GUNT Cold Play

game-based learning for a successful learning experience

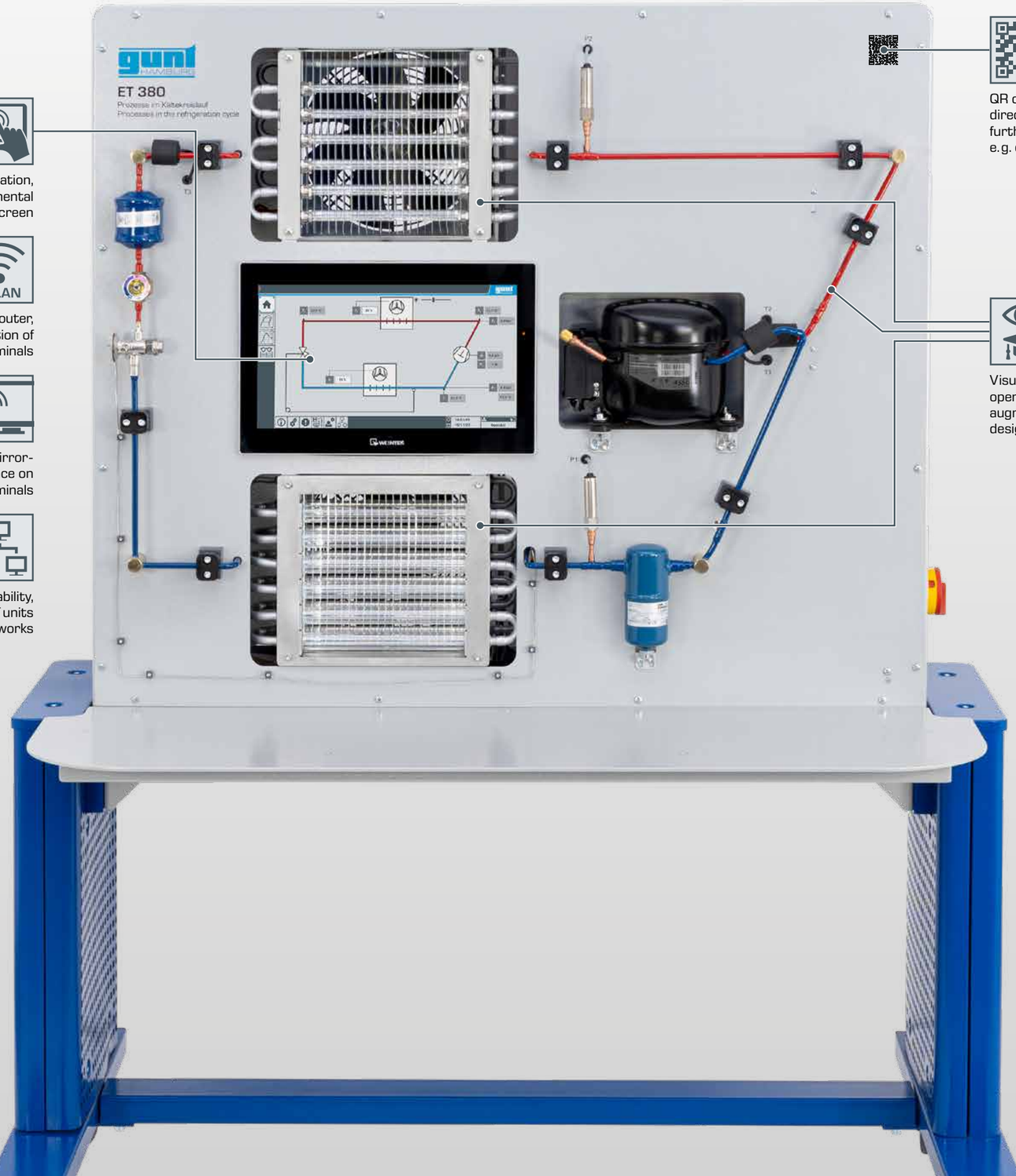
Refrigeration and air conditioning technology

Intuitive operation, control of the experimental units via touch screen

Integrated router, connection of mobile terminals

Screen mirroring, mirroring of the user interface on additional terminals

Network capability, integration of GUNT units into existing networks



QR codes on the device, direct access to further digital information, e.g. data sheets

Visual learning, transparent or openly designed components, augmented reality, didactically designed front panels

Table of contents

Learn complex topics in a simple and playful way	04
Learning with cognitive assistance systems	06
The GUNT Science Media Center	08
Thermodynamics of the refrigeration cycle with ET 380	10
Fundamentals of refrigeration with ET 350	12
Principles of cold production with ET 360	12
Components of refrigeration with ET 432	12
Fundamentals of air conditioning with ET 620	14

Equipped with smart features, it enables flexible lesson planning for small groups or entire classes:

- integration into the existing network
- screen mirroring of the user interface
- access to measured values via WLAN/LAN

MEDIA center

GUNT's web-based platform, access to digital media such as drawings, videos, exercises

E learn

E-Learning courses, extensive multimedia teaching material such as videos, explanations

AR

Augmented reality, real GUNT devices virtually connected with animations, additional information

Interactive teaching that makes learning more fun and secures the acquired knowledge in the long term

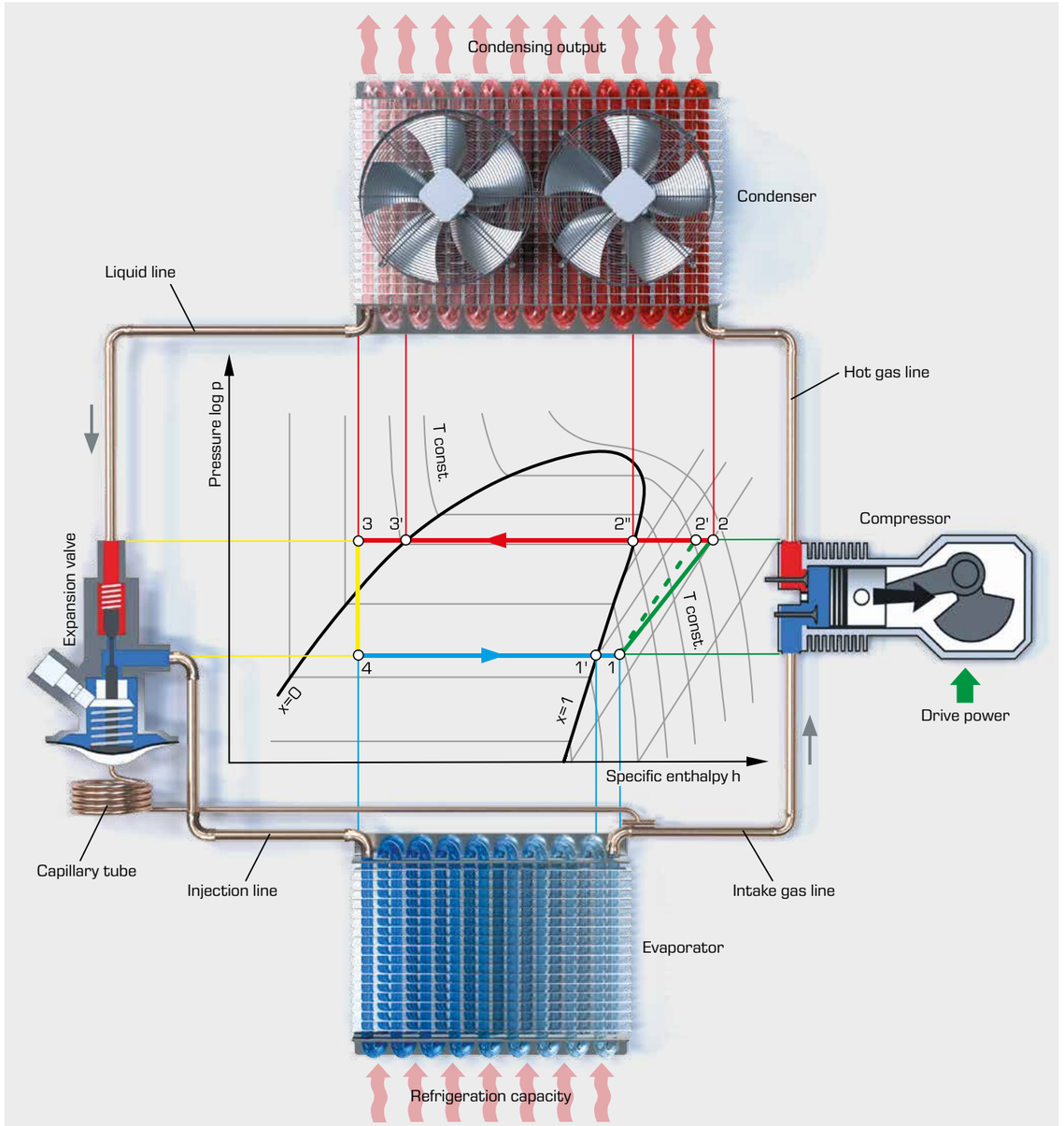
From teaching to learning
with game-based learning to kindle the desire to play and increase motivation to learn.

Our concept of hardware and digital features for gamified learning:

- combination of simulation and real-world conditions
- run competitions with our online accessible media
- solve assessments and tasks online
- videos, animations and augmented reality experiences that enable visual learning and intuitive, playful use of the equipment

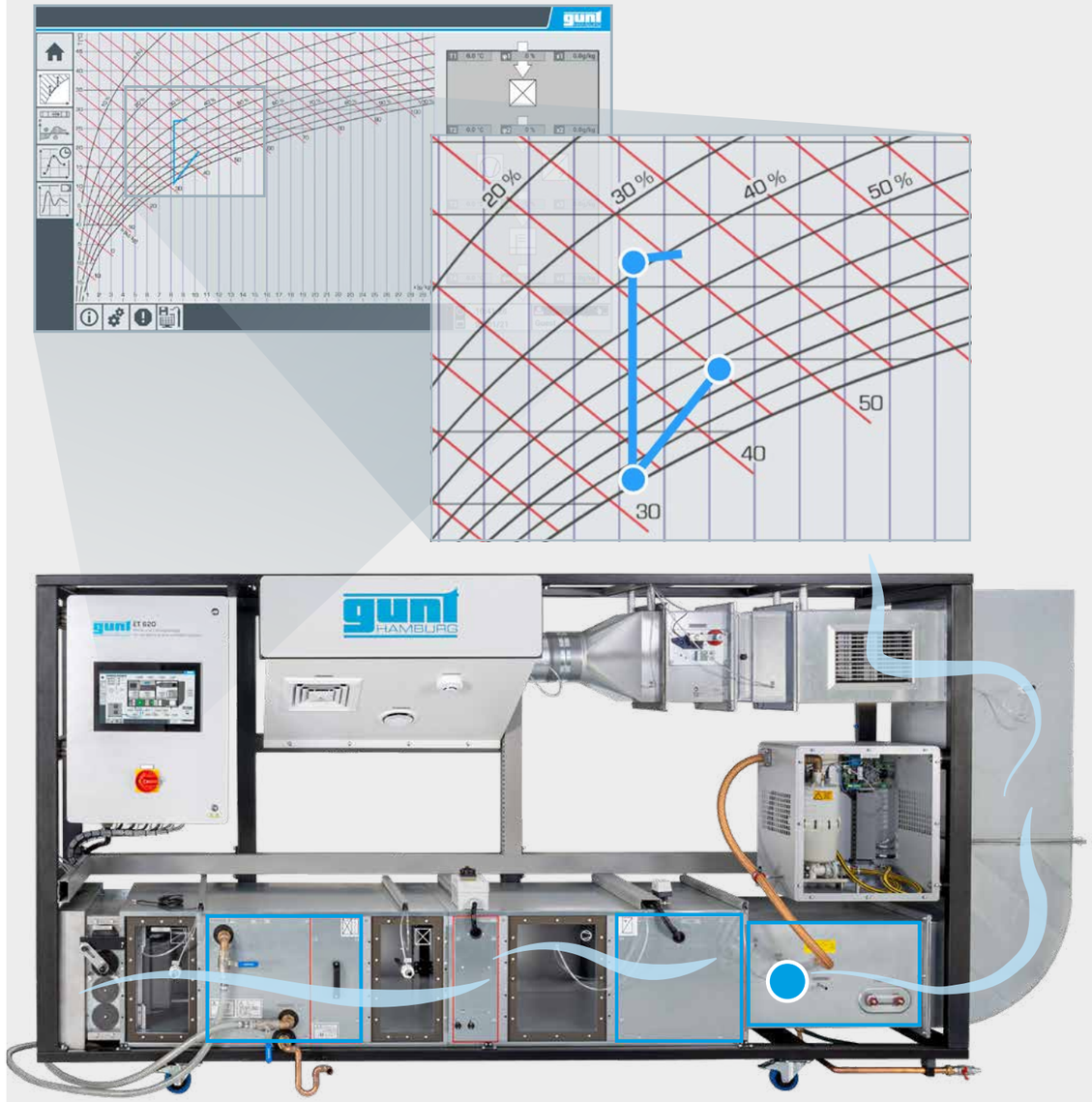
Learn complex topics in a simple and playful way

Refrigeration cycle in the log p-h diagram



In refrigeration engineering, the state variables such as pressure, temperature and density are important as is the dependence of these state variables on each other. Using a log p-h diagram, the various state variables can be represented graphically according to their dependencies. Using the log p-h diagram greatly simplifies thermodynamic calculations and is essential for understanding how refrigerating plants work.

Air conditioning in the h-x diagram



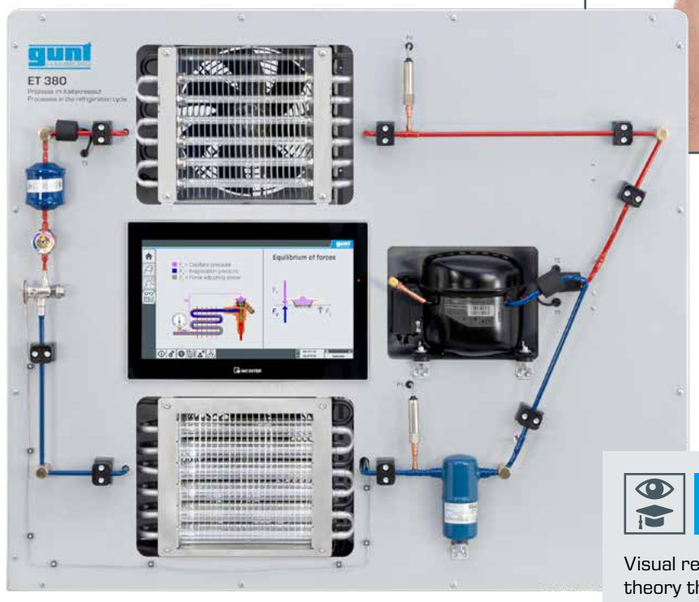
Air conditioning means affecting the condition of the room air in such a way that people feel comfortable and their capacity is not impaired. The condition of the air is characterised by temperature, pressure and humidity. The basic processes of air conditioning can be represented in the h-x diagram.

Learning with cognitive assistance systems

Intuitive handling of technology

Intuitive handling of technology leads to a better understanding of the complex theory:

- suitable human-machine interfaces, e.g. PLC with touch screen
- intuitive experimentation
- the simple operation
- the detailed animations and explanations of the main components



Augmented reality

The playful interaction with complex systems, components and functions teaches new knowledge and skills in less time.

- learning through experience and observation
- finding information quickly

Visual learning

Visual representation of complex theory that is otherwise invisible and can only be understood through calculation:

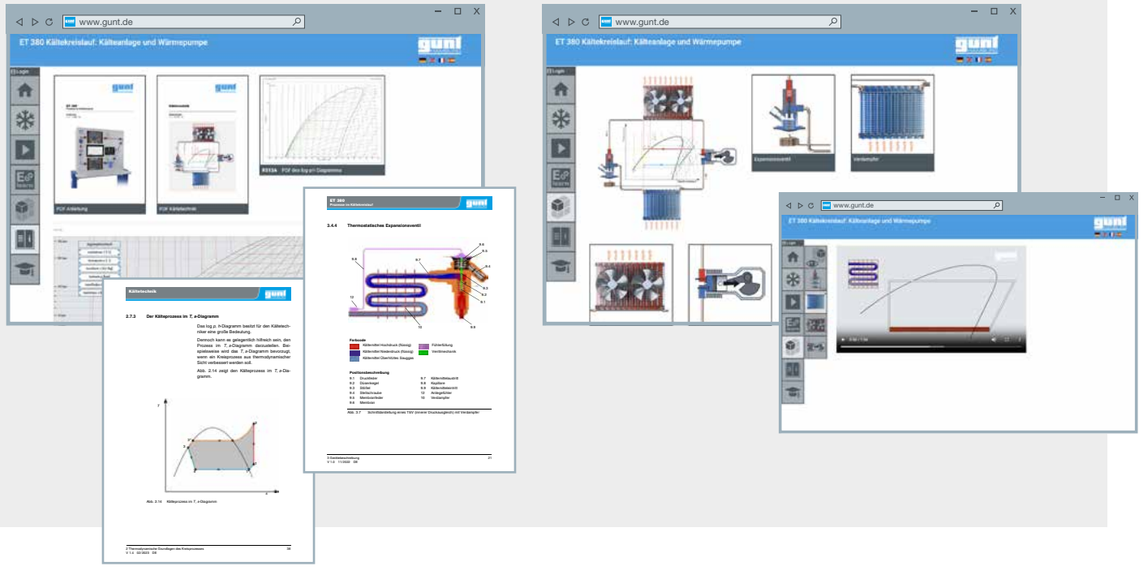
- visible phase transitions
- transparent condensers and evaporators

Interactive teaching

- increase motivation to learn: Learning can be fun!
- interactivity and direct influence on the training environment
- intuitive approach and trying things out
- acquired knowledge is retained in the long term

The GUNT Science Media Center

Basic knowledge and work materials



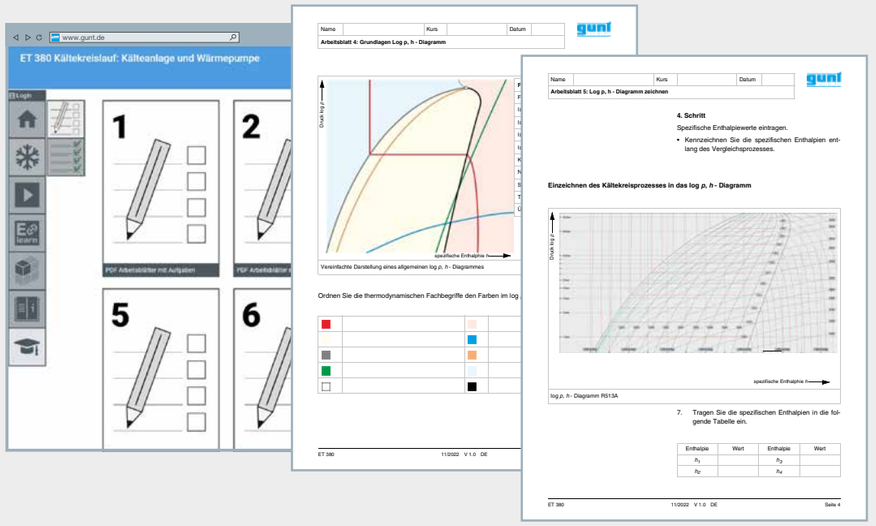
SCIENCE

GUNT Media Center
on the Web

Digital data packages are available on GUNT's own platform:

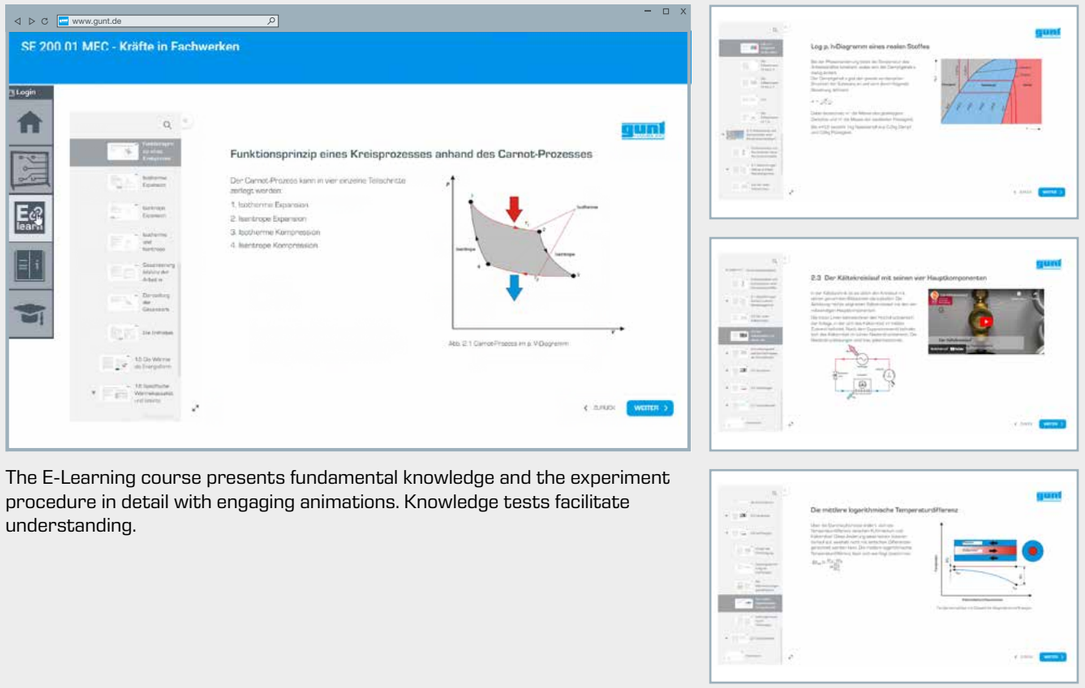
- quick and focused acquisition of information
- selected according to didactic criteria
- helpful in the development of digital skills
- traditional learning content supplemented by digital content and methods

Digital worksheets



Digital worksheets are available for the individual experiments. Access to solutions is password protected.

The E-Learning course



The E-Learning course presents fundamental knowledge and the experiment procedure in detail with engaging animations. Knowledge tests facilitate understanding.

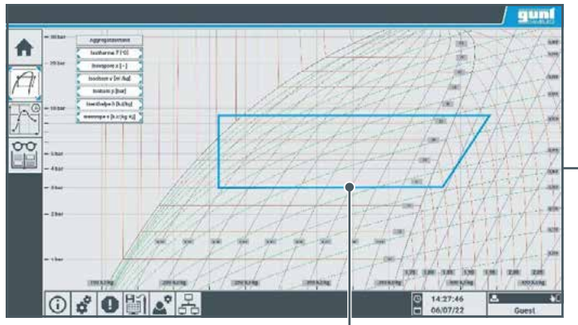
Thermodynamics of the refrigeration cycle

ET 380 Refrigeration cycle: refrigeration plant and heat pump

In **refrigeration plants**, the cooling effects are used for cooling. If the heat system is used to produce heat, this is known as a **heat pump**. The trainer provides an insight into the process of phase change and creates a didactic bridge to the theoretical comparative process, the log p-h diagram.

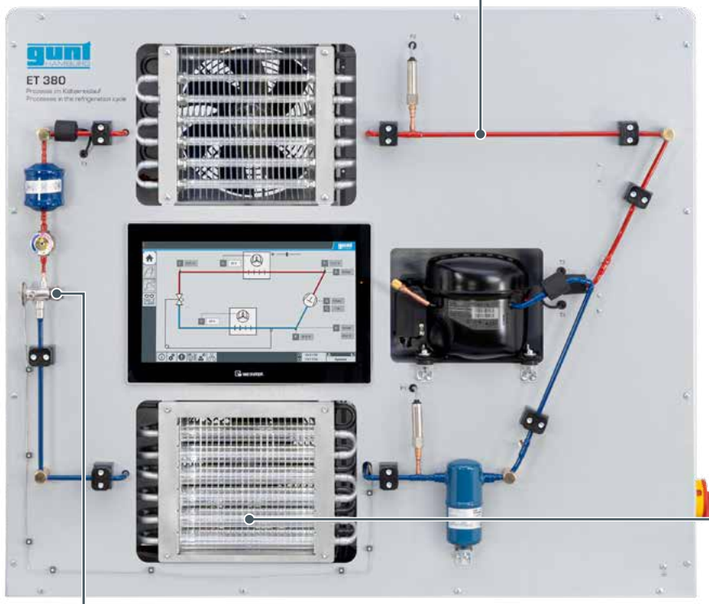
Learning objectives

- load dependency of a refrigerating plant
- represent and understand the refrigeration cycle in the log p-h diagram
- energy balances
- determine the coefficient of performance
- oil transport in the gas phase
- superheating and supercooling
- function of a piston compressor



Changes of state are visualised by real time representation of the cycle in the log p-h diagram.

About the product



The cycle is reflected in the piping and in the touch screen

Feeling and learning

Heat and cold are the perceptible result of the device setting, well felt in the case of the iced expansion valve. Experienced changes of state in the refrigeration circuit are internalised.

Evaporator with flowing refrigerant

Features

- visible phase transitions in evaporator and condenser
- log p-h diagram in real time
- dynamic display of the refrigerant mass flow

The transfer of all relevant measured values to a PLC enables easy evaluation and the display of the process in the log p-h diagram in real time.

Refrigerant: R513A, GWP: 631,
fill quantity: 1,25 kg, CO_2 equivalent: 0.8 t,
security: DIN EN 378: A1

GUNT devices for refrigeration

Fundamentals of refrigeration and augmented reality experiences

About the product

ET 350 Changes of state in the refrigeration circuit

- representing and understanding the refrigeration cycle in the log p-h diagram
- real time log p-h diagram
- transparent components offer insights into the changes of state
- function of the expansion valve is clearly visible
- aggregate state of the refrigerant visible in the sight glass
- augmented reality for visualisation of processes and components

Learning objectives

- observe the evaporation and condensation of the refrigerant
- represent and understand the refrigeration cycle in the log p-h diagram
- energy balances
- determine the coefficient of performance such as coefficient of performance, refrigeration capacity, compressor work

Principles of cold production

ET 360 Refrigeration circuit with propane

- natural, environmentally friendly refrigerant with a CO_2 equivalent of 0 tonnes
- investigate steady-state and transient load behaviour
- real time log p-h diagram
- visible phase transitions in evaporator and condenser

About the product

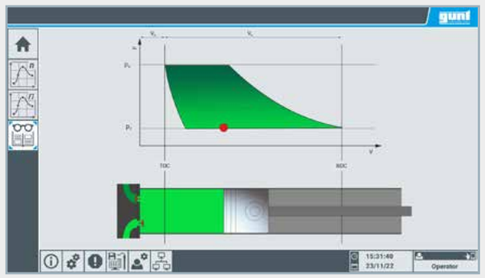
Feeling and learning

Evaporator in the cooling chamber with frozen condensate

Learning objectives

- represent and understand the refrigeration cycle in the log p-h diagram
- operating behaviour under load
- determine the coefficient of performance such as coefficient of performance, refrigeration capacity, compressor work

Components of refrigeration



ET 432 Piston compressor in refrigeration

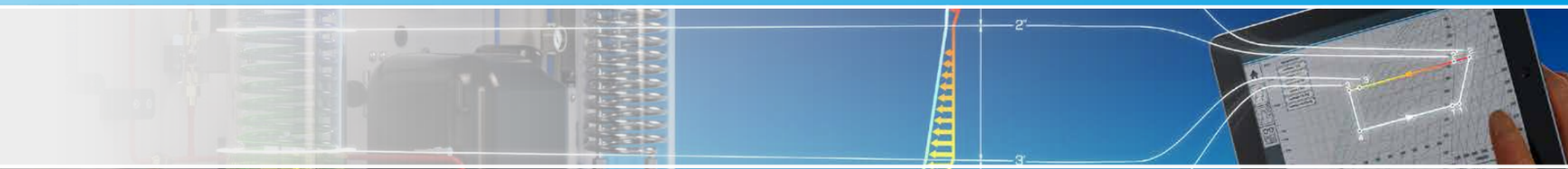
The compressor is – along with the condenser, evaporator and expansion valve – one of the four main components of a refrigeration system. Smaller refrigeration systems usually have a piston compressor. The flow rate for such compressors is a measure of the refrigeration capacity of the refrigeration system, so the characteristics of the compressor are important for the performance of the entire system.

Learning objectives

- determine characteristic variables of a piston compressor during experiments
- determination of the volumetric efficiency at different intake pressures, pressure ratios and speeds
- determination of the isothermal compressor capacity
- measurement of the mechanical and electrical power consumption in dependence of the high/low pressure and pressure ratio
- determination of the mechanical efficiency and the overall efficiency

About the product

GUNT devices for air conditioning



ET 620
Air conditioning and ventilation system with water chiller

- water chiller designed as a monobloc
- air-cooled condensing and hermetic scroll compressor
- microprocessor for control of limits and alarms

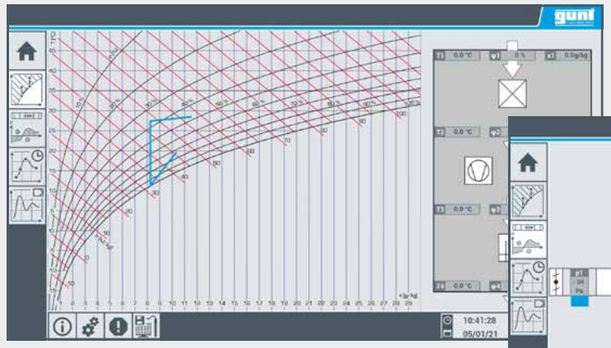
www
About the product

Fundamentals of air conditioning

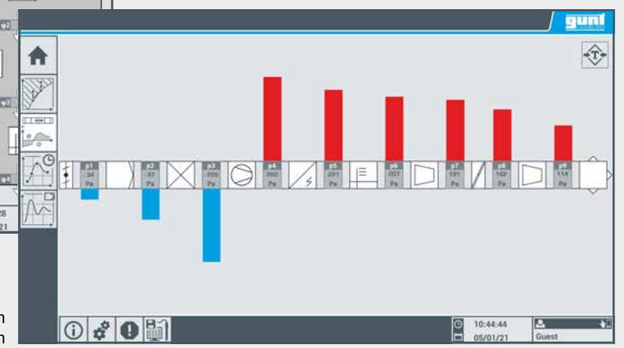
Unlike small systems that use conventional climate controllers, this experimental system is equipped with a modern building management system for control. This corresponds to the state of the art for large air-conditioning systems and is advantageous when presenting complex learning content.

Learning objectives

- practice-oriented principles of air conditioning and ventilation technology
- design and maintenance of an air conditioning and ventilation system
- principles of room air conditioning (h-x diagram)
- explanation of components: filter, air heater, air cooler, humidifier, condensing unit, PLC, flaps, outlets
- function of safety devices
- measurement of pressure curve and pressure losses
- effect of air cooler, air heater and humidifier on the state of the air at the outlet
- investigation of the control behaviour of an automatic air conditioning controller, determination of limiting factors



Real time display of state changes in the h, x-diagram



Pressure distribution in the system

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