product range, GUNT took guidance from the standard curricula and textbooks in use at German universities.

### Fundamentals and introduction

#### Chapter 1 | Fundamentals of thermodynamics

Thermodynamic state variables

Principles of heat transfer

Phase transition

### Application and practice

#### Chapter 2 | Heat exchangers

- heat transfer
- recuperators
- direct-contact heat exchangers
- fluidised bed heat exchanger

#### Chapter 3 | Thermal fluid energy machines

- steam power plants
- gas turbines
- piston compressors
- internal combustion engines

#### Chapter 4 | Principles of refrigeration

- principles of cold production
- compression refrigeration system
- refrigeration applications

#### Chapter 5 | Thermodynamic applications in supply engineering HVAC

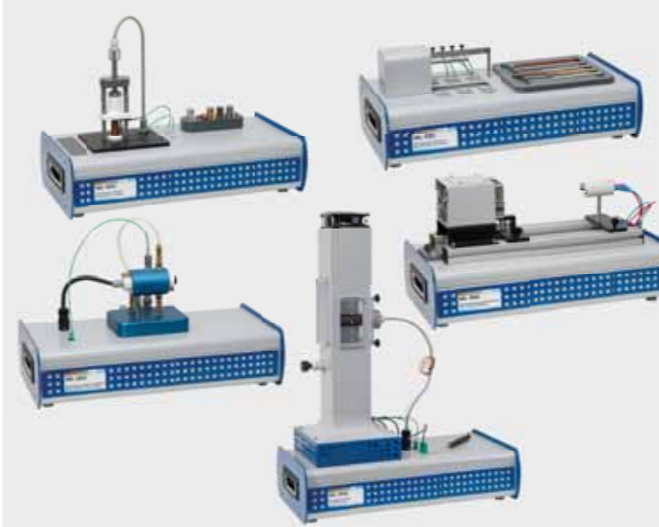
- hot water generation
- air conditioning technology and ventilation
- GUNT-RHLine Renewable Heat



## Equipment series in the thermodynamics product range

### Chapter 1 | Fundamentals of thermodynamics

#### GUNT-Thermoline Fundamentals of heat transfer



### Chapter 2 | Heat exchangers

#### Series WL 110 Heat exchanger with supply unit



### Chapter 4 | Fundamentals of refrigeration

#### ET 915 HSI training system refrigeration and air conditioning technology



### Chapter 5 | Thermodynamic applications in supply engineering HVAC

#### GUNT-RHLine Renewable Heat: HL 320 Solar thermal energy and heat pump modular system

