

# Refrigeration and air conditioning technology at GUNT

**Refrigeration and air conditioning technology** is among the most important topics of the 21<sup>st</sup> century. The development of cooling techniques makes the preservation of perishable food possible in the first place. Likewise, the production of high-performance plastics would be inconceivable without the possibilities of process cooling.

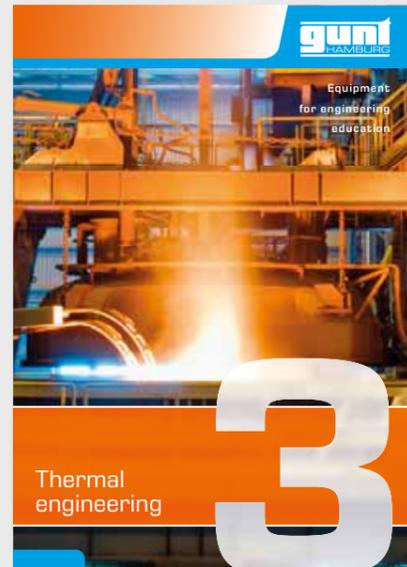
And the air conditioning of buildings and vehicles has become indispensable due to the legitimate desire for comfort. Although air-conditioning technology and refrigeration are closely related, they are two independent sub-disciplines.

The methods and procedures used to generate cold are referred to as **refrigeration technology**. The theoretical knowledge used in refrigeration covers the entire field of natural sciences. In addition to sound knowledge of thermodynamics, further knowledge in the fields of mechanical engineering, heat transfer, chemistry, thermal process engineering, apparatus engineering, measurement and control engineering is required.

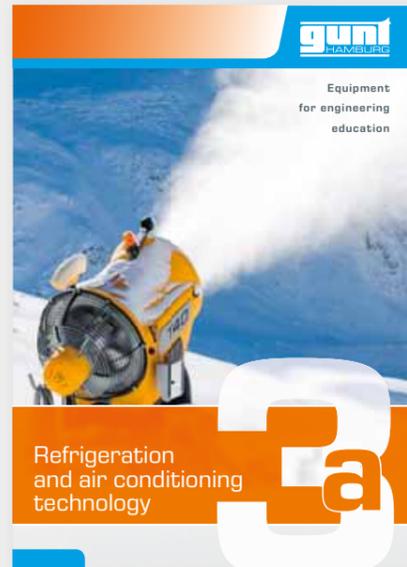
**Air conditioning technology**, which describes a sub-area of supply technology (HVAC), covers the regulation of room temperature, air humidity and air quality. An air conditioning system can heat, cool, humidify, dehumidify and filter. The central element of an air conditioning system is always a refrigerating plant.

GUNT has presented the subject of refrigeration and air conditioning technology briefly and compactly in its main catalogue **3 Thermal engineering**.

This important field of thermodynamics is examined in detail in this catalogue **3a Refrigeration and air conditioning technology**.



- 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

## What can GUNT do for you?

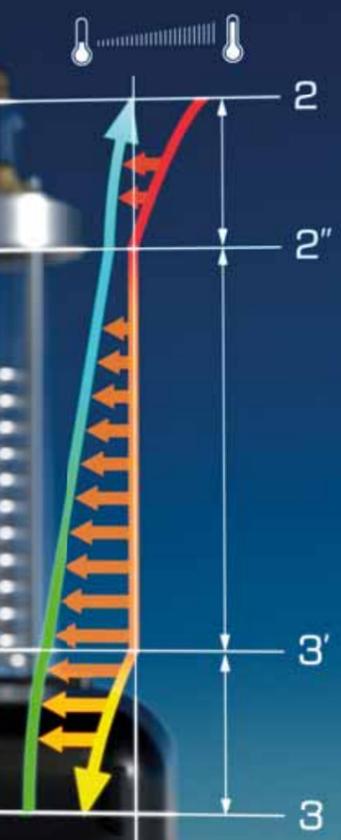
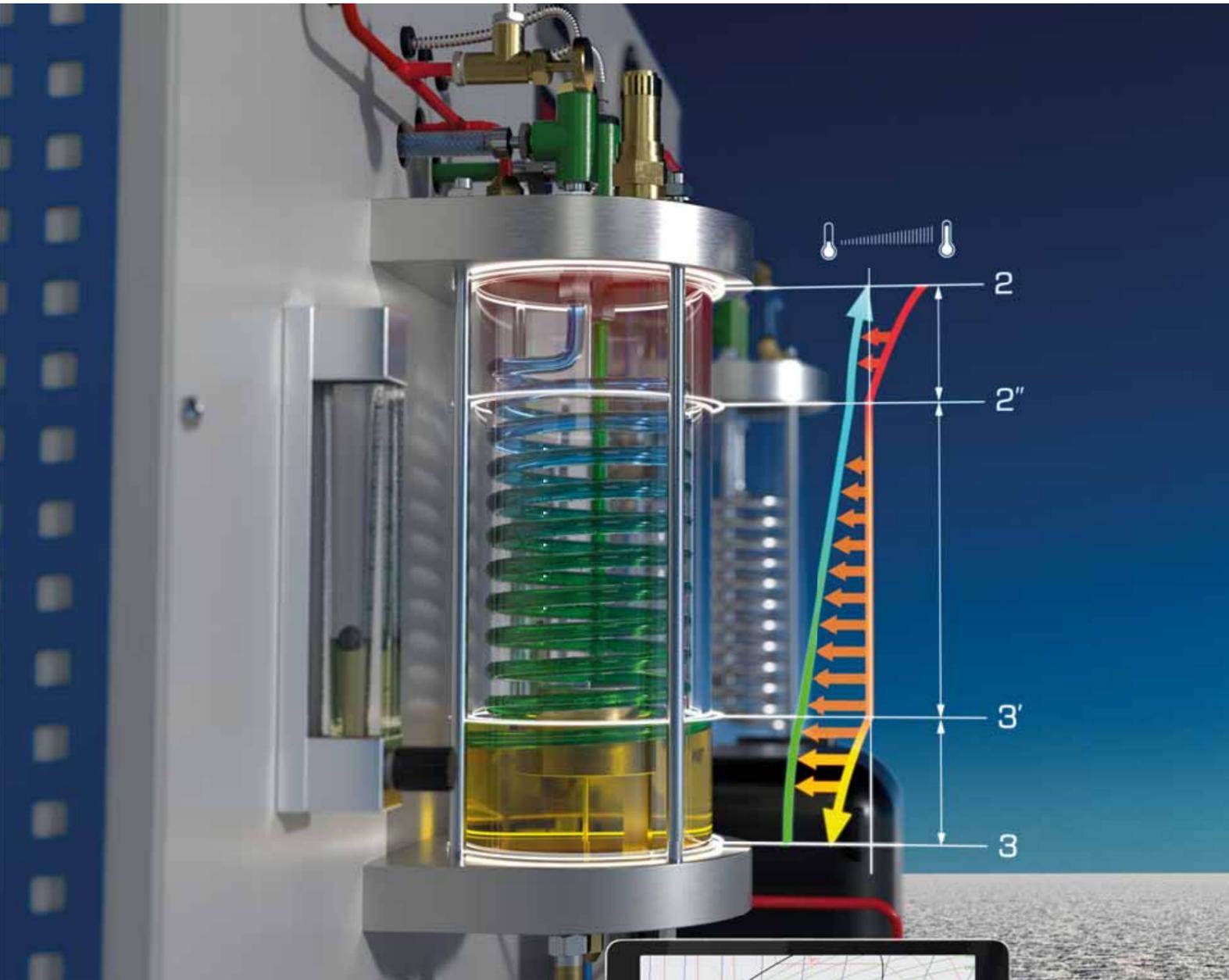
In view of the growing demands in terms of the energy efficiency of refrigeration and air conditioning systems, the more complex regulations and new system concepts, it is essential that prospective engineers and skilled workers acquire in-depth knowledge. GUNT develops products and solutions to aid your teaching. Our range of educational products is characterised by a practical focus and high standards of quality.

We offer 'Made in Germany' engineering education with over 40 years of experience. Our complete systems are perfectly matched to each other and can be used quickly and effectively in lessons or studies.



We plan, develop and manufacture stand-alone devices, modular training systems and complete specialist laboratories. We offer training on our products to users as well as experiment-based training sessions – at your site or at our Technical Academy. **Our knowledge takes you further!**

# GUNT training systems



GUNT offers a complete range of products for all aspects of refrigeration and air conditioning technology. The training systems are suitable both for vocational training as a refrigeration mechatronics technician and for engineering education.

Practical exercises	Scientific investigations
<ul style="list-style-type: none"> <li>■ assemble</li> <li>■ adjust</li> <li>■ test</li> <li>■ replace</li> </ul>	<ul style="list-style-type: none"> <li>■ thermodynamic inter-relationships</li> <li>■ observations in the cyclic process</li> <li>■ energy balances and energy efficiency</li> <li>■ efficiency</li> </ul>

The overall didactic concept from a single provider consists of:

- experimental unit
- measuring technology
- coordinated software
- instructional material
  - ▶ theoretical background
  - ▶ detailed experiment instructions
  - ▶ worksheets for trainees
  - ▶ solutions and hints for the teacher
  - ▶ educational software

See the outstanding quality of our devices for yourself. We look forward to welcoming you to our Technical Academy.

### Let's invest in the future together

European Regulation 517/2014 on fluorinated greenhouse gases has already come into force and sets high standards in terms of the responsible use of these refrigerants.

Refrigerants are evaluated on the basis of the relative global warming potential (GWP). This GWP value of a substance indicates the factor by which this substance contributes to global warming in comparison to CO<sub>2</sub>. Accordingly, CO<sub>2</sub> has a GWP of 1. The CO<sub>2</sub> equivalent is calculated as follows:

**CO<sub>2</sub> equivalent = GWP x refrigerant fill volume**

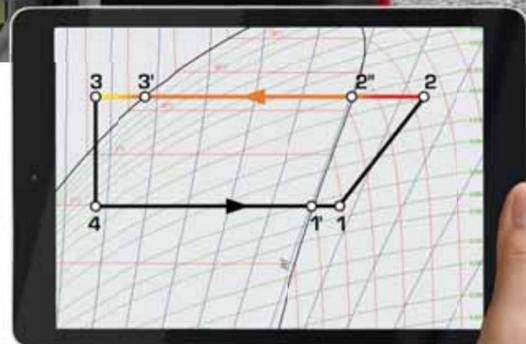
In the area of teaching especially, we see it as our duty to teach young people how to use resources responsibly. We are using the new regulations as an opportunity to contribute to combating global warming. The environmentally friendly concept behind our devices relieves you from various regulatory obligations incumbent upon operators.

All of our devices are designed so that they do not exceed a CO<sub>2</sub> equivalent of 5t. As such, our devices:

- are not affected by leak checks pursuant to article 4(1) of the Regulation,
- are exempt from the obligation to keep records pursuant to article 6(1) and
- do not require certificates for purchase and operation in almost all cases.

We make the complex changes of state in the otherwise closed piping systems of refrigeration and air conditioning systems visible and tangible. Operational changes are measured and displayed dynamically in the chart in real time.

Our devices combine the most effective methods of active and passive learning. The effective and long-lasting learning of thermodynamic formulas and their dependencies has never been so easy!



# Training in refrigeration and air conditioning technology with GUNT training systems

The skilled occupation of mechatronics technician for refrigeration is a particularly demanding profession due to the diversity of the scientific fundamentals required. Besides technical skills, it is also essential to be able to work with computers and evaluate and interpret measurement

data. The mechatronics engineer for refrigeration deals with the planning, calculation, installation, maintenance, repair and servicing of complex refrigerating plants as well as air conditioning systems and heat pumps. After installation, he checks the functionality of the system,

starts it up and instructs the customer how to use it.

## Subject areas for training as a mechatronics engineer for refrigeration

Refrigeration	Air conditioning technology	Electrical engineering in refrigeration and air conditioning technology
Functional interrelationships in the refrigeration circuit	Investigation of the states of the air	Principles of electrical engineering
Production of mechanical subsystems	Basic interrelationships in ventilation and room air conditioning	Consumers of single phase alternating current
Thermodynamics, log p-h diagram	Construction elements and function of the air conditioning system	Protection against electrical hazards
Refrigerants and lubrication oils	Air conditioning, h-x diagram	Simple refrigeration controls
Primary and secondary controllers	Air circuit in the ductwork	Consumers of three phase alternating current
Heat exchangers	Fire protection measures	Electrical drives and fault finding
Compressors	Energy saving	Control of refrigeration systems
Piping		Building automation
Troubleshooting, maintenance and disposal		

= covered by GUNT units

## Structure of the catalogue

The catalogue is divided into the three main areas of **refrigeration, air conditioning technology** and **electrical engineering in refrigeration and air conditioning technology**. Informative pages containing basic knowledge precede the sub-chapters

and explain the technical and physical context in an easy to comprehend manner. This allows for an easy introduction to the respective subject matter of the catalogue.

	<b>Refrigeration</b>	Principles of cold production
		Training systems
		Thermodynamics of the refrigeration cycle
		Components of refrigeration also assembly, troubleshooting, maintenance
		Heat pumps and ice store
		Solar cooling
	<b>Air conditioning technology</b>	States of the air
		Principles of air conditioning technology
		Practical air conditioning systems
		Ventilation technology
	<b>Electrical engineering in refrigeration and air conditioning technology</b>	Refrigeration controls
		Control of refrigeration systems
		Finding electrical faults

mainly with experimental orientation

mainly with technical orientation

