



Equipment for engineering education

Entire programme 2026



Innovative sustainable efficient

The complete GUNT programme with more than 700 devices from all programme areas



PDF version of the catalogue



GUNT Quality Made in Germany

Our excellent product quality, high productivity and extensive know-how means that GUNT is making a significant contribution worldwide in technology education.

At our headquarters in Barsbüttel, near Hamburg 150 highly qualified employees work in a 10,000 m² production and office space. From development and design to production and shipping, everything is located under one roof.

Germany is recognized for its excellent structure for education in technical professions and in engineering. Since 1979 our motto has been:

From Germany to anywhere in the world

Visit our website: www.gunt.de

Imprint

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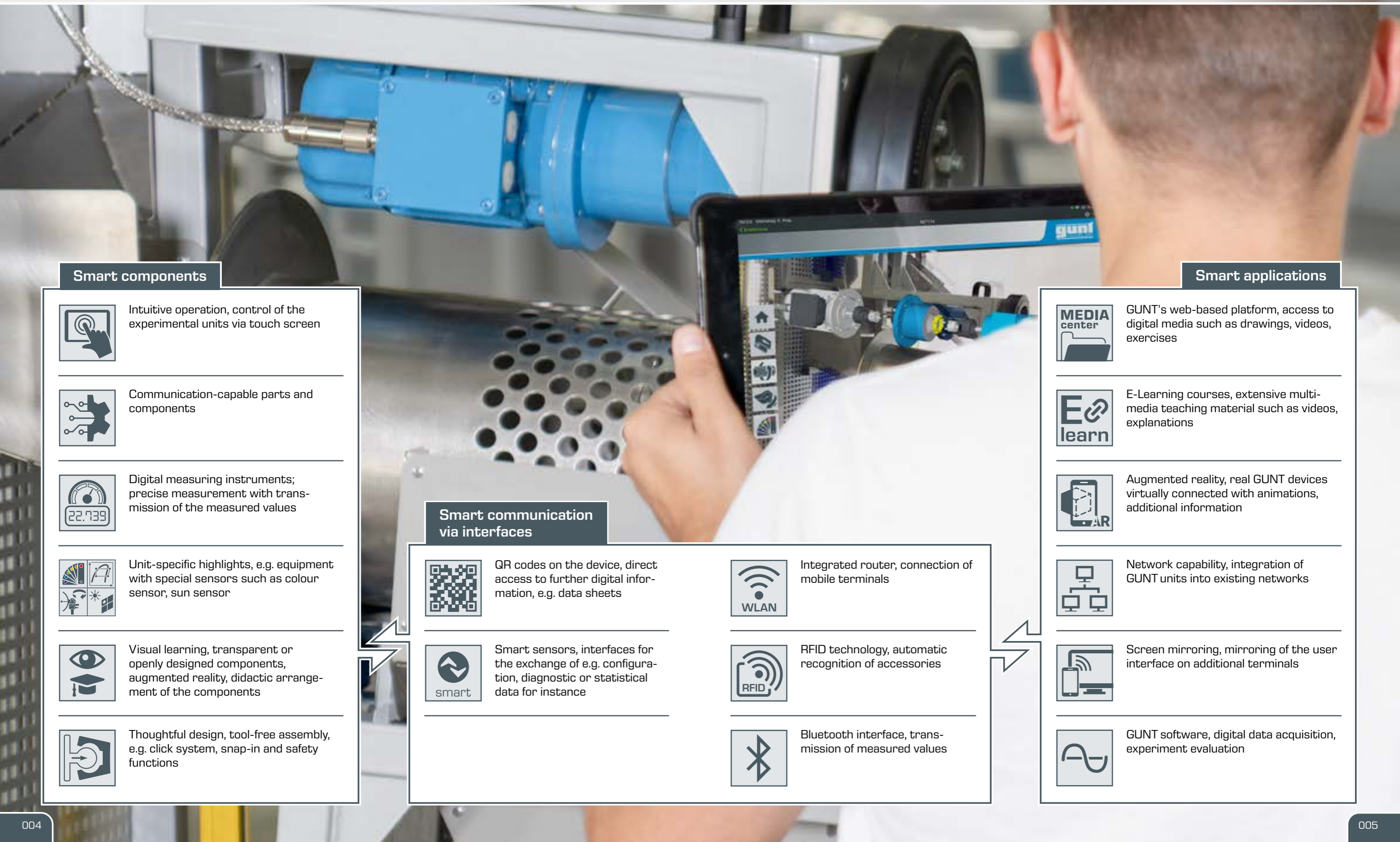
Design & typesetting:
G.U.N.T. Gerätebau GmbH.

1	Engineering mechanics and engineering design	006
2	Mechatronics	042
3	Thermal engineering Refrigeration HVAC	086 104 120
4	Fluid mechanics Fluid machinery Hydraulics for civil engineering	138 172 206
5	Process engineering	222
6	2E Energy 2E Environment	248 276

Hands-on teaching engineering – with GUNT's SMART features



Digitisation of traditional learning content



Smart components



Intuitive operation, control of the experimental units via touch screen



Communication-capable parts and components



Digital measuring instruments; precise measurement with transmission of the measured values



Unit-specific highlights, e.g. equipment with special sensors such as colour sensor, sun sensor



Visual learning, transparent or openly designed components, augmented reality, didactic arrangement of the components



Thoughtful design, tool-free assembly, e.g. click system, snap-in and safety functions

Smart applications



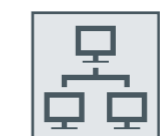
GUNT's web-based platform, access to digital media such as drawings, videos, exercises



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



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



Network capability, integration of GUNT units into existing networks



Screen mirroring, mirroring of the user interface on additional terminals



GUNT software, digital data acquisition, experiment evaluation

Smart communication via interfaces



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



Integrated router, connection of mobile terminals



Smart sensors, interfaces for the exchange of e.g. configuration, diagnostic or statistical data for instance



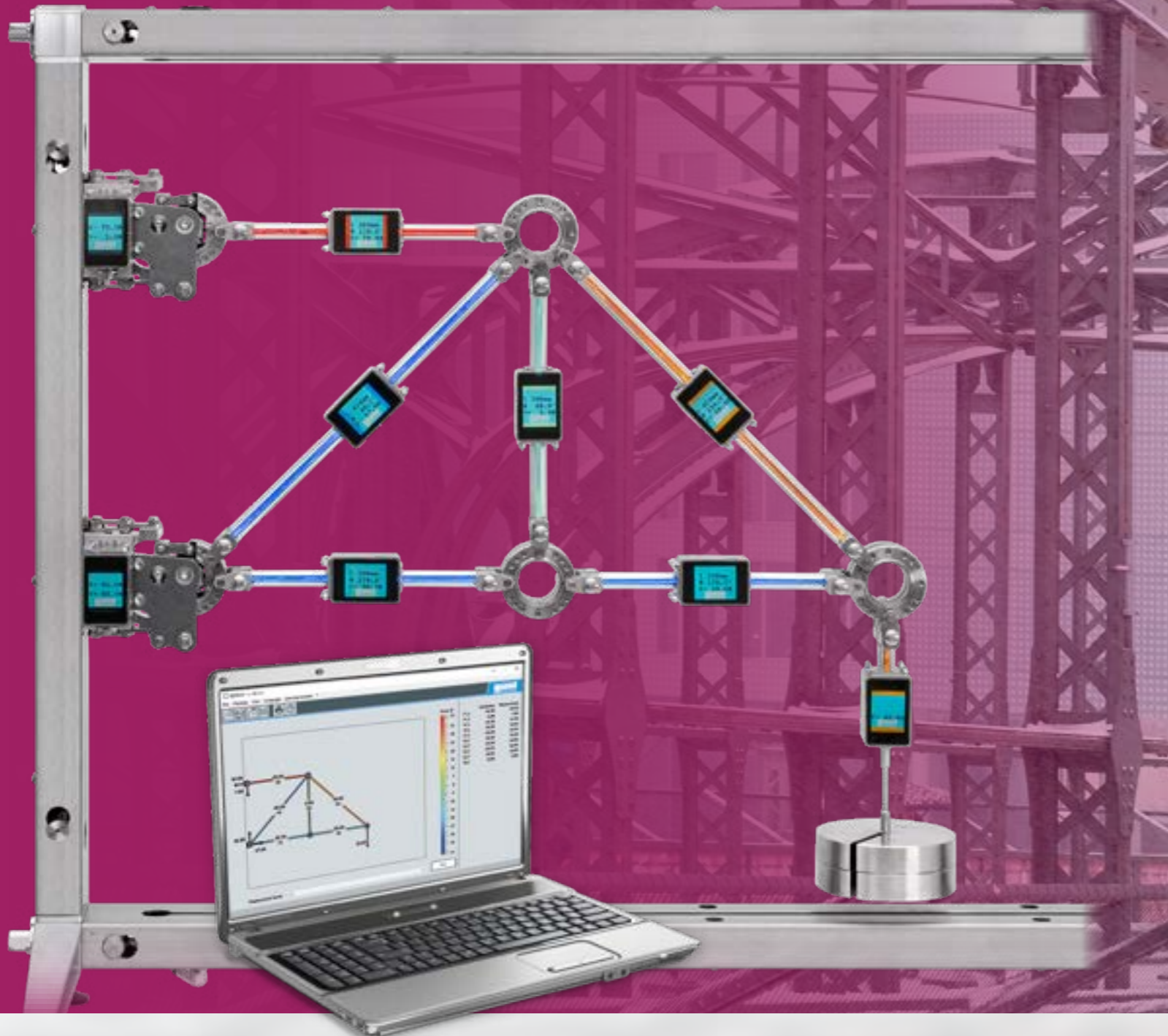
RFID technology, automatic recognition of accessories



Bluetooth interface, transmission of measured values

MEC Line – Statics and strength of materials

with GUNT's SMART features



1 | Engineering mechanics and engineering design



Engineering mechanics – statics

Forces and moments	008
Bridges, beams, arches, cables	009
Internal reactions and methods of section	011
Forces in a truss	012
Static and kinetic friction	013



Engineering mechanics – strength of materials

Elastic deformations	014
Buckling and stability	018
Compound stress	019
Experimental stress and strain analysis	019



Engineering mechanics – dynamics

Kinematics	021
Kinetics: basic experiments on dynamics and moment of inertia	022
Kinetics: dynamics of rotation	023
Vibrations	024



Machine dynamics

Vibrations in machines	025
Rotor dynamics	025
Balancing	026
Mass forces and mass balance	026
Vibration isolation	027
Machinery diagnosis	028



Engineering design

Engineering drawing	030
Cutaway models	031
Machine elements: fasteners	032
Machine elements: bearings	033
Machine elements: transmission elements	034
Assembly exercises	036



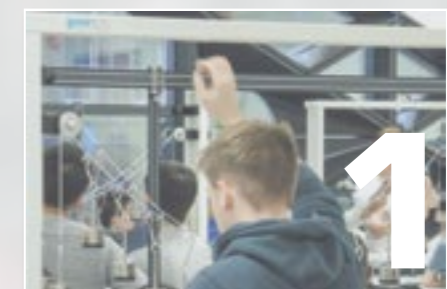
Materials testing

Tensile, compression, bending and hardness testing	038
Impact bending test	038
Torsional test	039
Fatigue of materials	039
Tribology and corrosion	040

About the product:



MEDIA center



Engineering mechanics and engineering design



Engineering mechanics – statics
Forces and moments

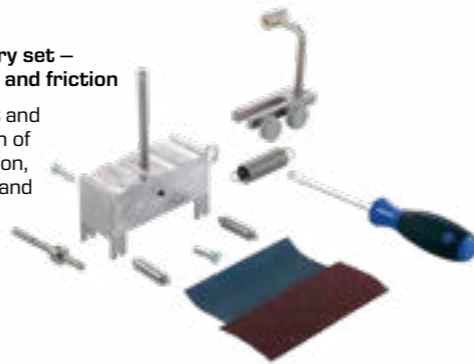
TM 110
Fundamentals of statics

Demonstration of force and moment equilibrium in a mechanical force system



TM 110.01
Supplementary set – inclined plane and friction

Measurement and demonstration of spring deflection, inclined plane and mechanical friction



TM 110.02
Supplementary set – pulley blocks

Construction and mode of operation of three different pulley blocks



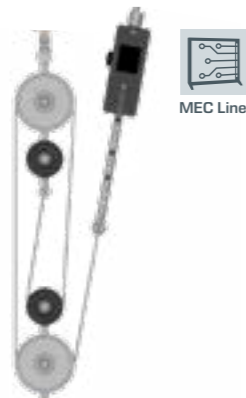
TM 110.03
Supplementary set – gear wheels

Mode of operation of single-stage and multistage toothed gear mechanisms



SE 200.05
MEC - Cable forces and pulley blocks

Construction and mode of operation of two different pulley blocks; 2 setup variants possible for each



For free
Multimedia instructional materials via Internet

SE 112
Mounting frame

Base unit for clear and simple set-up of experiments on statics, strength of materials and dynamics



TM 115
Forces in a crane jib

Graphical and experimental determination of forces in a planar central force system



SE 110.53
Equilibrium in a single plane, statically determinate system

Experimental investigation of the important principle of free vectors in statics
SE 112 Mounting frame required



TM 121
Equilibrium of moments on pulleys

Clear demonstration of the equilibrium of moments



TM 122
Equilibrium of moments on a differential pulley block

Equilibrium of forces and moments and the demonstration of the force reduction on a differential pulley block



FL 111
Forces in a simple bar structure

Resolution of forces in a simple bar structure



EM 049
Equilibrium of moments on a two-arm lever

Investigation of applied forces, generated moments and equilibrium



Engineering mechanics – statics
Bridges, beams, arches, cables

SE 110.18
Forces on a suspension bridge

Supporting cable force and demonstration of bending moments between the roadway support and supporting cables
SE 112 Mounting frame required



SE 200.02
MEC - Forces on a suspension bridge

Supporting cable force and demonstration of bending moments between the roadway support and supporting cables; experiments with rigid or flexible roadway



For free
Multimedia instructional materials via Internet

Engineering mechanics – statics
Bridges, beams, arches, cables

SE 110.12
Lines of influence on the Gerber beam

Using methods of section and conditions of equilibrium of statics to determine support forces



SE 112 Mounting frame required

SE 200.07
MEC - Gerber beam

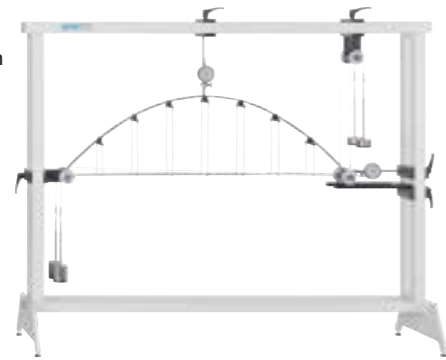
Method of section and conditions of equilibrium of statics to calculate the support forces for point load, line load and moving load



For free
Multimedia instructional materials via Internet

SE 110.16
Parabolic arch

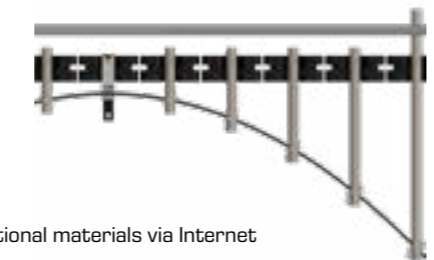
Differences between statically determinate and statically indeterminate arches under load



SE 112 Mounting frame required

SE 200.03
MEC - Parabolic arch bridge

Arched bridge with supporting arch below the roadway; differences between statically determinate and statically indeterminate arches under load



For free
Multimedia instructional materials via Internet

SE 110.17
Three-hinged arch

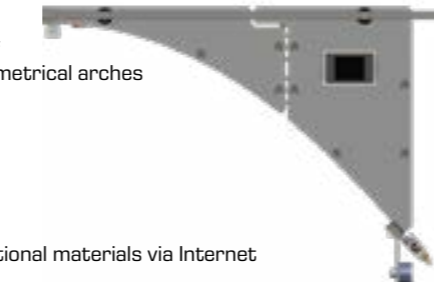
Symmetric and asymmetric arch subjected to point, line or moving loads



SE 112 Mounting frame required

SE 200.06
MEC - Three-hinged arch

Support forces of a three-hinged arch with different loads, partial arches for the construction of symmetrical/asymmetrical arches

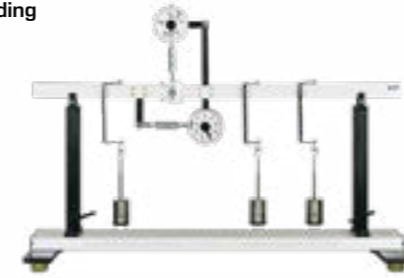


For free
Multimedia instructional materials via Internet

Engineering mechanics – statics
Internal reactions and methods of section

WP 960
Beam on two supports:
shear force & bending moment diagrams

Application of the method of sections to determine internal reactions of the beam



WP 961
Beam on two supports:
shear force diagram

Application of the method of sections to determine the shear force



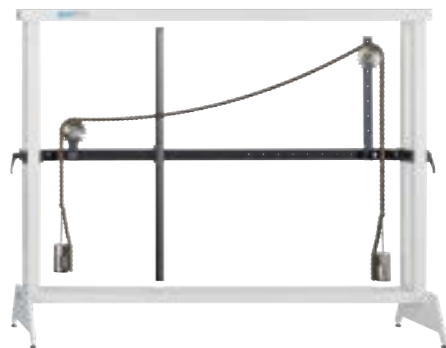
WP 962
Beam on two supports:
bending moment diagram

Application of the method of sections to determine the bending moment



SE 110.50
Cable under dead-weight

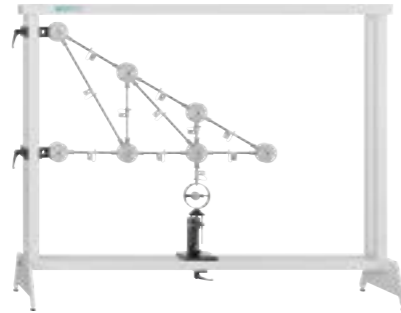
Catenary of a free-hanging cable under dead-weight
SE 112 Mounting frame required



Engineering mechanics – statics
Forces in a truss

SE 110.21
Forces in various single plane trusses

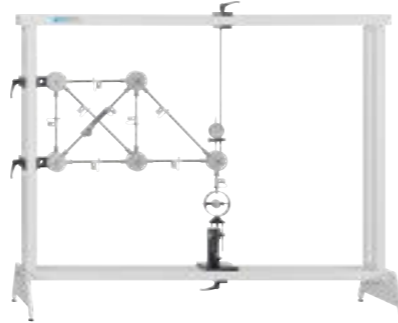
Using strain gauge technology to measure bar forces



SE 112 Mounting frame required

SE 110.22
Forces in an indeterminate truss

Comparison of forces in statically determinate and statically indeterminate trusses



SE 112 Mounting frame required

SE 200
MEC - Frame digital & smart

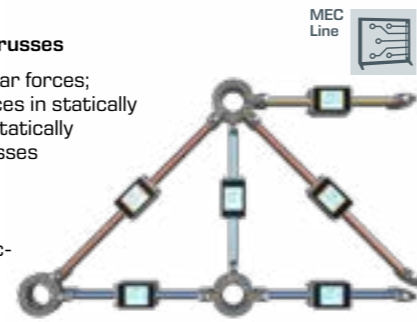
Mounting frame for set-up and digital connection, extensive experiments from engineering mechanics



SE 200.01
MEC - Forces in trusses

Measurement of bar forces; comparison of forces in statically determinate and statically indeterminate trusses

For free
Multimedia instructional materials via Internet



SE 130
Forces in a Howe truss

Investigation of bar forces under different load cases



SE 130.01
Truss beam: Warren girder

Bars with strain gauge full bridges to measure bar stress

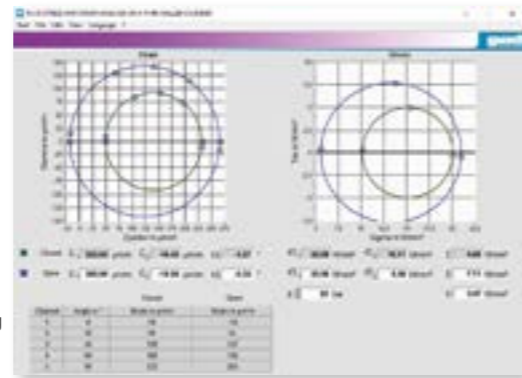


FL 152
Multi-channel measuring amplifier

Processing of analogue measuring signals for stress and strain analysis FL 120 – FL 140 and for GUNT trusses



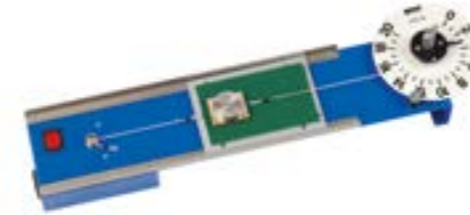
Analysis using the software in FL 152



Engineering mechanics – statics
Static and kinetic friction

TM 200
Fundamentals of mechanical friction

Stationary friction body, uniformly moving friction plate



TM 210
Dry friction

Force gauge with adjustable air damper to determine friction forces; slip/stick effect



TM 225
Friction on the inclined plane

Experiments to understand the fundamentals of mechanical friction on an inclined plane



TM 220
Belt drive and belt friction

Influence of the angle of contact, coefficient of friction and belt force (Eytelwein's belt friction formula)



SE 200.04
MEC - Friction on the inclined plane

Measurement of the coefficient of static and dynamic friction on an inclined plane, experiments with various material pairings

For free
Multimedia instructional materials via Internet

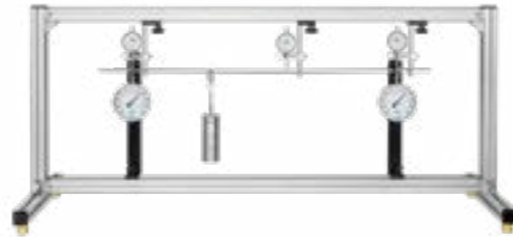


Engineering mechanics – strength of materials
Elastic deformations

SE 110.14
Elastic line of a beam
 Demonstration of Maxwell-Betti theorem
 SE 112 Mounting frame required



WP 950
Deformation of straight beams
 Elastic lines of statically determinate and indeterminate beams under various clamping conditions



FL 170
Deformation of curved-axis beams
 Principle of virtual forces (the force method) for calculating deformation



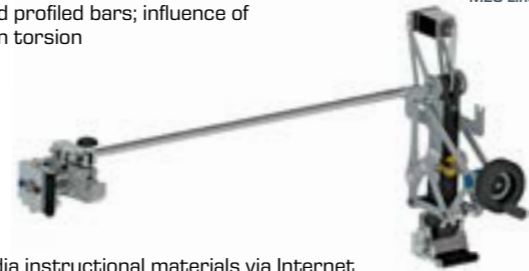
SE 110.44
Deformation of trusses
 Application of Castigliano's first theorem
 SE 112 Mounting frame required



SE 110.47
Methods to determine the elastic line
 Determination of elastic lines of a beam under load using the principle of virtual work and Mohr's Analogy
 SE 112 Mounting frame required



SE 200.10
MEC - Torsion of bars
 Fundamentals of elastic torsion on round bars, tubes and profiled bars; influence of rigidity on torsion



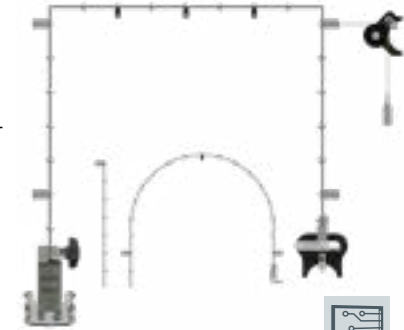
For free
 Multimedia instructional materials via Internet



SE 110.20
Deformation of frames
 Elastic deformation of a statically determinate or indeterminate frame under point load
 SE 112 Mounting frame required



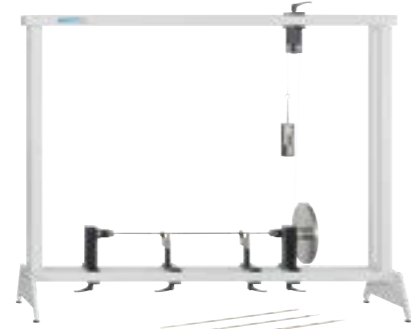
SE 200.09
MEC - Deformation of frames
 Deformation of material under load; elastic deformation of a statically indeterminate frame under point load



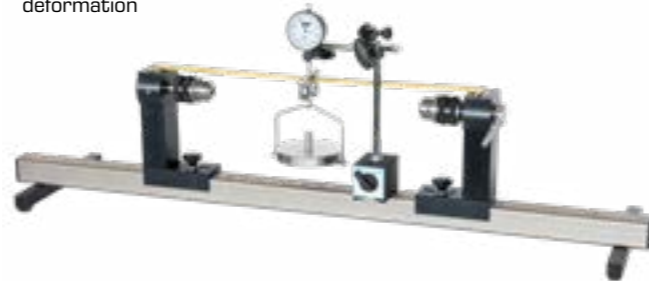
For free
 Multimedia instructional materials via Internet



SE 110.29
Torsion of bars
 Investigation of elastic torsion of bars with open and closed cross-section
 SE 112 Mounting frame required



WP 100
Deformation of bars under bending or torsion
 Influence of material, cross-section and clamping length on deformation



TM 262
Hertzian pressure
 Demonstration of the resulting characteristics of the contact area as a function of the contact force



TM 400
Hooke's law
 Elastic behaviour of tension springs under load



SE 200 - MEC Line
Experiments as accessories

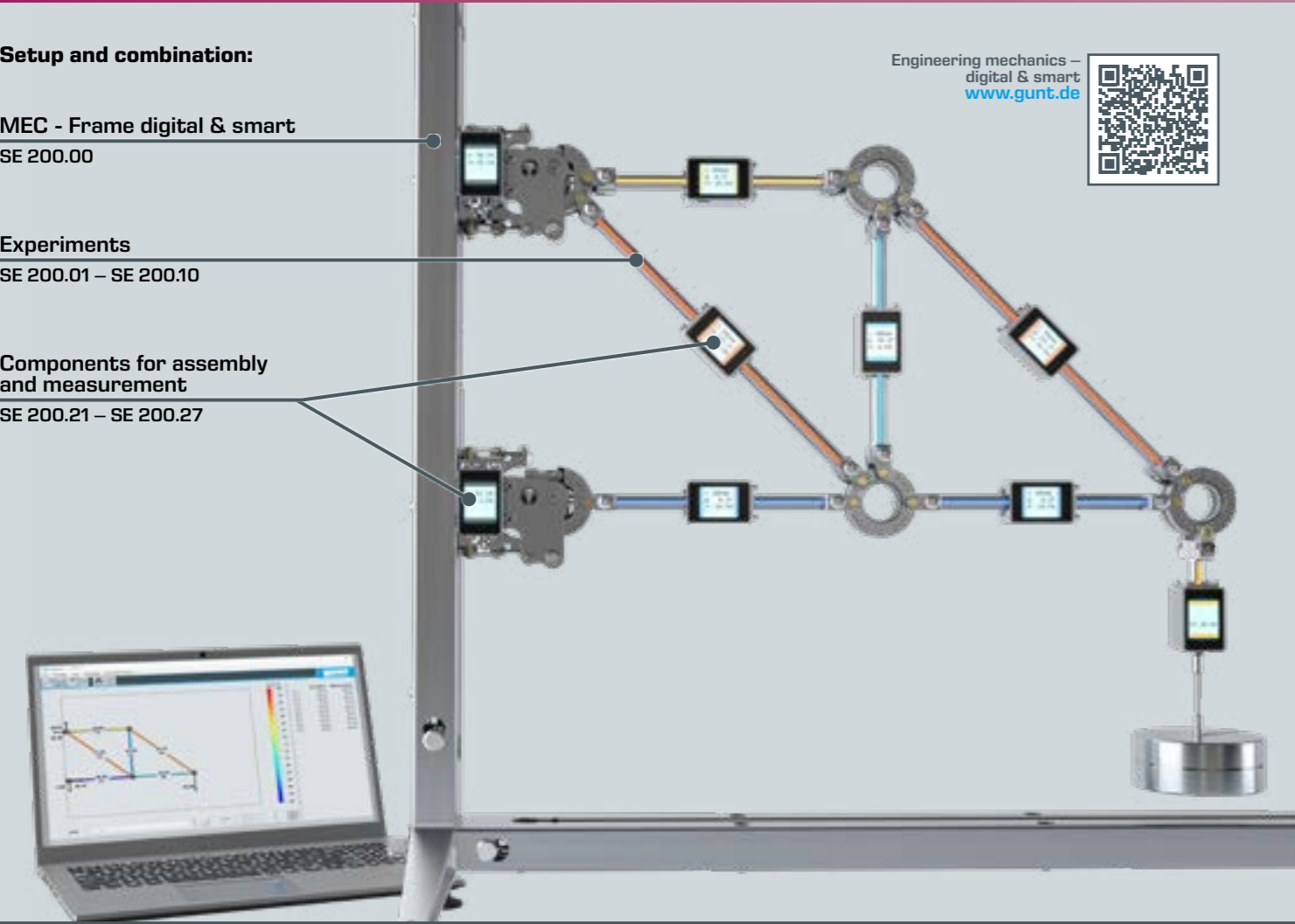
Setup and combination:

MEC - Frame digital & smart
SE 200.00

Experiments
SE 200.01 – SE 200.10

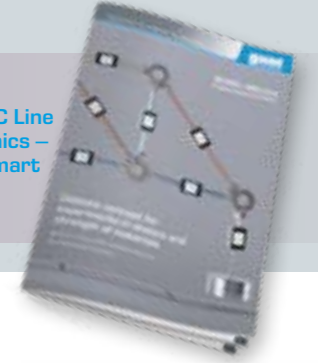
Components for assembly and measurement
SE 200.21 – SE 200.27

Engineering mechanics – digital & smart
www.gunt.de



Components for assembly and measurement as accessories

SE 200 | MEC Line
Engineering mechanics – digital & smart



SE 200.21
MEC - Support

Support with electronic module for data acquisition and measured value display; measurement of forces in x- and y-direction



For free
The GUNT Media Center provides extensive multimedia teaching material for the experiments.



SE 200.22
MEC - Load unit

Load unit with electronic module for data acquisition and measured value display; measurement of force and loading angle



SE 200.23
MEC - Distance measurement

Distance measurement with electronic module for data acquisition and measured value display; automatic transmission of the measurement direction



SE 200.24
MEC - Vertical load

Load with electronic module for data acquisition and measured value display; different weights to generate vertical loads



SE 200.25
MEC - Load

Loads with electronic module for data acquisition and measured value display; position detected via Gray code reader



SE 200.01
MEC - Forces in trusses

SE 200.02
MEC - Forces on a suspension bridge

SE 200.03
MEC - Parabolic arch bridge

SE 200.04
MEC - Friction on the inclined plane

SE 200.05
MEC - Cable forces and pulley blocks

SE 200.06
MEC - Three-hinged arch

SE 200.07
MEC - Gerber beam

SE 200.08
MEC - Buckling

SE 200.09
MEC - Deformation of frames

SE 200.10
MEC - Torsion of bars



All experiments including required accessories at a glance

SE 200.26
MEC - Line load

Line load with electronic module for data acquisition and measured value display; position detected via Gray code reader



SE 200.27
MEC - Bar set

Bars for constructing trusses, with electronic modules for data acquisition and measured value display; supplementing and expanding the scope of experiments in SE 200.01



Engineering mechanics – strength of materials
Buckling and stability

SE 110.19
Investigation of simple stability problems

Determination of the buckling load under different conditions
SE 112 Mounting frame required



WP 120
Buckling behaviour of bars

Verification of the Euler theory of buckling: influence of material, cross-section, length, and support



WP 121
Demonstration of Euler buckling

Correlation between buckling length, buckling load and various methods of support



SE 110.57
Buckling of bars

Determination of the buckling load: influence of material, support, and shear force
SE 112 Mounting frame required



SE 200.08
MEC - Buckling

Buckling behaviour under the influence of different supports, different cross-sections and different materials; verification of the Euler theory

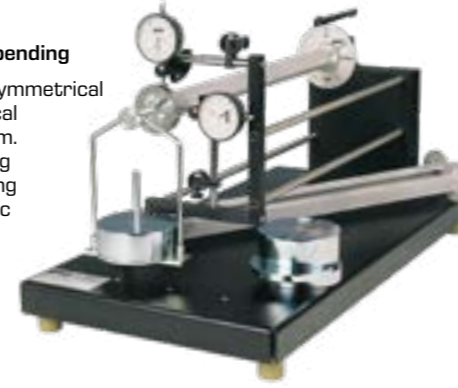


For free
Multimedia instructional materials via Internet

Engineering mechanics – strength of materials
Compound stress

FL 160
Unsymmetrical bending

Investigation of symmetrical and unsymmetrical bending on a beam. Combined bending and torsion loading using an eccentric force.



WP 130
Verification of stress hypotheses

Multiaxial loading of samples by bending and torsion



Engineering mechanics – strength of materials
Experimental stress and strain analysis

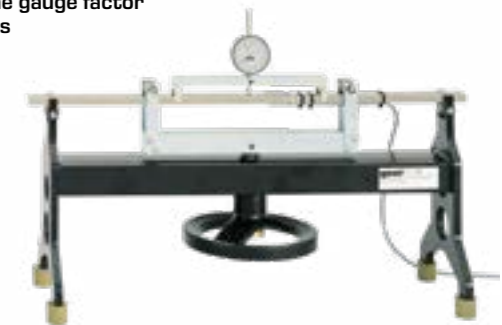
FL 100
Strain gauge training system

Basic introduction to measurement with strain gauges for tension, bending and torsion



FL 102
Determining the gauge factor of strain gauges

Calibration of a strain gauge: measurement of deflection and strain



FL 101
Strain gauge application set

Complete equipment for practising manual handling of strain gauge technology



Engineering mechanics – strength of materials
Experimental stress and strain analysis

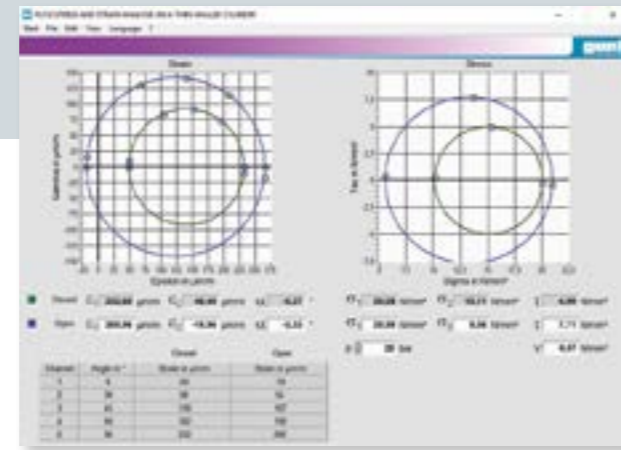
FL 120
Stress and strain analysis on a membrane
 Investigation of deflection and strain of a membrane under internal pressure; membrane with strain gauge application



FL 130
Stress and strain analysis on a thin-walled cylinder
 Investigation of axial and circumferential stress in a thin-walled cylinder under internal pressure



FL 140
Stress and strain analysis on a thick-walled cylinder
 Triaxial stress state in the cylinder wall; cylinder with strain gauge application on surface and in wall



FL 152
Multi-channel measuring amplifier
 Processing of analogue measuring signals for stress and strain analysis FL 120 – FL 140 and for GUNT trusses



FL 200
Photoelastic experiments with a transmission polariscope
 Visualisation of mechanical stresses in models subject to varying loads



FL 210
Photoelastic demonstration
 Representation of distribution of stress and stress concentrations in component models. Can be used in conjunction with an overhead projector.



Engineering mechanics – dynamics
Kinematics

KI 110
Kinematic model: crank mechanism
 Conversion of rotary motion into oscillating motion



KI 120
Kinematic model: crank slider
 Conversion of a uniform rotary motion into a pure harmonic reciprocating motion



KI 130
Kinematic model: four-joint link
 Conversion of rotary motion into oscillating motion



KI 140
Kinematic model: Whitworth quick return mechanism
 Uneven reciprocating motion with slow feed and quick return



KI 150
Kinematic model: Hooke's coupling
 Phenomenon of the gimbal error in Hooke's couplings and how to avoid it



KI 160
Kinematic model: Ackermann steering mechanism
 Determining the lead angle of a steering trapezoid



GL 105
Kinematic model: gear drive
 Investigation of transmission ratios on spur gear units



Engineering mechanics – dynamics
Kinetics: basic experiments on dynamics and moment of inertia

TM 610
 Rotational inertia
 Moments of inertia of different mass arrangements and bodies



TM 612
 Kinetic model: flywheel
 Experimental determination of the moment of mass inertia of a flywheel



TM 611
 Rolling disk on inclined plane
 Determining moment of inertia on rotating masses by rolling down an inclined plane and by performing a pendulum test



GL 210
 Dynamic behaviour of multistage spur gears
 Investigation of the dynamics of rotation of one-, two- and three-stage spur gear units



GL 212
 Dynamic behaviour of multistage planetary gears
 Investigation of rotational dynamics of a two-stage epicyclic gear with three planetary gears each; four different transmissions adjustable



Engineering mechanics – dynamics
Kinetics: dynamics of rotation

TM 600
 Centrifugal force
 Laws on the behaviour of centrifugal forces on rotating masses



TM 605
 Coriolis force
 Demonstration of the Coriolis force in rotating reference systems



TM 632
 Centrifugal governor
 Characteristic curves of different centrifugal force governors



TM 630
 Gyroscope
 Experimental verification of the laws of gyroscopes



Engineering mechanics – dynamics
Vibrations

TM 150
Vibration trainer

Experiments on damping, resonance and absorber effects in forced vibrations



SE 110.58
Free vibrations in a bending beam

Investigation of the free vibration of a bar and using the Rayleigh method to evaluate the natural frequency of a bar
SE 112 Mounting frame required



TM 161
Rod pendulum and thread pendulum

Comparison of physical and mathematical pendulum



TM 162
Bifilar/trifilar suspension of pendulums

Moments of inertia of different bodies in a rotary pendulum experiment



TM 163
Torsional vibrations

Determination of the oscillation period depending on torsion wire length, diameter and rotating mass



TM 164
Coil spring vibrations

Investigation of vibrations on a spiral spring rotating mass system



Machine dynamics
Vibrations in machines

TM 155
Free and forced vibrations

Basic experiments on mechanical vibration theory



TM 150.02
Free and damped torsional vibrations

Influence of mass, torsional rigidity and damping on the behaviour of a rotary oscillator. Vibrations are recorded on the TM 150 / TM 155 recorder.



TM 140
Free and forced torsional vibrations

Illustrative experiments on a torsion test bar with varying masses; multiple mass oscillator



HM 159.11
Ship vibration apparatus

Dynamic behaviour of a ship structure; experiments in air and in water



Machine dynamics
Rotor dynamics

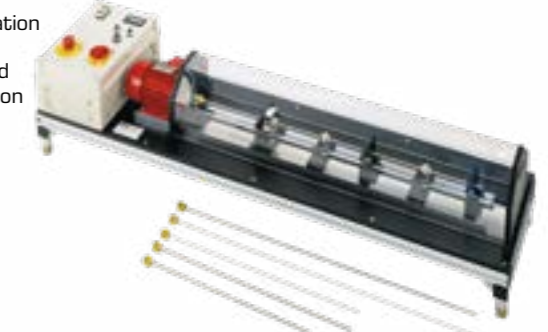
TM 620
Bending elasticity in rotors

Investigation of bending vibrations and resonance of a rotating shaft



TM 625
Elastic shafts

Determination of critical speeds and investigation of natural modes of a shaft



Machine dynamics
Balancing

TM 170
Balancing apparatus
Demonstration of the fundamentals of static and dynamic balancing



PT 502
Field balancing
Measurement of imbalance vibrations

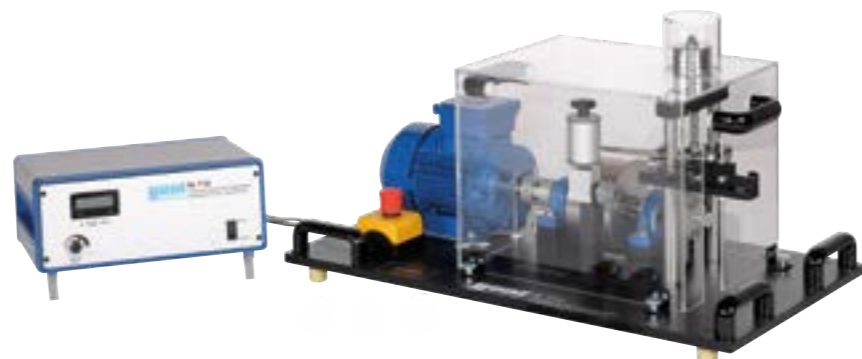


Machine dynamics
Mass forces and mass balance

TM 180
Forces in reciprocating engines
Investigation of mass forces on a reciprocating piston machine



GL 112
Investigation of cam mechanisms
Comparison of different cam members; recording elevation curves

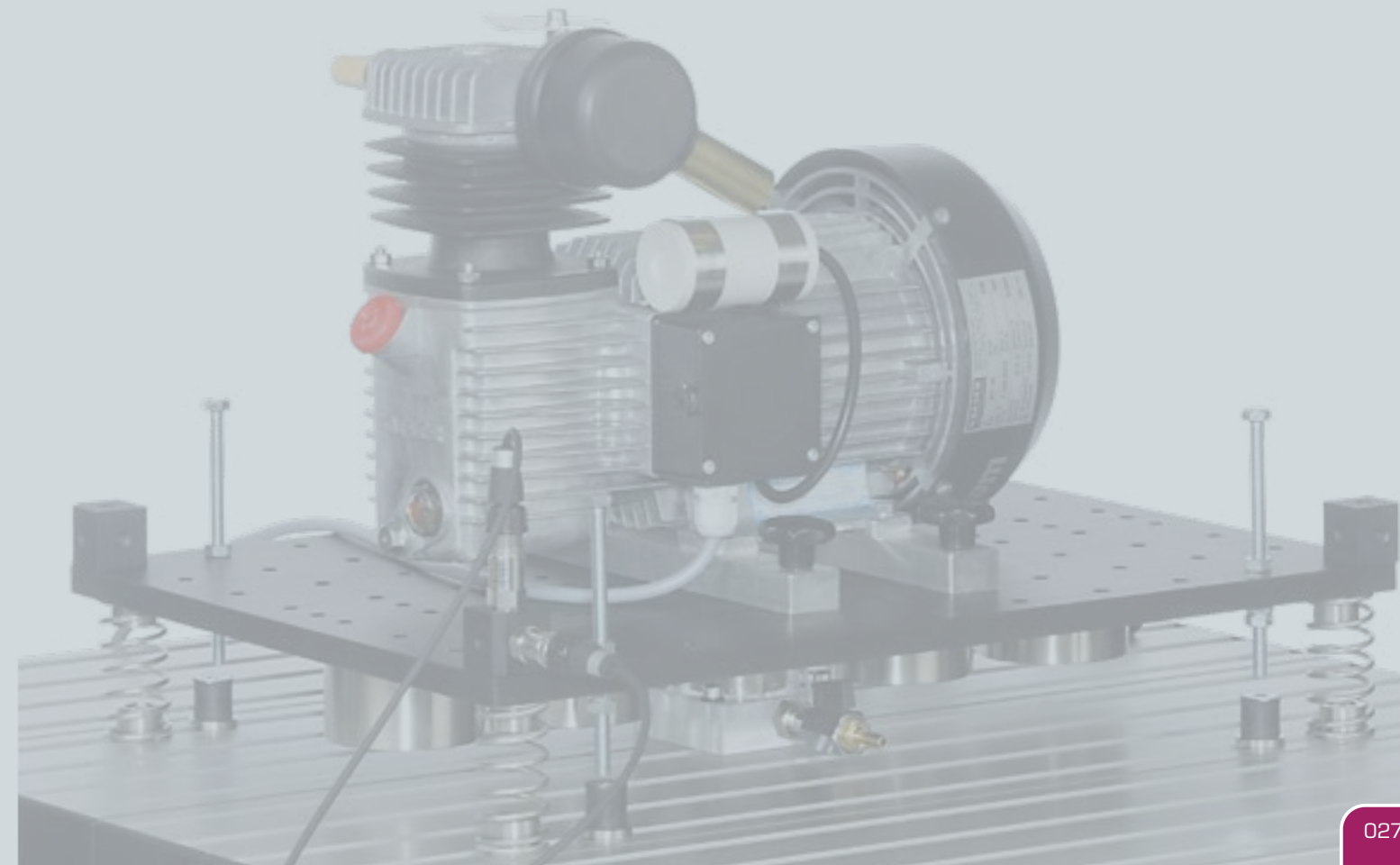


Machine dynamics
Vibration isolation



TM 182
Vibrations on machine foundations
Machine foundation and isolation of vibrations

TM 182.01
Piston compressor for TM 182
Used for generating vibrations for the TM 182



Machine dynamics
Machinery diagnosis

PT 500
Machinery diagnostic system, base unit

Base unit for setting up wide ranging experiments in machinery diagnostics using modular accessory sets



PT 500.10
Elastic shaft kit

Bending vibrations of elastic shaft



PT 500.17
Cavitation in pumps kit

Observation and measurement of cavitation



PT 500.18
Vibrations in fans kit

Identification of the vibration induced by the blades from the vibration spectrum



PT 500.11
Crack detection in rotating shaft kit

Vibrational behaviour of a shaft with a radial crack



PT 500.12
Roller bearing faults kit

Assessment of bearing condition by vibration analysis



PT 500.19
Electromechanical vibrations kit

Investigation of vibrational behaviour of an electric motor



PT 500.05
Brake & load unit

Unit for generating a load torque for use on various PT 500 experiments



PT 500.13
Couplings kit

Vibration analysis of couplings



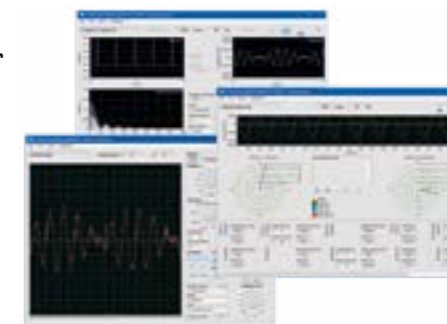
PT 500.14
Belt drive kit

Vibrations in belt drives



PT 500.04
Computerised vibration analyser

Supports all machinery diagnostic experiments of the PT 500 series



PT 500.15
Damage to gears kit

Vibration analysis of gearing damage



PT 500.16
Crank mechanism kit

Vibrations on crank drives



PT 501
Roller bearing faults

Investigation of the vibrations of roller bearings



Engineering design
Engineering drawing

TZ 100
Spatial imagination with three-view display

Introduction to three-view display as the basis of engineering drawing



GUNT offers five sets with Geometric models. To start with, TZ 100 establishes and trains the spatial imagination. TZ 110 to TZ 140 contain models with different shapes, used to practise the representation in three views.



For free
Multimedia instructional materials via Internet

TZ 200.01
Assembly exercise: bending press

Functional bending press made of steel: introduction to engineering drawing, measuring exercises, simple assembly sequences



For free
Multimedia instructional materials via Internet

TZ 300
Assembly exercise: lever press

Functional lever press made of steel: introduction to technical drawing, measuring exercises, simple assembly sequences



For free
Multimedia instructional materials via Internet

TZ 200.07
Assembly exercise: lever shear

Functional lever shear made of steel: introduction to engineering drawing, measuring exercises, simple assembly sequences



For free
Multimedia instructional materials via Internet



How to achieve the digital transformation to Industry 4.0



TZ 100 – TZ 300 are part of the **GUNT DigiSkills 1 learning project**. In addition to versatile learning objectives of engineering drawing, comprehensive digital skills are developed with GUNT DigiSkills 1.

Engineering design
Cutaway models

GL 300.01
Cutaway model: worm gear



GL 300.02
Cutaway model: mitre gear



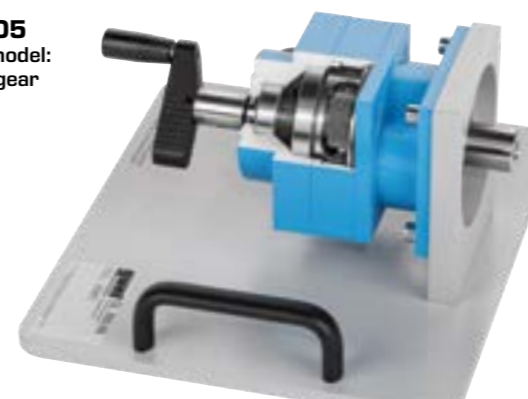
GL 300.03
Cutaway model: spur gear



GL 300.04
Cutaway model: two-stage spur gear



GL 300.05
Cutaway model: planetary gear



GL 300.06
Cutaway model: variable speed belt drive



GL 300.07
Cutaway model: control gear



GL 300.08
Cutaway model: multiple-disc clutch



Engineering design
Cutaway models

GL 300.10
Cutaway model:
electromagnetic
single disk brake



GL 300.12
Cutaway model:
pedestal bearing



TM 320
Threaded joint testing

Correlation between tightening torque and tension force on standardised bolts



TM 310
Thread testing

Thread efficiencies for different pairs of materials and thread pitches



Engineering design
Machine elements: fasteners

MG 901
Nuts and bolts kit

Comprehensive instructional kit of the main nuts and bolts used in engineering



MG 903
Screw-locking devices kit

Standardised designations, terms and graphical representation of different screw-locking devices



MG 905
Thread types kit

Standardised designations, terms and specific applications of different thread types, determination of the thread type with the thread gauge



Engineering design
Machine elements: bearings

MG 911
Roller bearings kit

Familiarisation with the most important roller bearing types and their specific applications



Engineering design
Machine elements: transmission elements

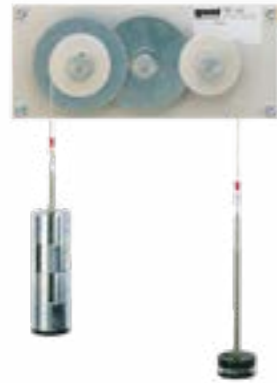
GL 100
Principle of gear units

Fundamental principles of belt drives, wheel and disc drives, and gear trains



TM 123
Spur gear unit

Mode of operation and layout of toothed gearing mechanisms



TM 124
Worm gear unit

Mode of operation and layout of a worm gear



TM 125
Cable winch

Using force equilibrium considerations to determine load transmission and efficiency



GL 110
Cam mechanism

Demonstration and measurement of the displacement curves for cam mechanisms



TM 220
Belt drive and belt friction

Influence of the angle of contact, coefficient of friction and belt force (Eytelwein's belt friction formula)



AT 200
Determination of gear efficiency

Test system for determining mechanical drive and braking efficiency for spur and worm gears



GL 410
Assembly simple gears

Versatile assembly exercise for simple drives using a belt, chain sprockets or a roller chain



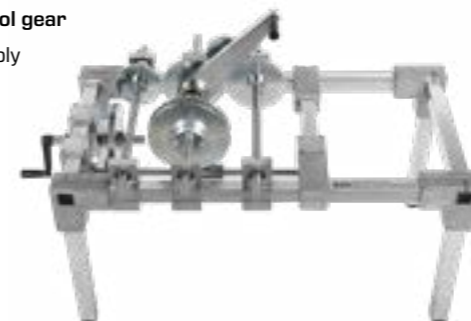
GL 420
Assembly combined gears

Versatile assembly exercise for combined drives



GL 430
Assembly control gear

Versatile assembly exercise for various step and gear units



GL 200
Lathe gear

Safe and clear demonstration of function of the gears on a conventional lathe



Engineering design
Assembly exercises

MT 190
Assembly materials tester

Study project with extensive practical relevance for training in metal working professions by constructing a hydraulic tensile/compression testing device



MT 190.01
Assembly data acquisition for materials tester

Mechanical and electrical engineering assembly kit: fully functional data acquisition for the materials tester MT 190



MT 171
Assembly hydrodynamic journal bearing

Understanding components and function; assembly and maintenance



MT 120
Assembly exercise: spur gear

Design and function of a spur gear with helical gear wheels; planning, assembly and disassembly



For free
Multimedia instructional materials via Internet

MT 121
Assembly exercise: mitre gear

Design and function of a mitre gear; planning, assembly and disassembly



For free
Multimedia instructional materials via Internet

MT 122
Assembly exercise: planetary gear

Design and function of a planetary gear; planning, assembly and disassembly



For free
Multimedia instructional materials via Internet

MT 123
Assembly exercise: spur and worm gear

Design and function of a spur and worm gear; planning, assembly and disassembly

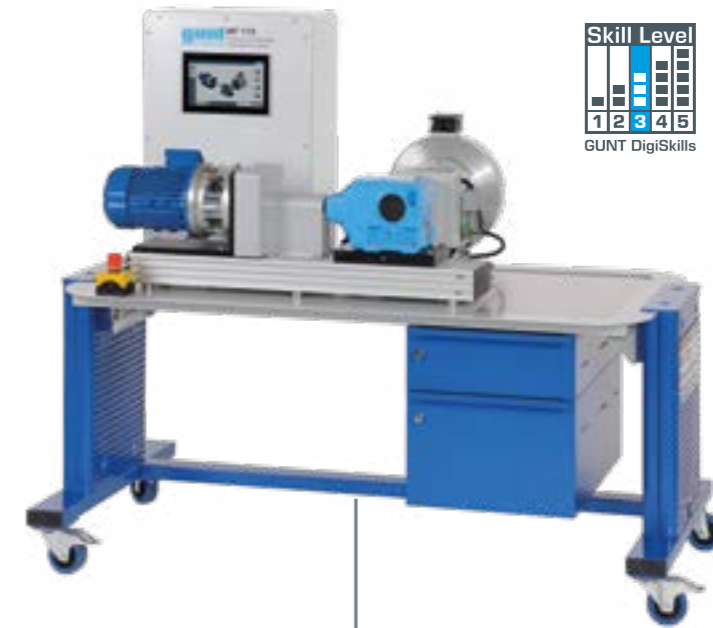


For free
Multimedia instructional materials via Internet

MT 173
Test stand for gears

Test system for determining the mechanical efficiency of different gear types, system control via PLC

For free
Multimedia instructional materials via Internet



How to achieve the digital transformation to Industry 4.0



MT 120



MT 121



MT 122



MT 123



MT 174
Sorting plant

Preventive maintenance based on the example of a separation process, system control via PLC

For free
Multimedia instructional materials via Internet



Materials testing
Tensile, compression, bending and hardness testing

WP 300
 Materials testing, 20 kN
 Training unit for basic experiments on materials testing: tensile tests, Brinell hardness tests, stress-strain diagrams



For free
 Multimedia instructional materials via Internet

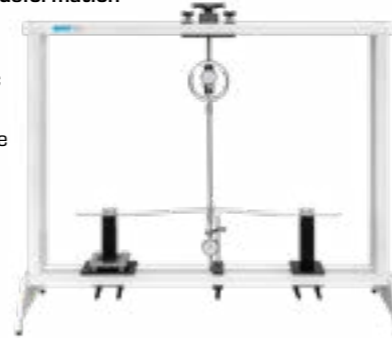
WP 310
 Materials testing, 50 kN
 Direct generation of tensile and compressive forces



SE 100
 Frame for load testing, 400 kN
 Load tests on components from steelwork and civil engineering; size allows measurements on real components



SE 110.48
 Bending test, plastic deformation
 Observation and determination of the transition from elastic to plastic deformation
 SE 112 Mounting frame required



Materials testing
Impact bending test

WP 400
 Impact test, 25 Nm
 Classic Charpy notched-bar impact test; specimens with different cross-sections and materials

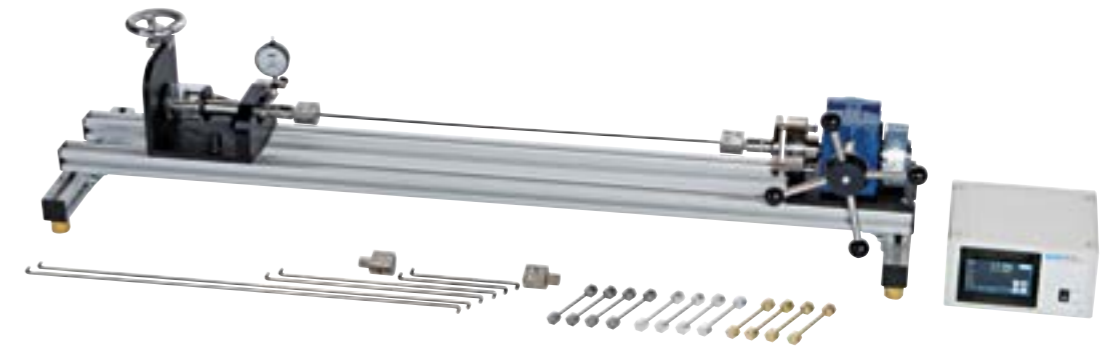


WP 410
 Impact test, 300 Nm
 Charpy notched-bar impact test with increased work capacity



Materials testing
Torsional test

WP 500
 Torsion test, 30 Nm
 Manual torsion testing of different materials to fracture



WP 510
 Torsion test 200 Nm, motor drive
 Motorised torsion testing of different materials to fracture, four different test velocities



Materials testing
Fatigue of materials

WP 140
 Fatigue strength test
 Fatigue strength of bars subject to cyclic bending load; stress-number (S-N) diagram



WP 600
 Creep rupture test
 Demonstration of typical creep phenomena in various materials



Materials testing
Tribology and corrosion

TM 260
Drive unit for tribological investigations

Modular experimental system for sliding and rolling friction



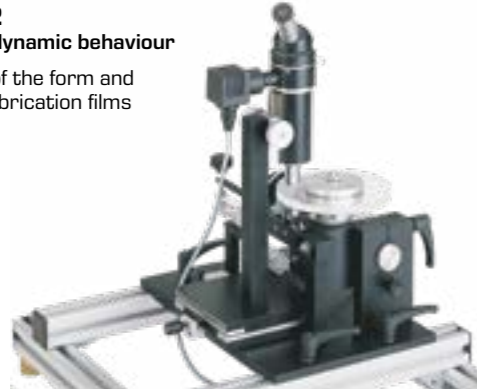
TM 260.01
Rolling friction in friction wheels

Slip forces in two discs rubbing together



TM 260.02
Elasto-hydrodynamic behaviour

Investigation of the form and thickness of lubrication films



TM 260.03
Dynamic friction in pin – disk

Investigations into wear on pairs of friction materials with surface contact



TM 260.04
Frictional vibrations

Differences between static and sliding friction, instability



TM 260.06
Pressure distribution in journal bearings

Demonstration of pressure distribution in a plain bearing with hydrodynamic lubrication



TM 260.05
Dynamic friction in cylindrical pin – roller

Investigation of wear in pairs of friction materials with point of contact



TM 232
Bearing friction

Sliding bearing friction with different bearing material pairings and comparison with rolling bearing friction



TM 282
Friction in journal bearings

Learning the fundamentals of hydrodynamic lubrication by experimentation



TM 290
Journal bearing with hydrodynamic lubrication

Investigation of friction in a hydrodynamically lubricated journal bearing



TM 280
Pressure distribution in journal bearings

Illustrates the principle of hydrodynamic lubrication



CE 105
Corrosion of metals

Parallel investigation of different influencing factors on different metal samples



Learning projects in the context of Industry 4.0

MT174 Sorting plant with GUNT's SMART features



2 | Mechatronics



Engineering design

Engineering drawing	044
Cutaway models: gear and drive elements	046
Cutaway models: refrigeration components	048
Cutaway models: components in piping systems	050
Machine elements: fasteners	054
Machine elements: bearings	055
Machine elements: transmission elements	056



Assembly technology

Assembly kits	058
Drive elements and gears	058
Fittings	061
Compressors	062
Piping	063



Maintenance

System components: valves, pumps, pipes	064
Test stands for valves and fittings and actuators	066
Complex projects on experimental plants	066
Machinery diagnosis	068



Production technology

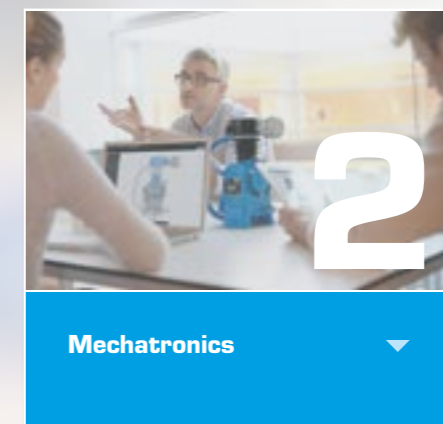
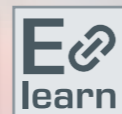
Dimensional metrology	070
Tools	071
Technological experiments	072



Automation and process control engineering

Components: sensors / instrumentation	072
Components: actuators	074
Components: controllers, controlled systems, networking	075
Components: fundamentals of pneumatics and hydraulics	076
Modular calibration systems	076
Simple process engineering control systems	077
Mechatronics projects	081
Robotics and CNC	082
PLC and PLC applications	083
Multivariable systems	083
Control systems with several controlled variables	084

About the product:



Engineering design
Engineering drawing

TZ 100
Spatial imagination with three-view display

Introduction to three-view display as the basis of engineering drawing

For free
Multimedia instructional materials via Internet



GUNT offers five sets with Geometric models. To start with, TZ 100 establishes and trains the spatial imagination. TZ 110 to TZ 140 contain models with different shapes, used to practise the representation in three views.

TZ 110
Cylindrical models with cuts parallel to axis

Comprehensive collection of models with varying levels of difficulty

For free
Multimedia instructional materials via Internet



TZ 120
Cylindrical models with slanted cuts

Comprehensive collection of models with varying levels of difficulty

For free
Multimedia instructional materials via Internet



TZ 140
Prismatic models with slanted cuts

Comprehensive collection of models with varying levels of difficulty

For free
Multimedia instructional materials via Internet



TZ 130
Prismatic models with cuts parallel to edges

Comprehensive collection of models with varying levels of difficulty

For free
Multimedia instructional materials via Internet



TZ 200.01
Assembly exercise: bending press

Functional bending press made of steel: introduction to engineering drawing, measuring exercises, simple assembly sequences

For free
Multimedia instructional materials via Internet



TZ 300
Assembly exercise: lever press

Functional lever press made of steel: introduction to technical drawing, measuring exercises, simple assembly sequences

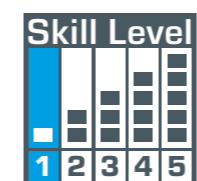
For free
Multimedia instructional materials via Internet



TZ 200.07
Assembly exercise: lever shear

Functional lever shear made of steel: introduction to engineering drawing, measuring exercises, simple assembly sequences

For free
Multimedia instructional materials via Internet



TZ 100 – TZ 300 are part of the **GUNT DigiSkills 1 learning project.** In addition to versatile learning objectives of engineering drawing, comprehensive digital skills are developed with GUNT DigiSkills 1.

How to achieve the digital transformation to Industry 4.0



Engineering design
Cutaway models: gear and drive elements

GL 300.01
 Cutaway model:
 worm gear



GL 300.02
 Cutaway model:
 mitre gear



GL 300.06
 Cutaway model:
 variable speed belt drive



GL 300.07
 Cutaway model:
 control gear



GL 300.03
 Cutaway model: spur gear



GL 300.04
 Cutaway model: two-stage spur gear



GL 300.08
 Cutaway model: multiple-disc clutch



GL 300.12
 Cutaway model: pedestal bearing



GL 300.05
 Cutaway
 model:
 planetary gear



GL 300.10
 Cutaway model:
 electromagnetic
 single disk brake



Engineering design
Cutaway models: refrigeration components

ET 499.30
Cutaway model:
ceiling air cooler



ET 499.01
Cutaway model:
hermetic refrigerant
compressor



ET 499.18
Cutaway model:
thermostatic expansion valve



ET 499.19
Cutaway model:
automatic expansion valve



ET 499.02
Cutaway model:
semi-hermetic
refrigerant
compressor



ET 499.03
Cutaway model:
open refrigerant
compressor, two-cylinder



ET 499.21
Cutaway model:
sight glass with
humidity indicator



ET 499.25
Cutaway model:
4-way reversing valve



ET 499.12
Cutaway model:
block drier



ET 499.13
Cutaway model:
oil separator



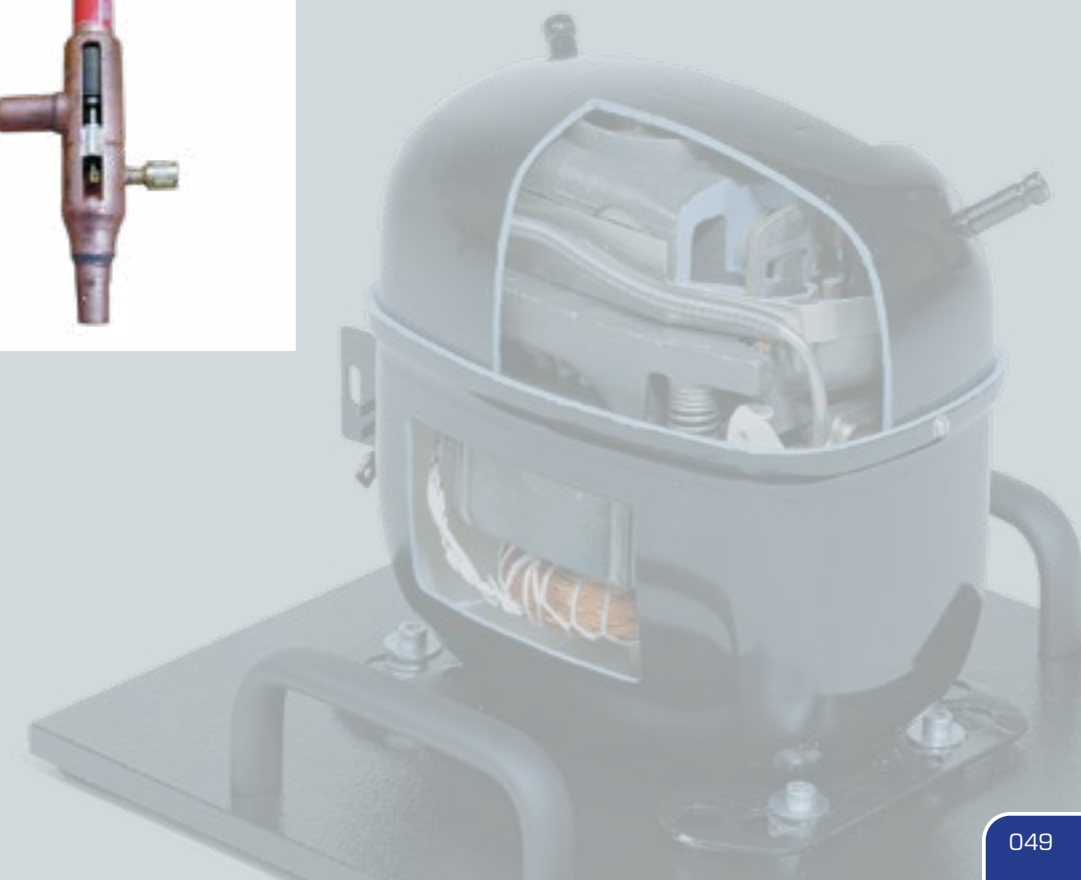
ET 499.26
Cutaway model:
condensation pressure
control valve



ET 499.14
Cutaway model:
liquid separator



ET 499.16
Cutaway model:
ball valve



Engineering design
Cutaway models: components in piping systems

HM 700.01
 Cutaway model:
 standard orifice plate



HM 700.02
 Cutaway model:
 flow nozzle



HM 700.09
 Cutaway model:
 strainer



HM 700.10
 Cutaway model:
 gate valve



HM 700.03
 Cutaway model:
 standard Venturi meter



HM 700.04
 Cutaway model:
 straight-way valve



HM 700.11
 Cutaway model:
 straight-way plug valve



HM 700.12
 Cutaway model:
 three-way plug valve



HM 700.05
 Cutaway model:
 corner valve



HM 700.06
 Cutaway model:
 angle seat valve



HM 700.13
 Cutaway model:
 ball valve



HM 700.14
 Cutaway model:
 safety valve



HM 700.07
 Cutaway model:
 non-return valve



HM 700.08
 Cutaway model:
 pressure reducing valve



HM 700.15
 Cutaway models:
 various screwed pipe
 connections



HM 700.16
 Cutaway models:
 pressure gauges



Engineering design
Cutaway models: components in piping systems

HM 700.17
 Cutaway model:
 centrifugal pump



HM 700.20
 Cutaway model:
 piston pump



HM 700.22
 Cutaway model:
 gear pump



VS 101
 Cutaway model:
 underground hydrant



VS 106
 Cutaway model:
 backflow preventer



VS 107
 Cutaway model:
 non-return butterfly valve



VS 102
 Cutaway model:
 resilient seated gate valve



VS 103
 Cutaway model:
 screw down valve



VS 108
 Cutaway model:
 water meter



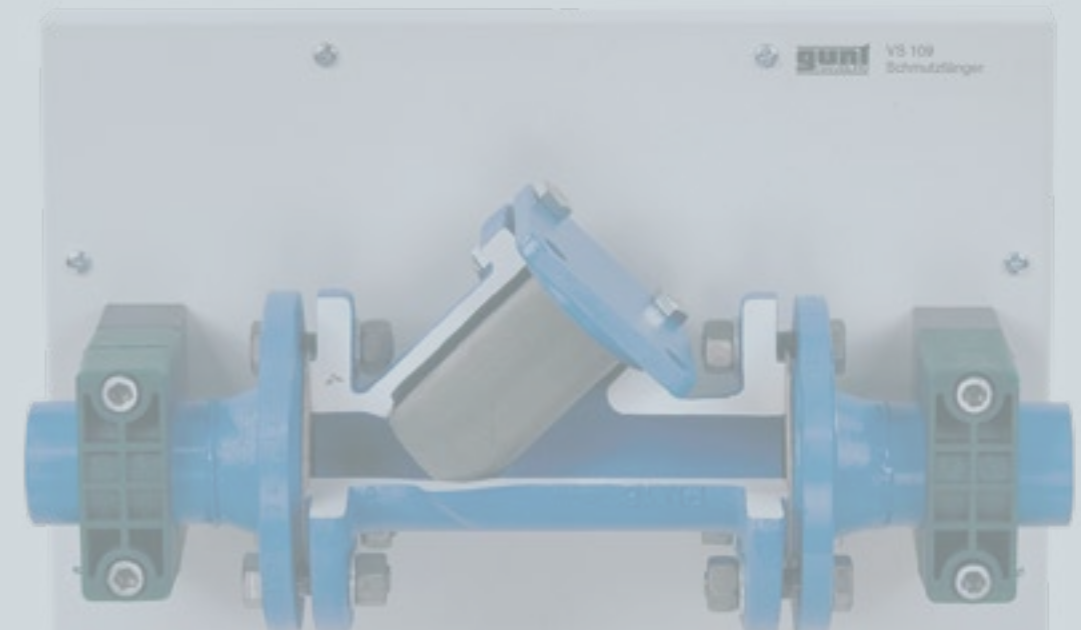
VS 109
 Cutaway model:
 strainer



VS 104
 Cutaway model:
 changeover valve



VS 105
 Cutaway model:
 gas meter



Engineering design
Machine elements: fasteners

MG 100
Instructional kit:
assembly with dowel pins

Familiarisation with various pin types, their special features and applications



MG 110
Instructional kit:
assembly with keys

Familiarisation with various feather keys, their production, special features and applications



MG 120
Instructional kit:
assembly with taper keys

Familiarisation with various taper keys, their production, special features and areas of application



MG 200
Instructional kit:
threaded joints

Practical workshop exercises on the topic of threaded fasteners, tightening and breakaway torques



MG 901
Nuts and bolts kit

Comprehensive instructional kit of the main nuts and bolts used in engineering



MG 903
Screw-locking devices kit

Standardised designations, terms and graphical representation of different screw-locking devices



MG 905
Thread types kit

Standardised designations, terms and specific applications of different thread types, determination of the thread type with the thread gauge



TM 310
Thread testing

Thread efficiencies for different pairs of materials and thread pitches



TM 320
Threaded joint testing

Correlation between tightening torque and tension force on standardised bolts



Engineering design
Machine elements: bearings

MG 911
Roller bearings kit

Familiarisation with the most important roller bearing types and their specific applications



Engineering design
Machine elements: transmission elements

GL 100
 Principle of gear units
 Fundamental principles of belt drives,
 wheel and disc drives, and gear trains



GL 110
 Cam mechanism
 Demonstration and measurement of the displacement
 curves for cam mechanisms



GL 200
 Lathe gear
 Safe and clear demonstration of function of the gears on a
 conventional lathe



AT 200
 Determination of gear efficiency
 Test system for determining mechanical drive
 and braking efficiency for spur and worm gears



TM 123
 Spur gear unit
 Mode of operation and
 layout of a spur gear



TM 124
 Worm gear unit
 Mode of operation and layout
 of a worm gear



TM 125
 Cable winch
 Using force equilibrium
 considerations to determine
 load transmission and
 efficiency



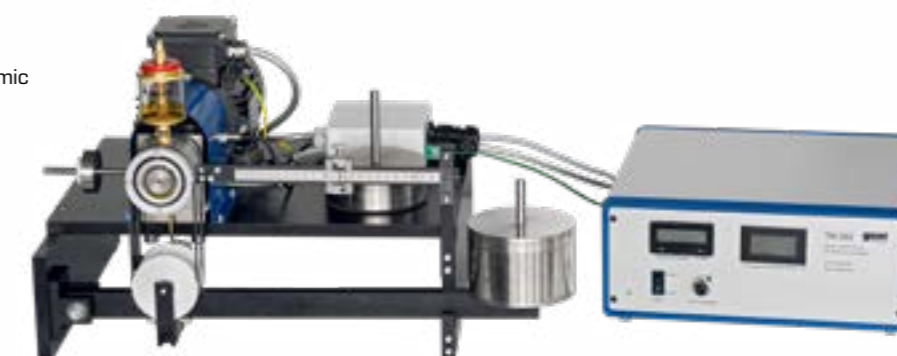
TM 220
 Belt drive and belt friction
 Investigating the influence of the angle of contact, coefficient of
 friction and belt force on belt drives and belt friction



TM 232
 Bearing friction
 Sliding bearing friction with
 different bearing material
 pairings and comparison with
 rolling bearing friction



TM 282
 Friction in journal bearings
 Learning the fundamentals of hydrodynamic
 lubrication by experimentation



Assembly technology
Assembly kits

MT 190
Assembly materials tester

Study project with extensive practical relevance for training in metal working professions by constructing a hydraulic tensile/compression testing device



MT 190.01
Assembly data acquisition for materials tester

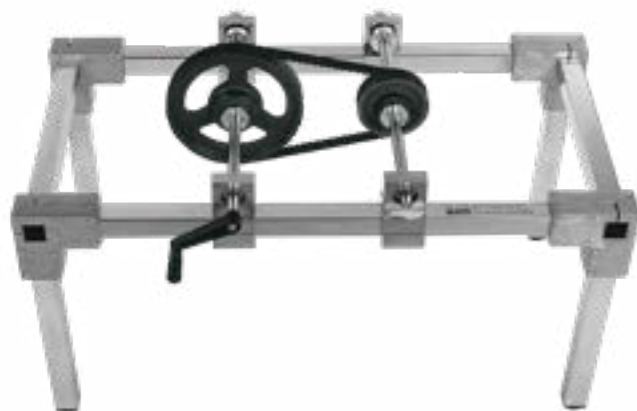
Mechanical and electrical engineering assembly kit: fully functional data acquisition for the materials tester MT 190



Assembly technology
Drive elements and gears

GL 410
Assembly simple gears

Versatile assembly exercise for simple drives using a belt, chain sprockets or a roller chain



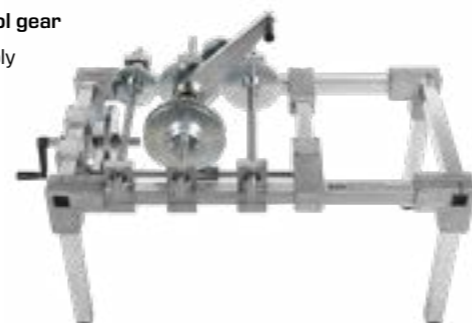
GL 420
Assembly combined gears

Versatile assembly exercise for combined drives



GL 430
Assembly control gear

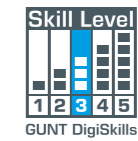
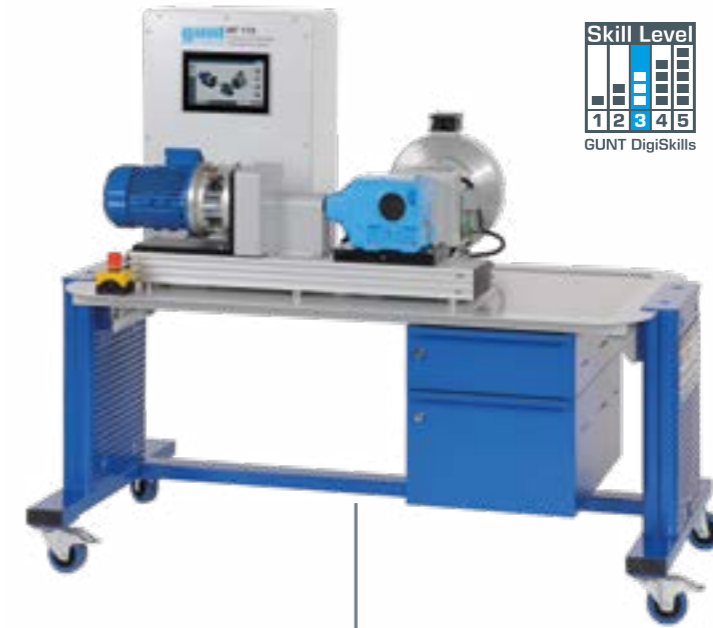
Versatile assembly exercise for various step and gear units



MT 173
Test stand for gears

Test system for determining the mechanical efficiency of different gear types, system control via PLC

For free
Multimedia instructional materials via Internet



How to achieve the digital transformation to Industry 4.0



MT 120



MT 121



MT 122



MT 123



MT 174
Sorting plant

Preventive maintenance based on the example of a separation process, system control via PLC

For free
Multimedia instructional materials via Internet



Assembly technology
Drive elements and gears

MT 171
Assembly hydro-dynamic journal bearing

Understanding components and function; assembly and maintenance



MT 110.10
Cutaway model: spur and worm gear

Manually operated cutaway model of a spur and worm gear



MT 120
Assembly exercise: spur gear

Design and function of a spur gear with helical gear wheels; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



MT 121
Assembly exercise: mitre gear

Design and function of a mitre gear; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



MT 122
Assembly exercise: planetary gear

Design and function of a planetary gear; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



MT 123
Assembly exercise: spur and worm gear

Design and function of a spur and worm gear; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



MT 136
Assembly exercise: gear pump

Design and function of a gear pump; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



Assembly technology
Fittings

MT 154
Assembly exercise: shut-off valve

Planning, assembly, disassembly: function and design of a shut-off valve



MT 156
Assembly exercise: wedge gate valve and angle seat valve

Assembly, disassembly and maintenance of industrial fittings



MT 157
Assembly exercise: butterfly valve and non-return valve

Assembly, disassembly and maintenance of industrial fittings



MT 158
Assembly exercise: ball valve and shut-off valve

Assembly, disassembly and maintenance of industrial fittings



MT 101
Assembly exercise: pneumatically driven

Design and function of a pneumatically driven valve; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



MT 162
Hydraulic valves and fittings test stand

Pressure test for GUNT assembly kits MT 154, MT 156, MT 157 and MT 158



MT 102
Assembly exercise: electrically driven control valve

Design and function of an electrically driven control valve; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



Assembly technology Compressors

MT 141
Assembly exercise: piston compressor

Function and design of a piston compressor; planning, assembly, disassembly

For free
Multimedia instructional materials via Internet



MT 142
Energy efficiency in piston compressors

Installation of the assembled MT 141 piston compressor: functional test; balancing of energies

For free
Multimedia instructional materials via Internet



Assembly technology Piping

HL 960
Assembly station pipes and valves and fittings

Assembly of real piping and plant installations; together with HL 960.01: operational testing on a pipe network



HL 960.01
Assembly and alignment of pumps and drives

Installation and removal of pumps in plants; water supply for HL 960



MT 220
Assembly station gas booster in hydrogen technology

Assembly of a pipe section with industrial gas booster and various valves and fittings: pipe assembly, leak testing, typical maintenance tasks; 3 assemblies possible

For free
Multimedia instructional materials via Internet



H₂SKILLS
Green hydrogen expertise



Future expertise for education – experience green hydrogen technology

The GUNT range of units for the development of H₂SKILLS enables future specialists in the hydrogen industry to receive practical training. For teachers, the hydrogen devices are didactically incorporated into the classroom to ensure the effective transfer of knowledge.

CE 810
Gas booster in hydrogen technology

Single-stage gas booster with pneumatic drive, visualising the processes and functions, supported by augmented reality

For free
Multimedia instructional materials via Internet



H₂SKILLS
www.gunt.de



RT 460
Hands-on mechatronics project: level control

Complete development and documentation of a level control system: digital planning in a coordinated learning environment, mechanical and electrical assembly, testing and optimisation



For free
Multimedia instructional materials via Internet



GUNT planning software for managing a mechatronics project. Creation of all necessary assembly documentation, such as drawings, parts lists and process diagrams.

Maintenance
System components: valves, pumps, pipes

MT 130
Assembly exercise: centrifugal pump

Design and function of a centrifugal pump; planning, assembly and disassembly

For free
 Multimedia instructional materials via Internet



MT 181
Assembly & maintenance exercise: multistage centrifugal pump

Understanding design and function of the pump; planning and executing assembly, disassembly and maintenance



MT 182
Assembly & maintenance exercise: screw pump

Understanding design and function of the pump; planning and executing assembly, disassembly and maintenance



MT 183
Assembly & maintenance exercise: diaphragm pump

Understanding design and function of the pump; planning and executing assembly, disassembly and maintenance



MT 134
Montage d'une pompe à piston

Fonction et montage d'une pompe à piston; planifier, monter, démonter

For free
 Multimedia instructional materials via Internet



MT 185
Assembly & maintenance exercise: in-line centrifugal pump

Understanding design and function of the pump; planning and executing assembly, disassembly and maintenance



MT 136
Assembly exercise: gear pump

Design and function of a gear pump; planning, assembly and disassembly

For free
 Multimedia instructional materials via Internet



HL 962
Assembly stand for pumps

Base unit when constructing a complex piping system



HL 962.01
Standard chemicals pump

Typical pump as used in process engineering



HL 962.02
Canned motor pump

Hermetic centrifugal pump, particularly suitable for pumping liquid gases



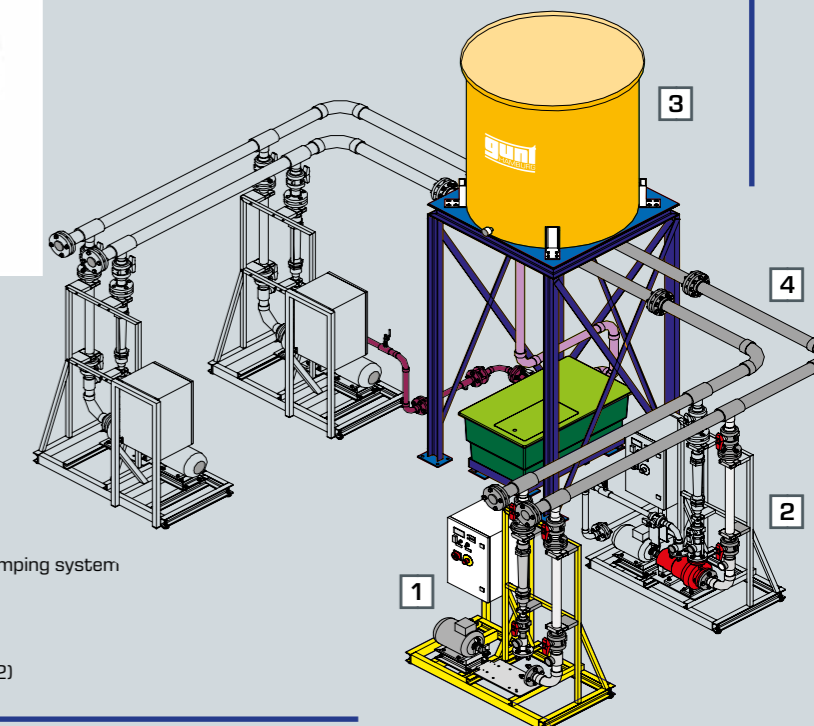
HL 962.03
Side channel pump

Self-priming three-stage pump



HL 962.04
Standard chemicals pump with magnetic clutch

Hermetic centrifugal pump according to ISO 5199



Possible combination of individual components into a functional pumping system

- 1 assembly stand for pumps (HL 962)
- 2 pumps, various types (HL 962.01 – HL 962.04)
- 3 tank installation (HL 962.30)
- 4 piping system to interconnect the plant components (HL 962.32)

Maintenance
Test stands for valves and fittings and actuators

RT 396
Pump and valves and fittings test stand
Recording characteristic curves of industrial fittings and a centrifugal pump



RT 395
Maintenance of valves and fittings and actuators
Maintenance and operational check: four different fittings and actuators



Maintenance
Complex projects on experimental plants

MT 210
Assembly & maintenance exercise: refrigeration
Study project with high practical relevance for training in metal and electrical professions: assembly of a refrigeration system from individual components



MT 174
Sorting plant
Preventive maintenance based on the example of a separation process, system control via PLC



For free Multimedia instructional materials via Internet

CE 585
Water purification process
Industrial-scale water purification plant with extensive operating functions and maintenance work; system control via PLC



For free Multimedia instructional materials via Internet

RT 460
Hands-on mechatronics project: level control
Complete development and documentation of a level control system: digital planning in a coordinated learning environment, mechanical and electrical assembly, testing and optimisation



For free Multimedia instructional materials via Internet

MT 220
Assembly station gas booster in hydrogen technology
Assembly of a pipe section with industrial gas booster and various valves and fittings: pipe assembly, leak testing, typical maintenance tasks; 3 assemblies possible



For free Multimedia instructional materials via Internet

CE 750
Pasteurisation process
Pasteuriser on an industrial scale with extensive operating functions and maintenance work; system control via PLC



For free Multimedia instructional materials via Internet

ET 195
Process cooling
Industrial-scale chiller with extensive operating functions and maintenance work; system control via PLC



For free Multimedia instructional materials via Internet

Maintenance
Machinery diagnosis

PT 500
Machinery diagnostic system, base unit

Base unit for setting up wide ranging experiments in machinery diagnostics using modular accessory sets



PT 500.10
Elastic shaft kit

Bending vibrations of elastic shaft



PT 500.17
Cavitation in pumps kit

Observation and measurement of cavitation



PT 500.18
Vibrations in fans kit

Identification of the vibration induced by the blades from the vibration spectrum



PT 500.11
Crack detection in rotating shaft kit

Vibrational behaviour of a shaft with a radial crack



PT 500.12
Roller bearing faults kit

Assessment of bearing condition by vibration analysis



PT 500.19
Electromechanical vibrations kit

Investigation of vibrational behaviour of an electric motor



PT 500.05
Brake & load unit

Unit for generating a load torque for use on various PT 500 experiments



PT 500.13
Couplings kit

Vibration analysis of couplings



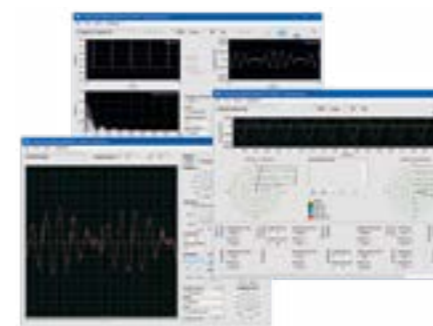
PT 500.14
Belt drive kit

Vibrations in belt drives



PT 500.04
Computerised vibration analyser

Supports all machinery diagnostic experiments of the PT 500 series



PT 500.15
Damage to gears kit

Vibration analysis of gearing damage



PT 500.16
Crank mechanism kit

Vibrations on crank drives



PT 501
Roller bearing faults

Investigation of the vibrations of roller bearings



Production technology
Dimensional metrology

PT 102
Dimensional metrology,
spacer plate

Measurement exercises on 10 spacer plates with digital and analog calliper, depth calliper and depth micrometer



For free
Multimedia instructional materials via Internet

PT 104
Dimensional metrology,
angle piece

Measurement exercises on 10 angle pieces with analog calliper, depth calliper, universal goniometer and radius gauge



For free
Multimedia instructional materials via Internet

PT 105
Dimensional metrology, shaft

Measurement exercises on 10 shafts with calliper, depth calliper, external micrometer, slip gauges and thread gauge



For free
Multimedia instructional materials via Internet

PT 107
Dimensional metrology,
flange housing

Measurement exercises on a real-world machine element; testing of a flange housing with calliper, three-point internal micrometer, thread limit plug gauge and surface comparison plates



For free
Multimedia instructional materials via Internet

PT 108
Dimensional metrology,
output shaft

Measurement exercises on a real-world machine element; testing of an output shaft with calliper, depth calliper, digital external micrometer and surface comparison plates



For free
Multimedia instructional materials via Internet

PT 109
Dimensional metrology,
hub

Measurement exercises on 10 hubs with analog calliper, depth calliper, three point internal micrometer and limit plug gauge



For free
Multimedia instructional materials via Internet

Skill Level				
1	2	3	4	5

PT 102 – PT 109 are part of the **GUNT DigiSkills 2 learning project**. In addition to versatile learning objectives of dimensional metrology, comprehensive digital skills are developed with GUNT DigiSkills 2.

How to achieve the digital transformation to Industry 4.0



Production technology
Tools

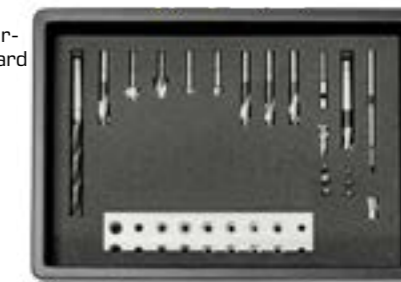
FT 901
Drilling kit

Various drilling tools: cutting geometry, incorrect cutter profiles



FT 903
Countersinking kit

Collection of countersinking tools: standard designations



FT 905
Reaming kit

Checking a hole with the limit plug gauge; various reaming tools



FT 907
Grinding kit

Teaching collection of traditional grinding tools and abrasives



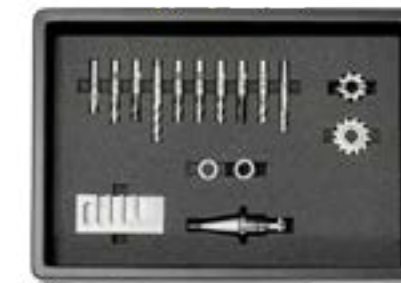
FT 909
Turning kit

Familiarisation with different lathe tools (shape, application) and reversible carbide tips (cutting geometry)



FT 913
Milling kit

Familiarisation with various types of milling cutters



Production technology
Technological experiments

FT 100
Cutting forces during drilling
Measurement of feed force and torque



FT 102
Cutting forces during turning
Measuring the forces acting on a lathe tool; three-component force measuring device



FT 200
Forming by bending
Vice experiment: permanent deformation of flat bars



Automation and process control engineering
Components: sensors / instrumentation

IA 110
Calibrating a pressure sensor
Test-pressure generated with dead-weight piston manometer



IA 120
Principles of industrial sensors
Familiarisation with key sensors: mode of operation and application



RT 306
Adjustment of level sensors
Familiarisation with different industry standard components with a 4-20mA current loop interface using the example of level measurement



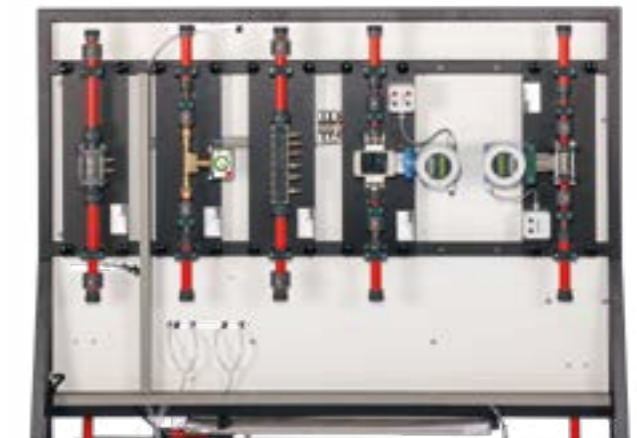
WL 202
Fundamentals of temperature measurement
Experimental introduction to temperature measurement: methods, areas of application, characteristics



FL 100
Strain gauge training system
Basic introduction to measurement with strain gauges for tension, bending and torsion



HM 500
Flow meter trainer
Comparison and calibration of different flow meters



Different flow meters HM 500.01-HM 500.16 are available as accessories.

Automation and process control engineering
Components: actuators

MT 101
Assembly exercise: pneumatically driven

Design and function of a pneumatically driven valve; planning, assembly and disassembly

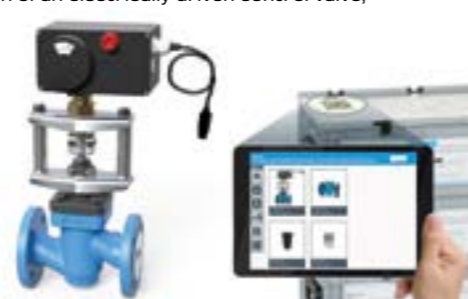
For free
Multimedia instructional materials via Internet



MT 102
Assembly exercise: electrically driven control valve

Design and function of an electrically driven control valve; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



RT 396
Pump and valves and fittings test stand

Recording characteristic curves of industrial fittings and a centrifugal pump



RT 390
Test stand for control valves

Design and function of control valves; determination of the Kv value



RT 395
Maintenance of valves and fittings and actuators

Maintenance and operational check: four different fittings and actuators



Automation and process control engineering
Components: controllers, controlled systems, networking

RT 350
Operation of industrial controllers

Simulation of controlled systems; digital controller with freely selectable parameters



RT 380
Optimization of control loops

Tuning the controller to the controlled system; software simulation of the most common controlled systems

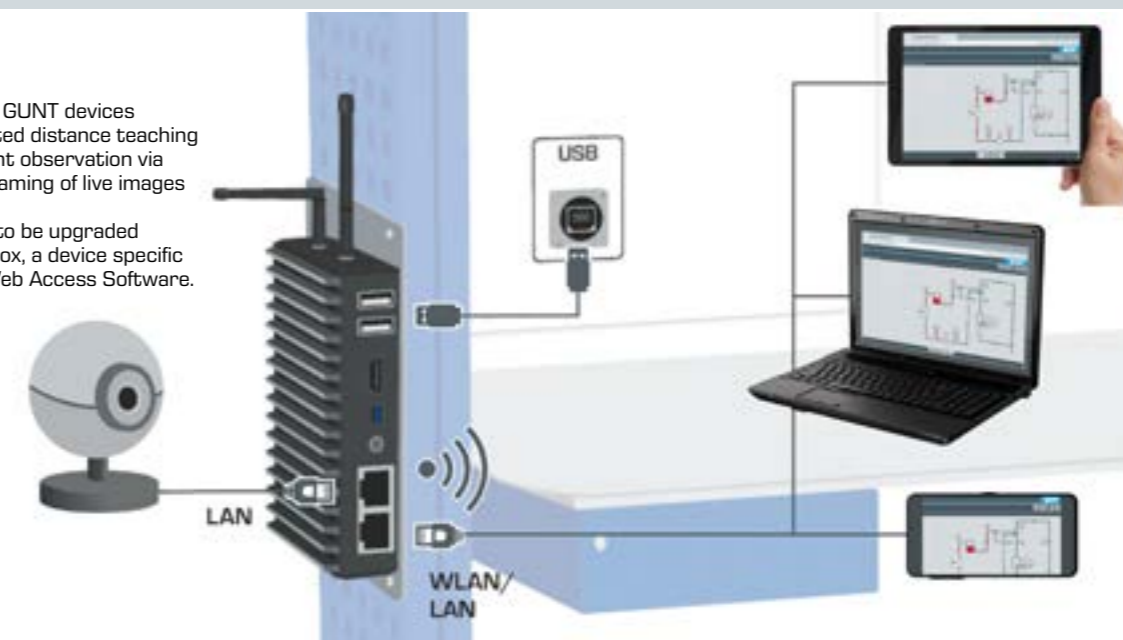


GU 100
Web Access Box

Accessory for selected GUNT devices enables practice-oriented distance teaching and learning: experiment observation via web browser with streaming of live images

For each GUNT device to be upgraded with the Web Access Box, a device specific software is available: Web Access Software. The software must be purchased separately for each device.

Information on this you will find on our [website](#)



Automation and process control engineering
Components: fundamentals of pneumatics and hydraulics

RT 700
 Training system:
 fundamentals of hydraulics
 Complete training system providing an experimental introduction to the fundamentals of hydraulics



RT 701
 Components set
 electrohydraulics
 Set of electrohydraulics components for hydraulics trainer RT 700



RT 710
 Hydraulic servo system
 Hydraulic position control circuit with adjustable load conditions



RT 770
 Training system:
 pneumatics, electro-pneumatics and PLC
 Complete training system providing an experimental introduction to the fundamentals of pneumatics and electro-pneumatics, also with PLC



Automation and process control engineering
Modular calibration systems

RT 310
 Calibration station
 Calibration of control loop components using precision measuring technique



RT 304
 Calibration trainer
 Investigation of the transmission behaviour of actuators and transducers



Automation and process control engineering
Simple process engineering control systems



For free
 The GUNT Media Center provides extensive multimedia teaching material for the experiments.



RT 010
 Training system level control, HSI
 Fundamentals of control engineering using the example of a level control system with integral behaviour
For free
 Multimedia instructional materials via Internet



RT 020
 Training system flow control, HSI
 Fundamentals of control engineering using the example of a rapid flow control system



For free
 Multimedia instructional materials via Internet

RT 030
 Training system pressure control, HSI
 Fundamentals of control engineering using the example of a pressure control system with first order lag



For free
 Multimedia instructional materials via Internet

RT 040
 Training system temperature control, HSI
 Fundamentals of control engineering using the example of a temperature control system with lag time



For free
 Multimedia instructional materials via Internet

RT 050
 Training system speed control, HSI
 Fundamentals of control engineering using the example of a speed control system with first order lag



For free
 Multimedia instructional materials via Internet

RT 060
 Training system position control, HSI
 Fundamentals of control engineering using the example of a position control system with integral behaviour



For free
 Multimedia instructional materials via Internet

Automation and process control engineering

Simple process engineering control systems

RT 451 Level control

Level controlled system based on standard industrial components, smart level sensor, system control via PLC

For free
Multimedia instructional materials via Internet



RT 452 Flow control

Flow controlled system based on standard industrial components, smart flow rate sensor, system control via PLC

For free
Multimedia instructional materials via Internet



RT 453 Pressure control

First order and second order pressure controlled system based on standard industrial components, smart pressure sensors, system control via PLC

For free
Multimedia instructional materials via Internet



RT 454 Temperature control

Temperature controlled system based on standard industrial components, controller configurable as a continuous or a switching device, smart temperature sensors, system control via PLC

For free
Multimedia instructional materials via Internet



RT 455 pH value control

pH value controlled system based on standard industrial components, smart pH sensors, system control via PLC

For free
Multimedia instructional materials via Internet



RT 614 Level control demonstration unit

Experimental introduction to control engineering using an example of level controlled system



RT 624 Flow control demonstration unit

Experimental introduction to control engineering using an example of flow controlled system



RT 634 Pressure control demonstration unit

Experimental introduction to control engineering using an example of second order pressure controlled system



RT 644 Temperature control demonstration unit

Experimental introduction to control engineering using an example of temperature controlled system



RT 674 Flow /level control demonstration unit

Experimental introduction to control engineering using an example of a controlled system for flow rate, level and level via flow rate (cascade control)





GUNT-TVET

Technical and Vocational Education and Training mit GUNT



Learning & practice modules
Practical, hands-on teaching



GUNT DigiSkills
Digitalisation of vocational training



Industrial application projects
Learning in an industry-like environment



Pilot plants & training plants
Industry-specific training and on-the-job training



GUNT-TVET
www.gunt.de



Automation and process control engineering Mechatronics projects

RT 460 Hands-on mechatronics project: level control

Complete development and documentation of a level control system: digital planning in a coordinated learning environment, mechanical and electrical assembly, testing and optimisation

For free
Multimedia instructional materials via Internet

GUNT's planning software generates all the necessary diagrams for a project:

- piping diagram with parts list
- electrical circuit diagram
- terminal diagram
- process flow diagram
- signal flow diagram



1. Project planning



2. Mechanical and electrical assembly



3. Commissioning and optimisation



Configuration of components and control in the PLC

Automation and process control engineering
Robotics and CNC

The GUNT DigiSkills5 learning project ... at the heart of mechatronics teaching

IA 500
Automated process with cobot
Realisation of an automated process in which a complete tensile test is carried out; collaborative robot (cobot) as a modern, high-quality industrial robot
For free Multimedia instructional materials via Internet

IA 501
Programming a servo drive
Programming the motor controller, adjusting the control parameters, checking the software and troubleshooting the device
For free Multimedia instructional materials via Internet

IA 520
Computer integrated manufacturing and handling system
Two CNC machines, one robot and one magazine as the main elements; PLC and process control software for process monitoring in an automated manufacturing process

Automation and process control engineering
PLC and PLC applications

RT 800
PLC application: mixing process
Experiments using PLC to control discontinuous mixing processes

IA 130
PLC module
Self-contained PLC module for basic exercises; also suitable for IA 210 and RT 800

IA 210
PLC application: transport and sorting
Basic system of automation: transporting and sorting workpieces

Automation and process control engineering
Multivariable systems

RT 682
Multivariable control: stirred tank
Heated stirrer tank with heat recovery as model: coupled level and temperature control

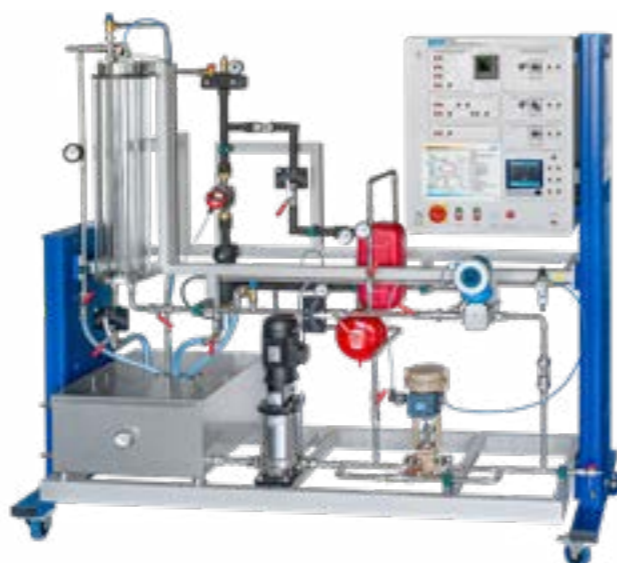
RT 681
Multivariable control: vacuum degassing
Model of "degassing of fluids": coupled level and pressure control in one vacuum tank

Automation and process control engineering
Control systems with several controlled variables

RT 586
Control of water quality
 Control of pH-value, redox potential, oxygen concentration and electrical conductivity



RT 578
Control of four variables from process engineering
 Practical control of level, flow rate, pressure and temperature



RT 580
Fault finding in control systems
 Control of level, flow rate, temperature and cascade control; plant control and configuration via touch screen and PLC



RT 590
Process control engineering experimental plant
 Complex industrial-scale experimental plant with large range of experiments; control of level, flow rate, pressure, temperature and cascade control, system control via PLC



GUNT-Service
Laboratory and conceptual design

Are you planning a new laboratory?
 A new specialist room?
 An entire department?
 Do you want to modernize?

Then take advantage of our know-how and experience! Our engineers design complete laboratories and fit them out. We provide an individual response to your requirements, taking into account the specific local environment:

- room drawings
- supply connections
- equipment lists
- performance specifications, etc.

If you have any questions please contact our sales or customer service, who would be glad to help you.



Contact form

Thermoline – Fundamentals of heat transfer

with GUNT's SMART features



WL 420 Heat conduction in metals

About the product:



3 | Thermal engineering



Fundamentals of thermodynamics

Thermodynamic state variables	088
Phase transition	089
Principles of heat transfer	090



Heat exchangers

Heat transfer	092
Recuperators	093
Direct-contact heat exchangers	095
Fluidisation and heat transfer	095



Thermal fluid energy machines

Steam power plants	096
Gas turbines	098
Piston compressors	099
Compressors	100



Internal combustion engines 101



Thermal engineering



Fundamentals of thermodynamics
Thermodynamic state variables

WL 201
Fundamentals of humidity measurement

Climatic chamber with adjustable humidity; comparison of four measuring methods



WL 203
Fundamentals of pressure measurement

Measurement of positive and negative pressure with different measuring devices



WL 202
Fundamentals of temperature measurement

Experimental introduction to temperature measurement: methods, areas of application, characteristics



WL 103
Expansion of ideal gases

Determination of the adiabatic exponent according to Clément-Desormes



WL 102
Change of state of gases

Isothermal and isochoric change of state of air



WL 920
Temperature measurement

Investigation of transient temperature behaviour and defined temperature jumps



Fundamentals of thermodynamics
Phase transition

WL 210
Evaporation process

Different forms of evaporation in an externally heated pipe



WL 204
Vapour pressure of water –
Marcet boiler

Pressure and temperature measurement in a steam boiler



WL 220
Boiling process

Visualisation of different forms of evaporation in a transparent pressure vessel



WL 230
Condensation process

Measurement of heat transfer in dropwise and film condensation



WL 205
Vapour pressure curve of water –
Marcet boiler

Pressure and temperature measurement in a steam boiler, software-supported experiments and evaluation



Fundamentals of thermodynamics
Principles of heat transfer



WL 420 – Thermoline
www.gunt.de

WL 362
Energy transfer by radiation
Investigation of thermal and light radiation; thermal radiator and thermopile for the investigation of thermal radiation



WL 460
Heat transfer by radiation
Effect of different surfaces on heat transfer



WL 377
Convection and radiation
Heat transport between heating element and vessel wall by convection and radiation



WL 440
Free and forced convection
Calculation of convective heat transfer at different geometries: flat plate, cylinder, tube bundle



WL 430
Heat conduction and convection
Investigation of heat conduction and convection using the example of a cooling fin



WL 420
Heat conduction in metals
Investigation of the thermal conductivity of different metals



WL 422
Heat conduction in fluids
Determination of the coefficient of thermal conductivity for gaseous and liquid fluids



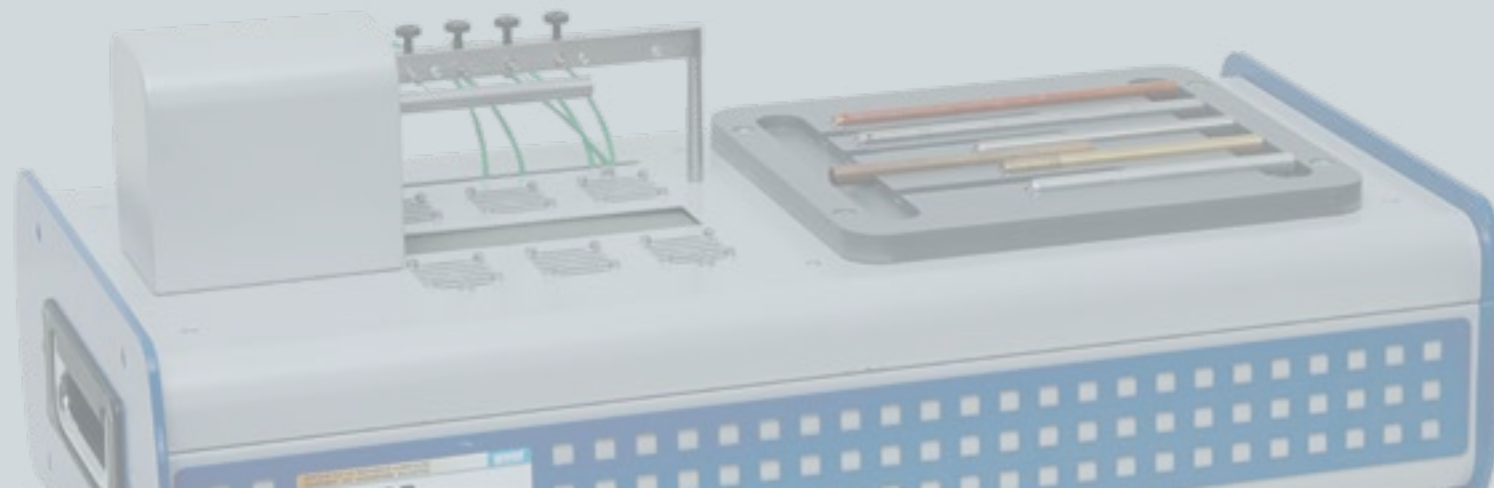
WL 900
Steady-state and non-steady-state heat conduction
Linear heat conduction in metals; non-steady state temperature distribution



WL 376
Thermal conductivity of building materials
Investigation of the insulation properties of typical materials from the building materials sector



WL 372
Radial and linear heat conduction
Study of heat conduction in solids



Heat exchangers
Heat transfer

WL 314
Convective heat transfer in air flow
Convective heat transfer in heat exchangers with different geometries



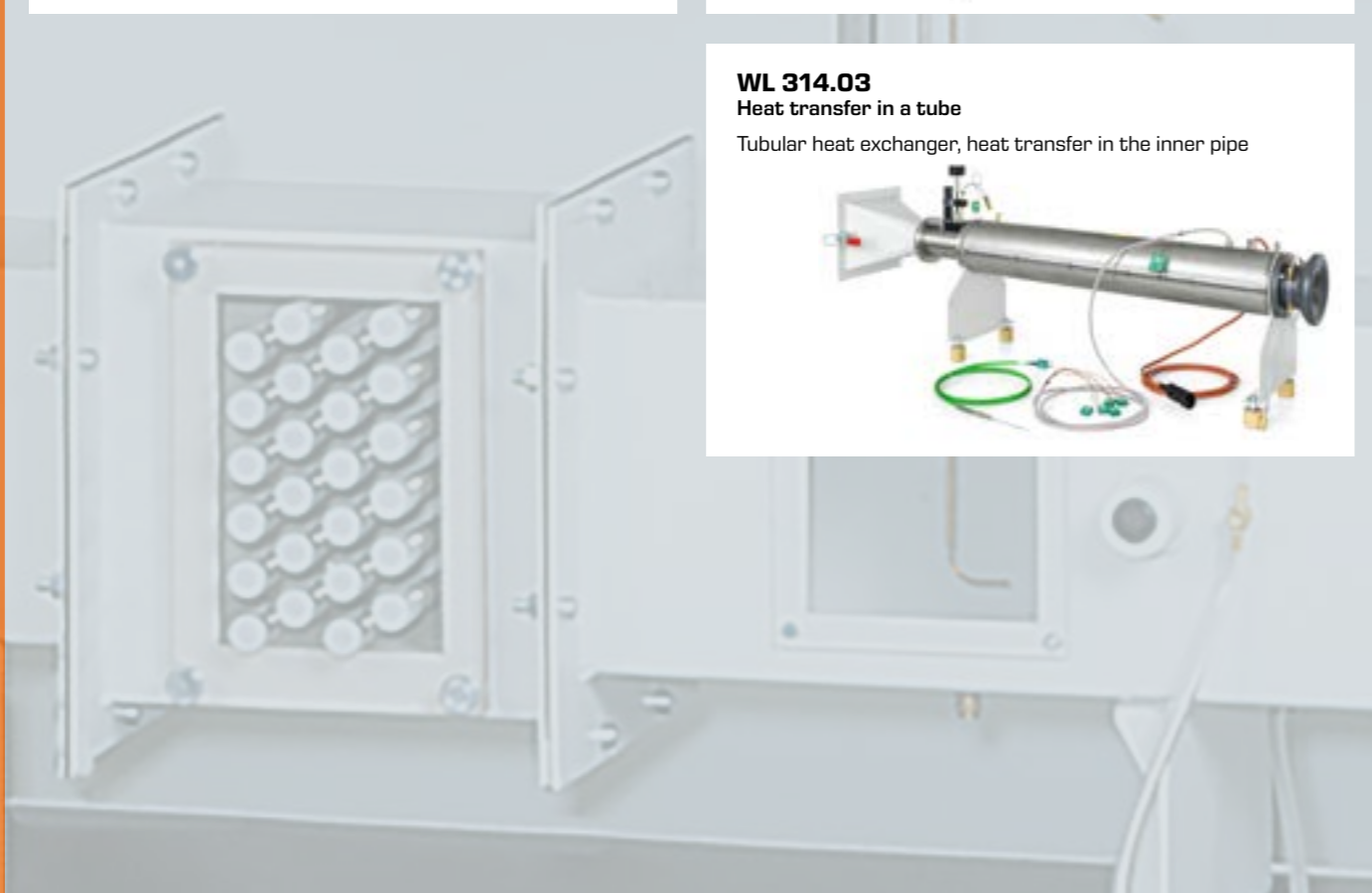
WL 314.01
Heat transfer in pipes in parallel flow
Heat transfer from the tube wall to the flowing medium



WL 314.02
Heat transfer in pipes in mixed flow
Heat transfer in a shell and tube heat exchanger in cross-flow operation



WL 314.03
Heat transfer in a tube
Tubular heat exchanger, heat transfer in the inner pipe



Heat exchangers
Recuperators

WL 110 Serie
www.gunt.de



WL 110
Heat exchanger supply unit
Measuring the transfer characteristics of five different heat exchanger models, system control via PLC



WL 110.01
Tubular heat exchanger
Transparent heat exchanger with additional temperature measuring point after half of the transfer section; parallel flow and counterflow operation



WL 110.02
Plate heat exchanger
Typical plate heat exchanger in parallel flow and counterflow operation



WL 110.03
Shell & tube heat exchanger
Transparent shell and tube heat exchanger in cross parallel flow and cross counterflow operation



WL 110.04
Stirred tank with double jacket and coil
Heating using jacket or coiled tube; stirrer for improved mixing of medium



WL 110.05
Finned tube heat exchanger
Heat transfer between water and air; cross-flow operation



WL 308
Heat transfer in pipe flow
Heat exchanger with measurement of the fluid and wall temperature; operation in parallel flow and counterflow



Heat exchangers
Recuperators

WL 302
Heat transfer in the tubular heat exchanger

Heat transfer in pipe flows and determination of heat flux; parallel flow and counterflow operation



WL 315.01
Shell & tube heat exchanger steam/water

Heat transfer process between steam and water, determination of heat flux of steam and water



ET 300
Finned tube heat exchanger water/air

Function of the heat exchanger as an air heater or water cooler



WL 312
Heat transfer in air flow

Convective heat transfer using shell & tube and finned tube heat exchangers



WL 315C
Comparison of various heat exchangers

Comparison of plate heat exchanger, tubular heat exchanger, shell and tube heat exchanger, finned cross-flow heat exchanger, and stirred tank with double jacket and coiled tube, system control via PLC



Heat exchangers
Direct-contact heat exchangers

WL 320
Wet cooling tower

Principle of operation and characteristic variables of a wet cooling tower with forced ventilation



WL 320.01 - WL 320.04
Cooling columns, type 2 - type 5

Cooling columns with different wetting areas



Heat exchangers
Fluidisation and heat transfer

WL 225
Heat transfer in the fluidised bed

Heat transfer from a heating element to the fluidised bed



Thermal fluid energy machines
Steam power plants

ET 860
Safety devices on steam boilers

Familiarisation with boiler safety devices such as pressure and water level monitors



ET 810
Steam power plant with steam engine

Single-cylinder piston steam engine with gas-fired boiler for steam generation



ET 805.50
Determination of the vapour content

Determination of the vapour content using a separating calorimeter with cyclone water separator or a throttling calorimeter with vapour depressurisation



ET 830
Steam power plant, 1,5kW

Oil-fired boiler, single-stage small industry turbine, condenser and feed water purification and monitoring via PLC

ET 813
Two-cylinder steam engine

Single-acting steam engine with condensation for determining mechanical power and efficiency



HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines



Wet cooling towers for steam power plants ET 830 / ET 833 for re-cooling the cooling water

ET 830.01 (115kW) or ET 830.02 (140kW)

ET 833.01 (115kW) or ET 833.02 (140kW)



Experimental plant with two-cylinder steam engine ET 813, steam generator ET 813.01 and brake unit HM 365



ET 850
Steam generator

Laboratory scale gas-fired steam generator for wet or superheated steam; integrated condenser



ET 833
Steam power plant 1,5kW with process control system

Steam turbine system like ET 830, with additional monitoring and control via control station with touch screen panel



ET 851
Axial steam turbine

Single-stage steam turbine with power output measurement; steam supply via ET 850, gas-fired or ET 852, electrical



ET 852 Steam generator, electrical

Laboratory scale electrical steam generator for superheated steam; integrated condenser; alternative to the gas-fired steam generator ET 850 for the supply of the steam turbine ET 851



ET 805
Steam power plant 20kW with process control system

Steam turbine with synchronous generator for grid-connected or stand-alone operation. Fully equipped with oil-fired or gas-fired boiler, condenser, cooling tower, feed water purification and modern synchronisation device (PPU)



Thermal fluid energy machines

Gas turbines

ET 792

Gas turbine

Operation with power turbine or as jet engine with propelling nozzle using liquid gas



ET 796

Gas turbine jet engine

Small single-shaft gas turbine with thrust measurement using either kerosene or petroleum



ET 794

Gas turbine with power turbine

Two-shaft arrangement with high-pressure turbine and power turbine using liquid gas



Thermal fluid energy machines

Piston compressors

ET 508

Simulation of a two-stage air compressor

Simulated operation of a two-stage compressor plant with intermediate and aftercooling



ET 513

Single-stage piston compressor

Investigations on an air compressor including the determination of the mechanical power consumption

Together with the HM365 drive unit, the single-stage piston compressor forms a complete compressed air generation system.



ET 432

Behaviour of a piston compressor

Investigations in an open two-cylinder piston compressor from refrigeration

For free
Multimedia instructional materials via Internet



Thermal fluid energy machines
Compressors

ET 500
Two-stage piston compressor

Recording the characteristic of an industrial two-stage compressor, system control via PLC

For free
Multimedia instructional materials via Internet



MT 141
Assembly exercise: piston compressor

Function and design of a piston compressor; planning, assembly, disassembly

For free
Multimedia instructional materials via Internet



MT 142
Energy efficiency in piston compressors

Installation of the assembled MT 141 piston compressor: functional test; balancing of energies

For free
Multimedia instructional materials via Internet

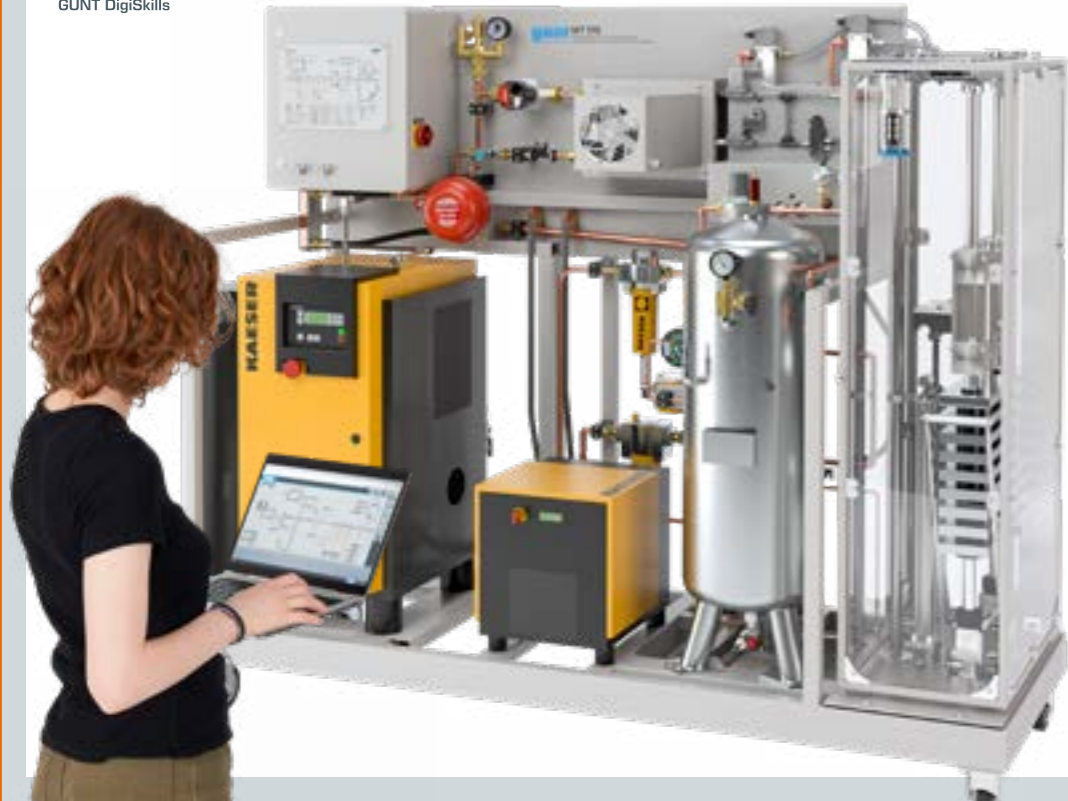


How to achieve the digital transformation to Industry 4.0

MT 175
Energy efficiency in compressed air systems

Energy efficiency of an industrial plant for metalworking and mechatronics, system control via PLC

For free
Multimedia instructional materials via Internet



Internal combustion engines



Modular test stand for single cylinder test engines CT 159, test engine CT 151 and brake unit HM 365

CT 159
Modular test stand for single-cylinder engines, 3 kW

Mounting the engine, supply with fuel and air; measurement of characteristic engine data



HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines



CT 150
Four-stroke petrol engine for CT 159

Air-cooled overhead valve four-stroke petrol engine



CT 151
Four-stroke diesel engine for CT 159

Air-cooled four-stroke diesel engine with direct injection



CT 153
Two-stroke petrol engine for CT 159

Air-cooled two-stroke petrol engine



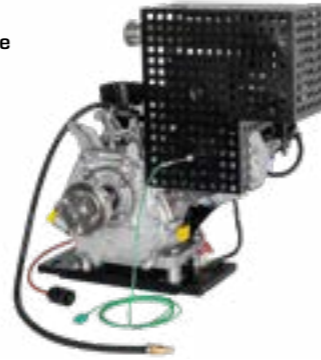
Internal combustion engines

CT 110
Test stand for single-cylinder engines, 7,5 kW

Control and load unit, supply with fuel and air; measurement of characteristic engine data

**CT 100.20**
Four-stroke petrol engine for CT 110

Air-cooled four-stroke petrol engine with external carburation

**CT 100.21**
Two-stroke petrol engine for CT 110

Air-cooled two-stroke petrol engine with reverse scavenging

**CT 100.22**
Four-stroke diesel engine for CT 110

Air-cooled four-stroke diesel engine with direct injection

**CT 100.23**
Water-cooled four-stroke diesel engine for CT 110

Water-cooled four-stroke diesel engine using the swirl chamber principle

**CT 300**
Engine test stand, 11 kW

Test stand for industrial two-cylinder engines

**CT 300.04**
Two-cylinder petrol engine for CT 300

Air-cooled four-stroke petrol engine with external carburation

**CT 300.05**
Two-cylinder diesel engine for CT 300

Water-cooled four-stroke diesel engine with indirect injection

**CT 400**
Load unit, 75 kW, for four-cylinder engines

Load unit with air-cooled eddy-current brake and instruments

**CT 400.01**
Four-cylinder petrol engine for CT 400

Water-cooled petrol engine with controlled catalytic converter, max. 75 kW

**CT 400.02**
Four-cylinder diesel engine for CT 400

Diesel engine with direct injection, max. 41 kW



Learning with cognitive assistance systems and GUNT's SMART features











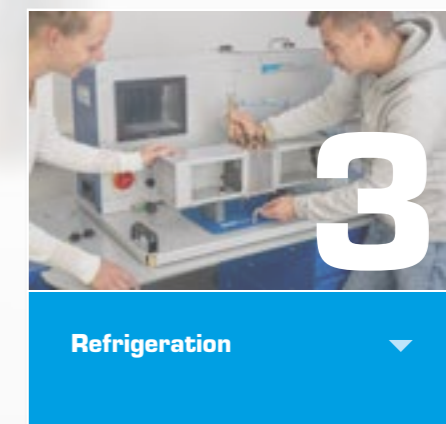
ET 380 Refrigeration cycle: refrigeration plant and heat pump

About the product:



3 | Refrigeration

 Principles of cold production	106	 Heat pumps and ice store	115
 Fundamentals of refrigeration	107	 Solar cooling	116
 Thermodynamics of the refrigeration cycle	109	 Electrical engineering in refrigeration	117
 Components of refrigeration	110	Refrigeration controls	117
Modular training systems	110	Control of refrigeration systems	117
Compressors	111	Fault finding	118
Evaporators and condensers	112	 Assembly, fault finding, maintenance	119
Primary and secondary controllers	112		
Piping	113		
Cutaway models	113		



Principles of cold production

ET 101
Simple compression refrigeration circuit

Cooling and heating of the heat exchangers directly tangible



ET 120
Cooling using the Peltier effect

Demonstration of the thermo-electric effect



ET 122
Vortex cooling device

Cooling and heating using compressed air



ET 480
Absorption refrigeration system

Thermally driven refrigeration system without compressor that can be heated with either gas or electrically



ET 352
Vapour jet compressor in refrigeration

Cold production using thermal energy. Transparent condenser and evaporator allow the view into the inner workings.



ET 360 Refrigeration circuit with propane

Investigate steady and transient load behavior of a propane refrigeration system. Dynamic display of the refrigerant mass flow and log p-h diagram in real time.

For free
Multimedia instructional materials via Internet



Fundamentals of refrigeration

ET 411C
Compression refrigeration system

Comparison of different expansion elements, investigation of the effects of over- and underfilling with refrigerant



ET 350
Changes of state in the refrigeration circuit

Energetic analyses of the refrigeration cycle; transparent components offer insights into the changes of state



For free
Multimedia instructional materials via Internet

ET 400
Refrigeration circuit with variable load

Compression refrigeration system with water-cooled evaporator



ET 350.01
Hot water generator

Production of hot water for the experiments in ET 350



GUNT Cold Play
Our concept combining hardware and digital features for gamified learning



GUNT Cold Play
www.gunt.de



Fundamentals of refrigeration

ET 915.01 Refrigerator model

Simple model of a domestic refrigerator for connection to ET 915



ET 915.02 Model of a refrigeration system with refrigeration and freezing stage

Series and parallel connection of evaporators; connection to ET 915



ET 915 HSI training system refrigeration and air conditioning technology, base unit

Modern learning environment through hardware/software integration (HSI)



HSI training system refrigeration with ET 915 and ET 915.02



Thermodynamics of the refrigeration cycle

ET 441 Refrigeration chamber and defrosting methods

Climatic investigations in cooling and freezing chambers; frosting and defrosting of the evaporator



ET 430 Refrigeration system with two-stage compression

Low temperature refrigeration system; compression with injection intercooler and additional refrigerant supercooling



ET 412C Refrigeration system with refrigeration and freezing chamber

Simulation of 18 electrical and hydraulic faults



ET 351C Thermodynamics of the refrigeration circuit

Compression refrigeration system for thermodynamic investigations, measurement of the mechanical compressor output



ET 380 Refrigeration cycle: refrigeration plant and heat pump

Visible phase transitions in evaporator and condenser, log p-h diagram in real time

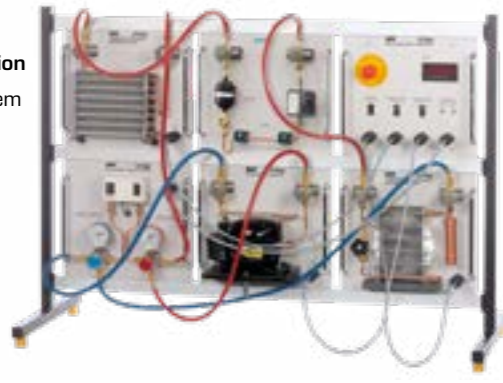


For free
Multimedia instructional materials via Internet

**Components of refrigeration
Modular training systems**

ET 900
Introduction to refrigeration

Training system with interchangeable modules



ET 910
Refrigeration training system, base unit

Set-up of various refrigeration circuits using modular component kits; includes refrigeration chamber and condensing unit



ET 910.10
Refrigeration components for basic experiments

Accessories to set up simple refrigeration circuits



ET 910.11
Refrigeration components for advanced experiments

Accessories to set up complex refrigeration circuits



Experimental setup capacity control with post injection with ET 910, ET 910.10 and ET 910.11



**Components of refrigeration
Compressors**



Compression refrigeration system ET 165 with drive unit HM 365

ET 165
Refrigeration system with open compressor

Capacity measurement at the open compressor with variable speed; refrigeration chamber with adjustable cooling load



HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines



ET 432
Piston compressor in refrigeration

Investigations in an open two-cylinder piston compressor from refrigeration

For free
Multimedia instructional materials via Internet



ET 428
Energy efficiency in refrigeration systems

Refrigeration system with three compressors in interconnected operation; adaptation to the capacity requirement



Refrigeration Evaporators and condensers

ET 431 Heat exchangers in the refrigeration circuit

Properties of different heat exchangers and their use in refrigeration; effect of superheating and supercooling



ET 405 Heat pump for cooling and heating operation

Heat pump with various heat exchangers for air and water



Refrigeration Piping

ET 460 Oil return in refrigeration systems

Transport of lubricants soluble in refrigerant in refrigeration systems; transparent pipes



Refrigeration Primary and secondary controllers

ET 182 Secondary controllers in refrigeration systems

Demonstration of the principle of operation of the various secondary controllers in the refrigeration circuit



ET 180 Pressure switches in refrigeration

Protection against overpressure and negative pressure in the refrigeration circuit; display of switching states via lamps



ET 426 Capacity control in refrigeration systems

Investigation of different capacity control methods



Refrigeration Cutaway models

ET 499.30 Cutaway model: ceiling air cooler



ET 499.01 Cutaway model: hermetic refrigerant compressor



ET 499.02 Cutaway model: semi-hermetic refrigerant compressor



ET 499.03 Cutaway model: open refrigerant compressor, two-cylinder



Refrigeration
Cutaway models

ET 499.12
Cutaway model:
block drier



ET 499.13
Cutaway model:
oil separator



ET 499.14
Cutaway model:
liquid separator



ET 499.16
Cutaway model:
ball valve



ET 499.18
Cutaway model:
thermostatic expansion
valve



ET 499.19
Cutaway model:
automatic expansion valve



ET 499.21
Cutaway model:
sight glass with
humidity indicator



ET 499.25
Cutaway model:
4-way reversing valve



ET 499.26
Cutaway model:
condensation pressure
control valve



Heat pumps and ice store

ET 102
Heat pump
Utilisation of ambient
heat for water heating



ET 405
Heat pump
for cooling and
heating operation
Heat pump with
various heat
exchangers for air
and water



ET 420
Ice stores in refrigeration
Industrial refrigeration system
with ice store, dry cooling
tower and wet cooling tower



HL 320.01
Heat pump
Heat pump for operation with different sources, operating the
heating controller via touch screen or web browser



HL 320.07
Underfloor heating/
geothermal energy
absorber
Can be used as heat
sink or heat source



HL 320.08
Fan heater/
air heat exchanger
Can be used as heat sink
or heat source



Solar cooling

ET 256
Cooling with solar electricity
Compression refrigeration system for operation with solar current from ET 250 or ET 255.02



ET 256 together with the optional artificial light source HL 313.01 and solar modules ET 250

ET 352.01
Solar heat for refrigeration
Solar thermal operation of a vapour jet compressor



ET 352
Vapour jet compressor in refrigeration
Cold production using thermal energy. Transparent condenser and evaporator allow the view into the inner workings.



HL 313
Domestic water heating with flat collector
Demonstration of the conversion of the sun's radiation energy into heat and the storing of that heat, operating the solar controller via web browser



HL 314
Domestic water heating with tube collector
Familiarisation with the functions of the evacuated tube collector and the solar circuit, operating the solar controller via web browser



ET 480
Absorption refrigeration system
Thermally driven refrigeration system without compressor that can be heated with either gas or electrically



Electrical engineering in refrigeration
Refrigeration controls

ET 144
Electrical installation in refrigeration systems
Design and wiring of typical electrical circuits from refrigeration

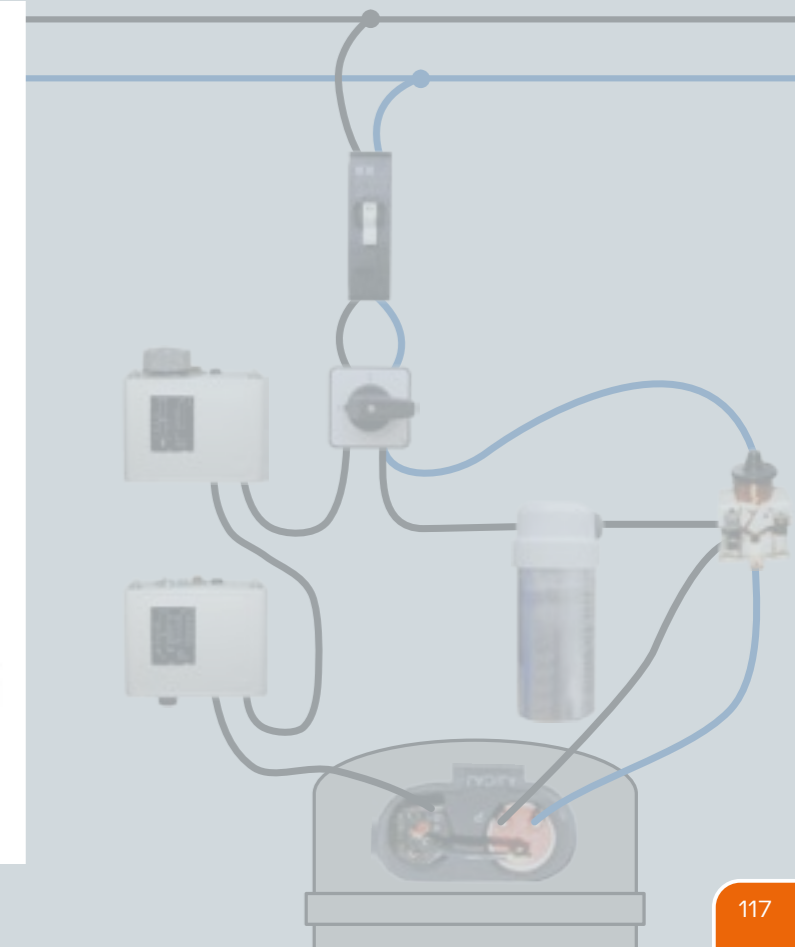


ET 171
Electrical connection of refrigerant compressors
Use of a real refrigerant compressor



Electrical engineering in refrigeration
Control of refrigeration systems

ET 930
Evaporator control with electronic expansion valve
Practical programming of a modern refrigeration controller



Electrical engineering in refrigeration
Fault finding

ET 172
Electrical faults in refrigerant compressors
Investigation of important electrical components from refrigeration



ET 170
Electrical faults in simple air conditioning systems
Simulation of a simple air conditioning system with compressor, fan and thermostat



ET 174
Electrical faults in full air conditioning systems
Simulation of the electrical circuit of a complex conditioning system with humidifying and heat pump function



Electrical engineering in refrigeration
Assembly, fault finding, maintenance

MT 210
Assembly & maintenance exercise: refrigeration
Study project with high practical relevance for training in metal and electrical professions: assembly of a refrigeration system from individual components



ET 192
Replacement of refrigeration components
Service and repair exercises: replacement of compressor, pressure switch, filter / drier, solenoid valve and expansion valve



ET 422
Capacity control and faults in refrigeration systems
Investigation of different methods for capacity control; fault simulation



ET 195
Process cooling
Industrial-scale chiller with extensive operating functions and maintenance work; system control via PLC



For free
Multimedia instructional materials via Internet

The trainer can be used as a stand-alone unit or in conjunction with the ET 620 Air conditioning and ventilation system or the Pasteurisation process in the CE 750.



Technical and Vocational Education and Training in operation & maintenance services

- learning in an environment similar to industry
- modern industrial components, carefully prepared for training courses
- typical operations and maintenance tasks






Hands-on teaching of air conditioning technology

with GUNT's SMART features



ET620 Air conditioning and ventilation system

3 | HVAC

	Air conditioning technology	122		Heating technics	132
	Principles of air conditioning technology	122		Principles of heating	132
	States of the air	123		Applied heating technics	134
	Practical air conditioning systems	124			
	Ventilation	125		Sanitary systems	137
	Renewable energies in building services engineering	126			
	Photovoltaics	126			
	Solar thermal energy	127			
	Shallow geothermal energy	128			
	Cogeneration	128			
	Energy efficiency in building services engineering	129			
	Heat pumps	130			
	Ice store	130			



About the product:



Air conditioning technology
Principles of air conditioning technology

ET 605
Air conditioning system model
 Climatic chamber with latent and sensitive heat source as cooling load; recirculating and outer air operation



HSI training system air conditioning technology with ET 915 and ET 915.07

ET 915.06
Model of a simple air conditioning system

Model of a simple air conditioning system for room cooling; connection to ET 915



ET 915
HSI training system refrigeration and air conditioning technology, base unit

Modern learning environment through hardware/software integration (HSI)



ET 915.07
Air conditioning model

Model of a full air conditioning system with outer air and recirculating operation; connection to ET 915



Air conditioning technology
States of the air

WL 320
Wet cooling tower

Principle of operation and characteristic variables of a wet cooling tower with forced ventilation



WL 320.01 - WL 320.04
Cooling columns, type 2 - type 5

Cooling columns with different wetting areas



WL 201
Fundamentals of humidity measurement

Climatic chamber with adjustable humidity; comparison of four measuring methods



Air conditioning technology
Practical air conditioning systems

ET 611
Air conditioning system with chamber
 Chamber for comfort studies, suitable for occupation by test individuals. Air conditioning system with water chiller and vapour humidifier.



ET 600
Conditioning of room air
 Air conditioning system consisting of industrial components including direct evaporator and vapour humidifier



ET 630
Split system air conditioner
 Modern air conditioning unit with heat pump function: cooling or heating



ET 450
Vehicle air conditioning
 Vehicle air conditioning system for cooling the vehicle interior; use of typical components from automotive technology



ET 620
Air conditioning and ventilation system
 Manual or automatic operation by PLC; use of real components



For free
 Multimedia instructional materials via Internet

Ventilation

HL 720
Ventilation system
 Design and operation of a ventilation system; measuring the pressure curve within the ventilation system



HL 722
Control unit for ventilation system
 Temperature control unit for ventilation system HL 720



HL 710
Air duct systems
 Planning and setup of simple and complex air duct systems





Renewable energies in building services engineering
Photovoltaics

ET 252
Solar cell measurements

Investigation of the properties of solar cells; objective measurements by extensive temperature control of solar cells



ET 250
Photovoltaic modules measurements

Determining the characteristic parameters of a photovoltaic system



ET 250.01
Photovoltaic in grid-connected operation

Expansion module for ET 250 with components for feeding solar power into a public grid



ET 250.02
Stand-alone operation of photovoltaic modules

Expansion module for ET 250 with components for independent use of electricity from photovoltaic modules



ET 255
Energy system for solar and wind power

Electrical components of a photovoltaic installation in practice; operation with real photovoltaic modules or a photovoltaic simulator



ET 255.01
Photovoltaic simulator

Simulation of the current and voltage characteristics of photovoltaic modules

ET 255.02
Photovoltaic modules

Operating behaviour of photovoltaic modules with varying temperature and illuminance; illumination by sunlight or light source HL.313.01

ET 255.03
Consumers

Controllable electrical consumers for utilisation simulation in solar electricity systems

ET 256
Cooling with solar electricity

Compression refrigeration system for operation with solar current from ET 250 or ET 255.02



Photovoltaics
www.gunt.de



Renewable energies in building services engineering
Solar thermal energy

Solar thermal energy
www.gunt.de



ET 202
Principles of solar thermal energy

Determining characteristic parameters of a solar thermal system; model fitted with artificial radiation source



ET 202.01
Parabolic trough collector

Function and operating behaviour of a parabolic trough collector, accessories for ET 202



ET 203
Parabolic trough collector with solar tracking

Function and operating behavior of a parabolic trough collector; astronomical and sensor-based sun tracking, system control via PLC



HL 320.03
Flat collector

Pivotable flat collector for converting solar energy into heat



HL 320.04
Evacuated tube collector

Conversion of solar energy into heat in the evacuated tube collector



HL 313
Domestic water heating with flat collector

Demonstration of the conversion of the sun's radiation energy into heat and the storing of that heat



HL 314
Domestic water heating with tube collector

Familiarisation with the functions of the evacuated tube collector and the solar circuit



HL 320.05
Central storage module with controller

Module with buffer storage and bivalent storage for heating systems with renewable energies, operating the heating controller via touch screen or web browser



Renewable energies in building services engineering
Shallow geothermal energy

ET 264
Geothermal energy with two-well system
Use of geothermal energy in an open system without thermal repercussion



ET 262
Geothermal probe with heat pipe principle
Transparent components allow observing how the state of the heat transfer medium changes



HL 320.07
Underfloor heating / geothermal energy absorber
Can be used as heat sink or heat source



Renewable energies in building services engineering
Cogeneration

ET 292
Fuel cell system
Water-cooled polymer-membrane fuel cell combined heat and power



For free
Multimedia instructional materials via Internet

Renewable energies in building services engineering
Energy efficiency in building services engineering



HL 320.01
Heat pump
Heat pump for operation with different sources, operating the heating controller via touch screen or web browser



HL 320.02
Conventional heating
Electric complementary heater for the HL 320 modular system



HL 320.03
Flat collector
Pivotable flat collector for converting solar energy into heat



HL 320.04
Evacuated tube collector
Conversion of solar energy into heat in the evacuated tube collector



HL 320.05
Central storage module with controller
Module with buffer storage and bivalent storage for heating systems with renewable energies, operating the heating controller via touch screen or web browser



HL 320.07
Underfloor heating / geothermal energy absorber
Can be used as heat sink or heat source



HL 320.08
Fan heater / air heat exchanger
Can be used as heat sink or heat source



Renewable energies in building services engineering

Heat pumps

ET 102 Heat pump

Utilisation of ambient heat for water heating



ET 405 Heat pump for cooling and heating operation

Heat pump with various heat exchangers for air and water



HL 320.01 Heat pump

Heat pump for operation with different sources, operating the heating controller via touch screen or web browser



Renewable energies in building services engineering

Ice store

ET 420 Ice stores in refrigeration

Industrial refrigeration system with ice store, dry cooling tower and wet cooling tower



GUNT-Service Installation and com- missioning

Have your new equipment commissioned by trained expert personnel. Our highly qualified staff will gladly assist you.

Commissioning of the equipment includes the following services:

- setup of equipment in the laboratory
- connection to the laboratory's supply systems
- commissioning the equipment
- testing the equipment

 Heating technics
Principles of heating
HL 102
Installation technology: losses in different pipes

Investigation of the pressure difference in four equal-length pipe sections made of different materials

**HL 103**
Installation technology: losses in pipe bends

Investigation of the pressure loss at pipe elements with different changes in pipe direction and materials

**HL 106**
Four-way mixing valve training panel

Effect of mixing ratio on feed flow and circulating flow temperature

**HL 107**
Circulating pumps training panel

Series and parallel operation of two pumps

**HL 111**
Installation technology: losses in straight pipes

Determining the pressure loss in an open pipe section

**HL 113**
Installation technology: losses in valves and fittings

Investigation of the pressure loss of standard valves and fittings

**HL 108**
Domestic heating circuit training panel

Model of a central heating system with radiators, circulating pump and four-way mixing valve

**HL 109**
Safety devices training panel

Function of safety valves against excess pressure and excess temperature

**HL 210**
Installation technology: losses in a pipe system

Investigation of pressure losses at contractions, pipe angles, pipe bends, valves and fittings and pipe elements

**HL 101**
Thermal expansion training panel

Investigation of thermal expansion of different pipe sections (PVC, PE, Cu, steel)

**HL 110**
Expansion vessel training panel

Displacement volume of an expansion vessel as a function of the pressure

**HL 112**
Radiator training panel

Familiarisation with a hot water heating system

**HL 104**
Temperature measurement training panel

Investigation of four different temperature measuring methods

**HL 105**
Three-way mixing valve training panel

Effect of mixing ratio on feed flow and circulating flow temperature



Heating technics

Applied heating technics

ET 203 Parabolic trough collector with solar tracking

Function and operating behavior of a parabolic trough collector, astronomical and sensor-based sun tracking, system control via PLC



ET 202 Principles of solar thermal energy

Determining characteristic parameters of a solar thermal system; model fitted with artificial radiation source



ET 202.01 Parabolic trough collector

Function and operating behaviour of a parabolic trough collector, accessories for ET 202



HL 305 Hydronic balancing of radiators

Hydronic balancing of a heating system: three heating subcircuits with radiators, thermostatic valves and circulation pump



HL 313 Domestic water heating with flat collector

Demonstration of the conversion of the sun's radiation energy into heat and the storing of that heat, operating the solar controller via web browser



HL 300 Hot water heating system

Function and operating behaviour of a hot water heating system with digital heating controller



HL 350 Oil burner demonstrator

Heating boiler with viewing window for observing the flame



HL 351 Domestic heating boiler

Heating boiler with an oil burner; hot water generator for other trainers from the HL series



HL 352 Test stand for oil, natural gas and propane gas burners

Design and operating behaviour of a heating boiler with hot water storage



HL 353 Hot water generator

Setup of a complete domestic heating system together with HL 353.01 and/or HL 353.02



HL 353.01 Comparison of different heating types

Two independent heating circuits: floor heating or forced convector with fan and two radiators



HL 353.02 Heat distribution and control in heating systems

Two independent heating circuits with control devices: heating circuit with one subcircuit and with two subcircuits



HL 860 Exhaust gas analyser

Easy to operate gas analysis device



HL 360 Oil tank safety trainer

Investigation of tank safety devices and their function



Heating technics Applied heating technics

HL 392C Safety & control in heating systems

Function and operating behaviour of safety valve, safety pressure cut-out, temperature controller, flow switch and much more



HL 510 Domestic gas supply training panel

Simulation of leaks in pipes



HL 500 Instantaneous gas heater

Methods of gas burner adjustment; simulation of twelve faults



HL 358 Forced air gas burner training panel

Nominal load adjustment and fault finding on a gas burner; hazard-free due to operation with air



HL 356 Demo unit, gas burner

Electronic simulation of the operation of a forced air gas burner



HL 530 Training panel function of gas heater

Functioning of a typical combination boiler; separate circuits for room heating and domestic water heating



HL 620 Domestic heating system control training panel

Operation of a modern heating controller



HL 630 Efficiency in heating technolog

Basic principles of energy efficient heating technology with a computer-supported learning process



Sanitary systems

ST 210 Sanitation fittings training panel

Investigation of function and operating behaviour: two handle mixers, flushing valve



ST 330 Protection of drinking water training panel

Safety and hygiene of drinking water pipes



ST 320 Pipe cleaning training panel

Pipe flushing according to DIN 1988 standards; contaminants can be introduced



ST 310 Drinking water installation demonstrator

Drinking water installation in domestic setting with all common components



ST 510 Full-scale sewerage system

Demonstration of key aspects of wastewater technology. Transparent piping system allows view of the inside to observe the flow conditions.



HM150 DIGITAL – Fluid dynamics

with GUNT's SMART features



HM150.21 Visualisation of streamlines in an open channel

About the HM 150 series



4 | Fluid mechanics



Fundamentals of fluid mechanics

Physics and properties of fluids	140
Fundamentals of hydrostatics	141
Flow around bodies	141
Fundamentals of hydrodynamics	142
Flow in pipes	143
Methods of flow rate measurement	143
Compact fluid mechanics: Fluidtutor	144
Turbomachines	144
Open-channel flow	145
Compact + digital: HM 250 Fundamentals of fluid mechanics	146



Steady flow

Fundamentals of steady flow	148
Steady flow of compressible fluids	150
Flow in pipe systems	151
Flow in valves	153
Methods of flow rate measurement	153
Cavitation	154



Examples of transient flow

155



Flow around bodies

156



Hydraulic fluid energy machines

Hydraulic turbines	159
Driven machines	160
Centrifugal pumps	161
Positive displacement pumps	161



Components in piping systems and plant design

Cutaway models	162
Assembly exercises: valves and fittings	166
Assembly & maintenance exercises: pumps	167
Design of complex piping and plant systems	168



Fluidic experimental plants

169



Fluid mechanics




Fundamentals of fluid mechanics
Physics and properties of fluids
WL 202
Fundamentals of temperature measurement

Experimental introduction to temperature measurement: methods, areas of application, characteristics


WL 203
Fundamentals of pressure measurement

Measurement of positive and negative pressure with different measuring devices


HM 150.02
Calibration of pressure gauges

Operation of a Bourdon tube pressure gauge and a piston manometer


WL 102
Change of state of gases

Isothermal and isochoric change of state of air


WL 103
Expansion of ideal gases

Determination of the adiabatic exponent according to Clément-Desormes


WL 205
Vapour pressure curve of water – Marcet boiler

Pressure and temperature measurement in a steam boiler, software-supported experiments and evaluation


WL 204
Vapour pressure of water – Marcet boiler

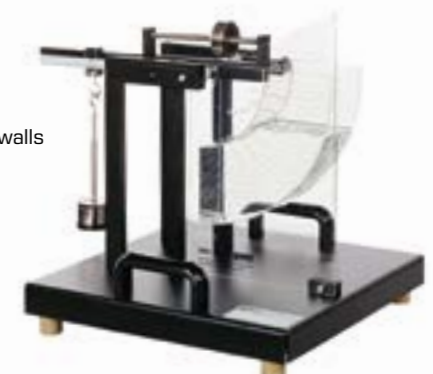
Pressure and temperature measurement in a steam boiler


Fundamentals of fluid mechanics
Fundamentals of hydrostatics
HM 115
Hydrostatics trainer

Experiments on buoyancy, density, capillarity etc.; various methods of pressure measurement


HM 150.05
Hydrostatic pressure in liquids

Investigation of fluid pressure on vessel walls


HM 150.06
Stability of floating bodies

Determining metacentre and buoyancy using a rectangular hull cross-section


HM 150.39
Floating bodies for HM 150.06

Comparison of two different frame shapes: hard chine and round bilge


Fundamentals of fluid mechanics
Flow around bodies
HM 135
Determination of the settling velocity

Vertically falling body in liquid using specimens of different sizes and different materials


HM 150.10
Visualisation of streamlines

Investigation of flow around models in laminar, two-dimensional flow using ink as contrast medium

For free
Multimedia instructional materials via Internet



Fundamentals of fluid mechanics
Fundamentals of hydrodynamics

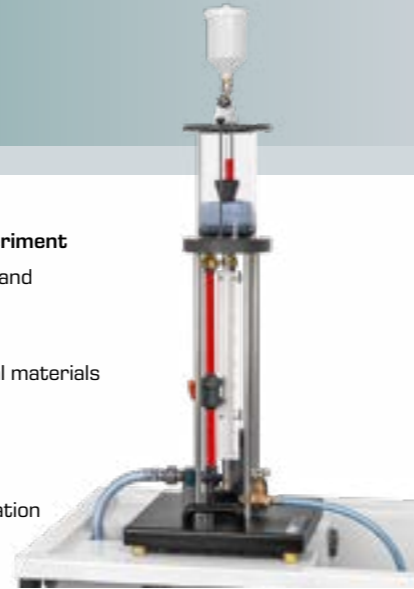
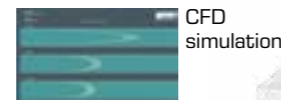
HM 150
Base module
for experiments in
fluid mechanics

Volumetric flow
measurement
for large and small
flow rates



HM 150.18
Osborne reynolds experiment
Visualisation of laminar and
turbulent flow

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via Internet



HM 150.07
Bernoulli's principle

Static pressure and total
pressure distribution
along the Venturi nozzle

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Multimedia instructional
materials via Internet



HM 150.08
Measurement of jet forces

Demonstration of the principle of
linear momentum and impact forces
on interchangeable deflectors with
different deflection angles

For free
Multimedia instructional
materials via Internet



HM 150.09
Horizontal flow from a tank

Recording the trajectory
of the water jet at different
outlet velocities

For free
Multimedia instructional
materials via Internet



HM 150.12
Vertical flow from a tank

Determination of pressure
losses and discharge
coefficient for different
outlet contours

For free
Multimedia instructional
materials via Internet



HM 150.14
Vortex formation

Free and forced vortex; point gauges
to detect surface profiles

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Multimedia instructional materials
via Internet



TM 605
Coriolis force

Demonstration of the
Coriolis force in rotating
reference systems



Fundamentals of fluid mechanics
Flow in pipes



For free
The GUNT Media Center
provides extensive multimedia
teaching material for the
experiments.



HM 150.01
Pipe friction for
laminar/turbulent flow

Determining the critical
Reynolds number
Recommended for
water supply:
HM 150 Base module
for experiments in
fluid mechanics

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Multimedia instructional
materials via Internet



CFD simulation

HM 150.11
Losses in a pipe system

Influence of flow velocity
on pressure loss

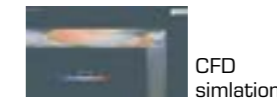
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Multimedia instructional
materials via Internet



HM 150.29
Energy losses in piping
elements

Pressure losses in various
pipe fittings and in the ball
valve

For free
Multimedia instructional
materials via Internet



HM 150 DIGITAL
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Fundamentals of fluid mechanics
Methods of flow rate measurement

HM 150.13
Methods of flow measurement

Comparison of different measuring methods and
determining the flow coefficients

For free
Multimedia instructional
materials via Internet



Fundamentals of fluid mechanics
Compact fluid mechanics: Fluidtutor

HM 241
Fundamentals
of water flow

Experiments on water flow in open flumes and in pipes. Transparent design allows observation of the flow processes.



Fundamentals of fluid mechanics
Turbomachines

HM 150.19
Operating principle of a Pelton turbine

Model of an impulse turbine with adjustable nozzle; determination of the efficiency

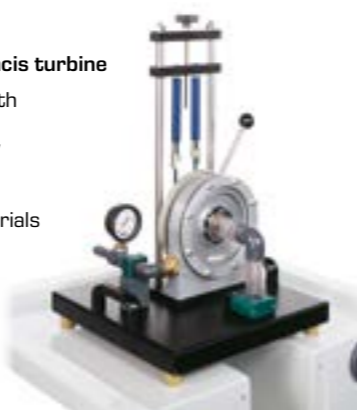
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HM 150.20
Operating principle of a Francis turbine

Model of a reaction turbine with adjustable guide vanes and determination of the efficiency

For free
Multimedia instructional materials via Internet



HM 150.04
Centrifugal pump

Determining the characteristics of a typical centrifugal pump
Required for water supply: HM 150

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Multimedia instructional materials via Internet



HM 150.16
Series and parallel configuration of pumps

Characteristic curves and hydraulic power; comparison of operating modes

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Multimedia instructional materials via Internet

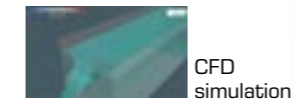


Fundamentals of fluid mechanics
Open-channel flow

HM 150.03
Plate weirs for HM 150

Discharge measurement in open channels using two measuring weirs
Required for water supply: HM 150

For free Multimedia instructional materials via Internet



HM 150.21
Visualisation of streamlines in an open channel

Flow around various drag bodies and incident flow of weirs; ink as contrast medium

For free
Multimedia instructional materials via Internet



HM 164
Open channel and closed channel flow

Flow processes on different structures in open and closed channel flows; losses at inlet and outlet



HM 160
Experimental flume 86x300 mm

Experimental section lengths of 2,5m or 5m available, closed water circuit and inclination adjustment



Accessories for the experimental flume HM160

Experiments

- control structures
- flow-measuring flumes
- change in cross-section
- wave generator
- beaches
- vibrating piles
- sediment trap
- sediment feeder

Measuring instruments

- level gauges, analogue analogue or with digital display
- determination of velocity via pitostatic tube or via velocity meter
- pressure measurement

Other accessories

- UV system for disinfection
- extension element



GUNT experimental flumes
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Fundamentals of fluid mechanics

Compact + digital: HM 250 Fundamentals of fluid mechanics



Fluid Line – HM 250
www.gunt.de

HM 250 Fundamentals of fluid mechanics

Base module for experiments in fluid mechanics, system control via PLC



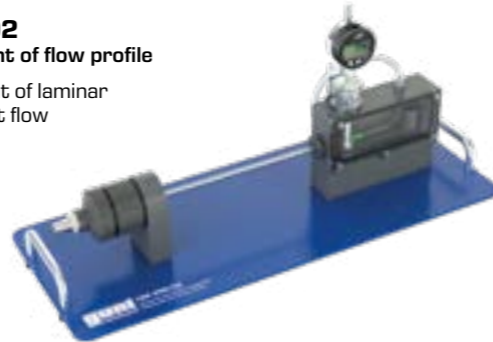
HM 250.07 Bernoulli's principle

Static pressure and total pressure distribution along the Venturi nozzle



HM 250.02 Measurement of flow profile

Measurement of laminar and turbulent flow



HM 250.04 Continuity equation

Relationship between cross-sectional area traversed and flow velocity



HM 250.05 Measurement of jet forces

Demonstration of the principle of linear momentum; interchangeable deflectors with different deflection angles



HM 250.01 Visualisation of pipe flow

Visualisation of laminar and turbulent flow



HM 250.06 Free discharge

Recording the trajectory of the water jet and discharge coefficients at different outlet velocities



HM 250.09 Fundamentals of pipe friction

Pipe friction for laminar/turbulent flow, Reynolds number and pipe friction factor



HM 250.10 Pressure curve along the inlet section

Friction losses in the inlet as well as with different pipe geometries and surface roughnesses



HM 250.11 Open channel

Flow around various drag bodies and incident flow of weirs



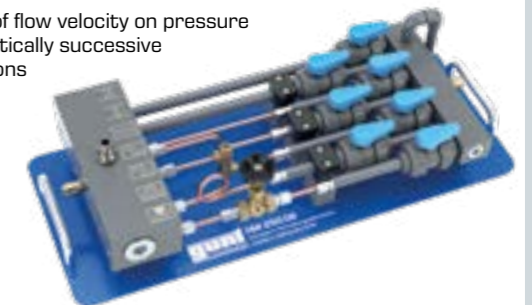
HM 250.03 Visualisation of streamlines

Investigation of cross-sectional changes in laminar, two-dimensional flow; visualisation using electrolytically generated hydrogen bubbles



HM 250.08 Losses in pipe elements

Influence of flow velocity on pressure loss, didactically successive pipe sections



HM 250.90 Laboratory shelf

Shelf with extendable shelves, for stowing accessories for HM 250

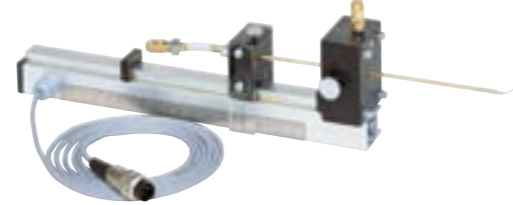


Steady flow Fundamentals of steady flow

HM 240
Principles of air flow
Recording the fan characteristic



HM 240.03
Electronic total pressure sensor
Measurement of the velocity distribution in the intake tube on HM 240



HM 240.04
Pressure distribution on a cylinder
Cylinder in transverse incident flow; record pressure distribution in the wake of the cylinder in conjunction with HM 240.03



HM 240.06
Heat transfer at a cylinder in transverse flow
Investigation of heat transfer from a heated rod to an air flow



HM 240.05
Pressure losses in pipe elements
Measurement of pressure losses in straight pipe sections, in a 90° pipe bend, and in a 90° pipe angle



HM 241
Fundamentals of water flow

Experiments on water flow in open flumes and in pipes. Transparent design allows observation of the flow processes.



HM 220
Air flow experimental plant
Determining pressure loss and velocity profiles; different measuring objects



HM 220.01
Venturi tube
Examination of the continuity equation and Bernoulli's principle; representation of the pressure curve



HM 220.02
Measurement of boundary layers
Velocity distribution and boundary layer thickness within the boundary layer of a flat plate in longitudinal flow; vertically sliding Pitot tube



HM 225
Aerodynamics trainer
For experiments from the fields of flow around bodies and steady incompressible flow



HM 225.03
Bernoulli's principle
Demonstration of the continuity equation and Bernoulli's equation



HM 225.05
Flow in a pipe bend
Determination of the static pressure at 29 pressure measuring points



HM 225.07
Free jet
Investigation of flow from nozzles



Steady flow

Steady flow of compressible fluids

HM 230
Flow of compressible fluids
Subsonic and sonic flow
through different measuring objects



HM 172
Supersonic wind tunnel with Schlieren optics
Schlieren optics for visualisation of Mach lines and shock waves
on drag bodies; interchangeable walls in the measuring section
produce velocities up to Mach 1,8



HM 260
Characteristics of nozzles
Measuring the impact or
thrust force for determining
the discharge velocity and
the nozzle efficiency



HM 261
Nozzle pressure distribution
Measuring the pressure
curves in a convergent nozzle
and in Laval nozzles



Steady flow

Flow in pipe systems

HL 102
Installation technology: losses in
different pipes
Investigation of the
pressure difference
in four equal-length
pipe sections made
of different
materials



HL 103
Installation technology: losses in pipe bends
Investigation of the
pressure loss at
pipe elements with
different changes
in pipe direction
and materials



HL 113
Installation technology: losses in
valves and fittings
Investigation of the
pressure loss of
standard valves
and fittings



HL 210
Installation technology: losses in a pipe system
Investigation of pressure
losses at contractions,
pipe angles, pipe bends,
valves and fittings and
pipe elements



HL 111
Installation technology: losses in
straight pipes
Determining the
pressure loss in an
open pipe section



HM 222
Air flow in pipes and pipe elements
Resistances and losses in
laminar and
turbulent pipe
flow



HM 120
Losses in
pipe elements
Investigation of
flow and pressure
losses in different
pipe sections



HM 112
Fluid mechanics trainer
Interchangeable measuring
objects and different
pipe sections



Steady flow Flow in pipe systems

HM 111 Pipe networks

Pressure losses at various piping elements and pipe networks; parallel and series connection of pipe sections



HM 124 Fluid mechanics experimental plant

Investigations on centrifugal pumps, control valves, piping and fittings. Large scale industrial components and high-quality instrumentation deliver realistic measurement results.



HM 122 Pressure losses in pipes

Experimental determination of important coefficients related to pressure loss in various pipe systems



Steady flow Flow in valves

RT 390 Test stand for control valves

Design and function of control valves; determination of the Kv value



RT 396 Pump and valves and fittings test stand

Recording characteristic curves of industrial fittings and a centrifugal pump



Steady flow Methods of flow rate measurement

HM 500 Flow meter trainer

Comparison and calibration of different flow meters



Different flow meters HM 500.01-HM 500.16 are available as accessories.

Steady flow Cavitation

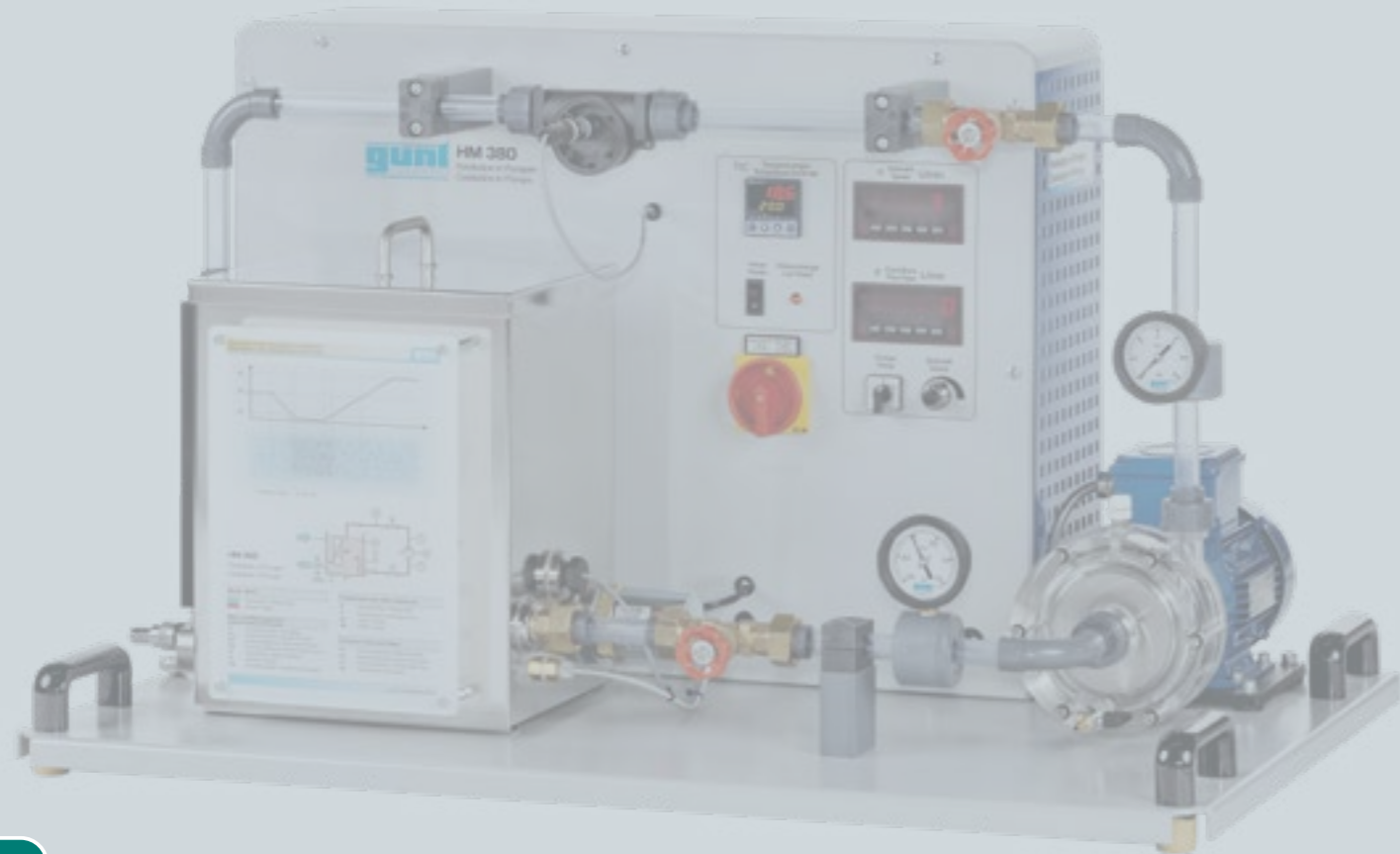
HM 380 Cavitation in pumps

Visualisation of cavitation effects in a transparent pump; how speed, inlet pressure, flow rate and temperature affect cavitation



ST 250 Cavitation

Visualisation of the formation of vapour bubbles in a Venturi nozzle



Examples of transient flow

HM 156 Water hammer and surge chamber

Investigation of formation, effect and function



HM 150.09 Horizontal flow from a tank

Recording the trajectory of the water jet at different outlet velocities

For free
Multimedia instructional materials via Internet



HM 150.12 Vertical flow from a tank

Determination of pressure losses and discharge coefficient for different outlet contours

For free
Multimedia instructional materials via Internet



HM 155 Water hammer in pipes

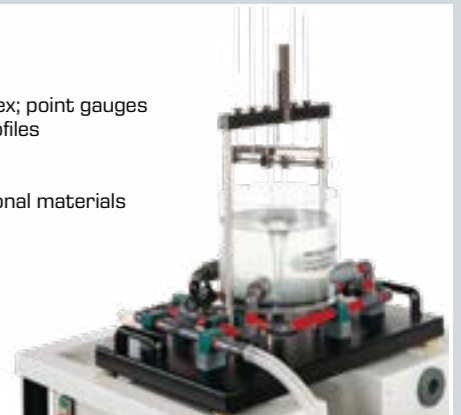
Water hammer as a function of valve closing time; calculation of the wave propagation velocity in water



HM 150.14 Vortex formation

Free and forced vortex; point gauges to detect surface profiles

For free
Multimedia instructional materials via Internet



HM 150.15 Hydraulic ram – pumping using water hammer

Formation and effect of water hammer

Recommended for water supply: HM 150 Base module for experiments in fluid mechanics

For free
Multimedia instructional materials via Internet



HM 143 Transient drainage processes in storage reservoirs

Demonstration of the function of a rainwater retention basin and a storage lake



Flow around bodies

HM 170
Open wind tunnel

Experiments from the field of aerodynamics and fluid mechanics with an "Eiffel" type wind tunnel



HM 170.70
Wind power plant with rotor blade adjustment

Extension to wind tunnel HM 170



Drag bodies
HM 170.01 – HM 170.11

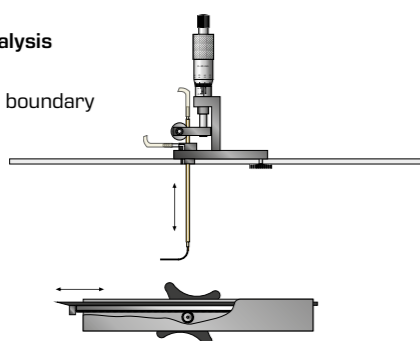
HM 170.22
Pressure distribution on an aerofoil NACA 0015

Experiments with different aerofoil angles of attack



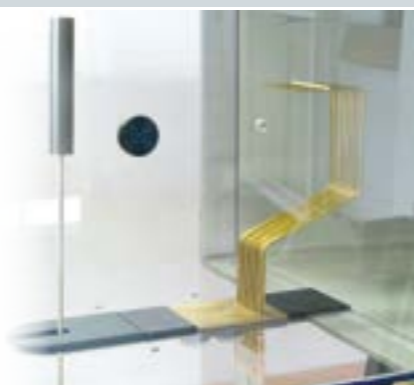
HM 170.24
Boundary layer analysis with Pitot tube

Investigation of the boundary layer on a flat plate with flow along the plate; two different surfaces



HM 170.28
Wake measurement

Investigation of the pressure distribution behind a cylinder subject to surrounding flow



HM 225
Aerodynamics trainer

For experiments from the fields of flow around bodies and steady incompressible flow



HM 225.02
Boundary layers

Investigation of boundary layers on a flat plate with flow along the plate



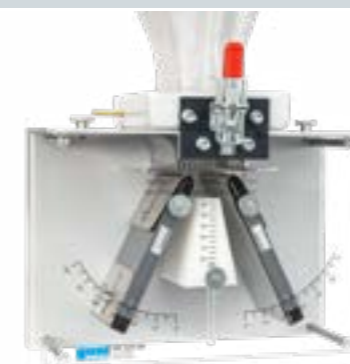
HM 225.04
Drag forces

Determining drag forces on models immersed in a flow



HM 225.06
Coanda effect

Investigation of wall-guided airflow and familiarisation with the principle of pneumatic logic elements



HM 225.08
Visualisation of streamlines

Flow patterns in real fluids at different models; visualisation using fog



HM 152
Potential flow

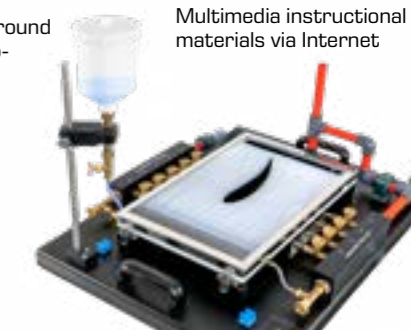
Visualisation of streamlines in a Hele-Shaw cell, ink as contrast medium



HM 150.10
Visualisation of streamlines

Investigation of flow around models in laminar, two-dimensional flow using ink as contrast medium

For free
Multimedia instructional materials via Internet



Flow around bodies

HM 226
Wind tunnel for visualisation of streamlines
Illuminated test section, various models,
fog generator included



HM 153
Visualisation of
different flows
Visualisation of
flow around bodies
and flow phenomena
in open channels
and pipes



HM 133
Visualisation of flow fields
Visualisation of laminar and
turbulent flow processes
in a water channel
using electrolytically
generated hydrogen
bubbles




CE 220
Fluidised bed formation
Investigation of
fluidised bed
formation of
solids in air and
water



HM 136
Flow through packed columns
Comparison of different modes of operation;
water and/or air, parallel flow or counterflow mode



HM 132
Vertical visualisation of flow fields
Visualisation using electrolytically generated hydrogen bubbles


 Hydraulic fluid energy machines
Hydraulic turbines

HM 450C
Characteristic variables of hydraulic turbomachines
Determination of output and efficiency
of turbines and pumps;
demonstration of a pumped storage plant



HM 450.01
Pelton turbine
Model of an impulse turbine
with speed and torque
measurement



HM 450.02
Francis turbine
Model of a reaction turbine
with speed and torque
measurement;
adjustable guide
vanes



HM 450.03
Propeller type turbine
Six-bladed propeller
type turbine with
guide vane adjustment
for varying power,
measurement of
speed and torque



HM 450.04
Kaplan turbine
Five-bladed Kaplan
turbine with blade
and guide vane
adjustment for varying
power, measurement
of speed and torque



HM 287
Experiments with an
axial turbine
Record character-
istics of an axial
reaction turbine



HM 405
Axial-flow turbomachines
Function of a
turbomachine;
configuration as
pump or turbine
with interchange-
able rotor/impeller
and stator/guide
vane system



Hydraulic fluid energy machines

Hydraulic turbines

HM 288

Experiments with a reaction turbine

Record characteristics of a turbine based on the reaction force



HM 289

Experiments with a Pelton turbine

Record characteristics of a free jet turbine



HM 291

Experiments with an action turbine

Record characteristics of an axial impulse turbine



HM 290

Base unit for turbines

Water supply for HM 288, HM 289 and HM 291



Hydraulic fluid energy machines

Driven machines

HM 299

Comparison of positive displacement machines and turbomachines

Interchangeable driven machines: piston compressor, piston pump, impeller pump, centrifugal pumps



Hydraulic fluid energy machines

Centrifugal pumps

HM 283

Experiments with a centrifugal pump

Determination of characteristic pump variables



HM 284

Series and parallel configuration of pumps

Demonstration of series, parallel and the individual operation of centrifugal pumps



HM 332

Pump characteristics for parallel and series configuration

Investigation of the behaviour of two identical centrifugal pumps in operation, system control via PLC



HM 300

Hydraulic circuit with centrifugal pump

Measurement of pressure conditions in valves and fittings and a pump



Hydraulic fluid energy machines

Positive displacement pumps

HM 285

Experiments with a piston pump

Record characteristics of a reciprocating positive displacement pump




HM 286

Experiments with a gear pump

Record characteristics of a rotary positive displacement pump



 Components in piping systems and plant design
Cutaway models

HM 700.01
Cutaway model:
standard orifice plate



HM 700.02
Cutaway model:
flow nozzle



HM 700.09
Cutaway model:
strainer



HM 700.10
Cutaway model:
gate valve



HM 700.03
Cutaway model:
standard Venturi meter



HM 700.04
Cutaway model:
straight-way valve



HM 700.11
Cutaway model:
straight-way plug valve



HM 700.12
Cutaway model:
three-way plug valve



HM 700.05
Cutaway model:
corner valve



HM 700.06
Cutaway model:
angle seat valve



HM 700.13
Cutaway model:
ball valve



HM 700.14
Cutaway model:
safety valve



HM 700.07
Cutaway model:
non-return valve



HM 700.08
Cutaway model:
pressure reducing valve



HM 700.15
Cutaway models:
various screwed pipe
connections



HM 700.16
Cutaway models:
pressure gauges



Components in piping systems and plant design
Cutaway models

HM 700.17
 Cutaway model:
 centrifugal pump



HM 700.20
 Cutaway model:
 piston pump



HM 700.22
 Cutaway model:
 gear pump



VS 101
 Cutaway model:
 underground hydrant



VS 106
 Cutaway model:
 backflow preventer



VS 107
 Cutaway model:
 non-return butterfly valve



VS 102
 Cutaway model:
 resilient seated gate valve



VS 103
 Cutaway model:
 screw down valve



VS 108
 Cutaway model:
 water meter



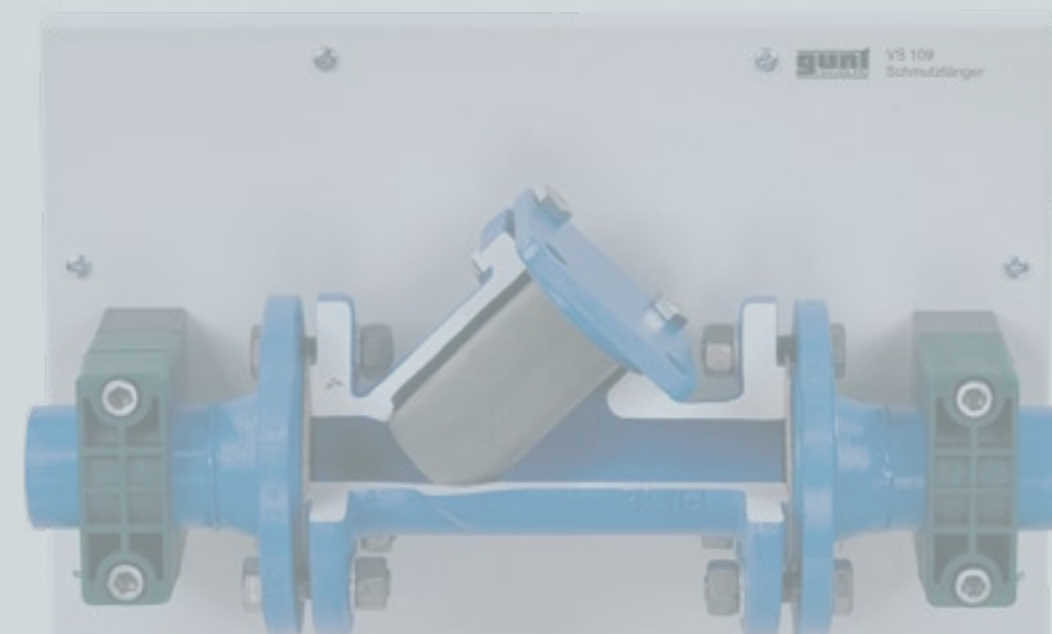
VS 109
 Cutaway model:
 strainer



VS 104
 Cutaway model:
 changeover valve



VS 105
 Cutaway model:
 gas meter



Components in piping systems and plant design

Assembly exercises: valves and fittings

MT 154

Assembly exercise: shut-off valve

Planning, assembly, disassembly; function and design of a shut-off valve



MT 156

Assembly exercise: wedge gate valve and angle seat valve

Assembly, disassembly and maintenance of industrial fittings



MT 157

Assembly exercise: butterfly valve and non-return valve

Assembly, disassembly and maintenance of industrial fittings



MT 158

Assembly exercise: ball valve and shut-off valve

Assembly, disassembly and maintenance of industrial fittings



MT 101

Assembly exercise: pneumatically driven

Design and function of a pneumatically driven valve; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



MT 102

Assembly exercise: electrically driven control valve

Design and function of an electrically driven control valve; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



MT 162

Hydraulic valves and fittings test stand

Pressure test for GUNT assembly kits MT 154, MT 156, MT 157 and MT 158



Components in piping systems and plant design

Assembly & maintenance exercises: pumps

MT 130

Assembly exercise: centrifugal pump

Design and function of a centrifugal pump; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



MT 181

Assembly & maintenance exercise: multistage centrifugal pump

Understanding design and function of the pump; planning and executing assembly, disassembly and maintenance



MT 182

Assembly & maintenance exercise: screw pump

Understanding design and function of the pump; planning and executing assembly, disassembly and maintenance



MT 183

Assembly & maintenance exercise: diaphragm pump

Understanding design and function of the pump; planning and executing assembly, disassembly and maintenance



MT 134

Montage d'une pompe à piston

Fonction et montage d'une pompe à piston; planifier, monter, démonter

For free
Multimedia instructional materials via Internet



MT 185

Assembly & maintenance exercise: in-line centrifugal pump

Understanding design and function of the pump; planning and executing assembly, disassembly and maintenance



MT 136

Assembly exercise: gear pump

Design and function of a gear pump; planning, assembly and disassembly

For free
Multimedia instructional materials via Internet



Components in piping systems and plant design
Design of complex piping and plant systems

HL 960
Assembly station pipes and valves and fittings
 Assembly of real piping and plant installations; together with HL 960.01: operational testing on a pipe network



HL 960.01
Assembly and alignment of pumps and drives
 Installation and removal of pumps in plants; water supply for HL 960



HL 961
Compact assembly station pipes, valves and fittings
 Assembly of real piping and plant installations, space-saving setup



RT 460
Hands-on mechatronics project: level control
 Complete development and documentation of a level control system: digital planning in a coordinated learning environment, mechanical and electrical assembly, testing and optimisation



For free Multimedia instructional materials via Internet

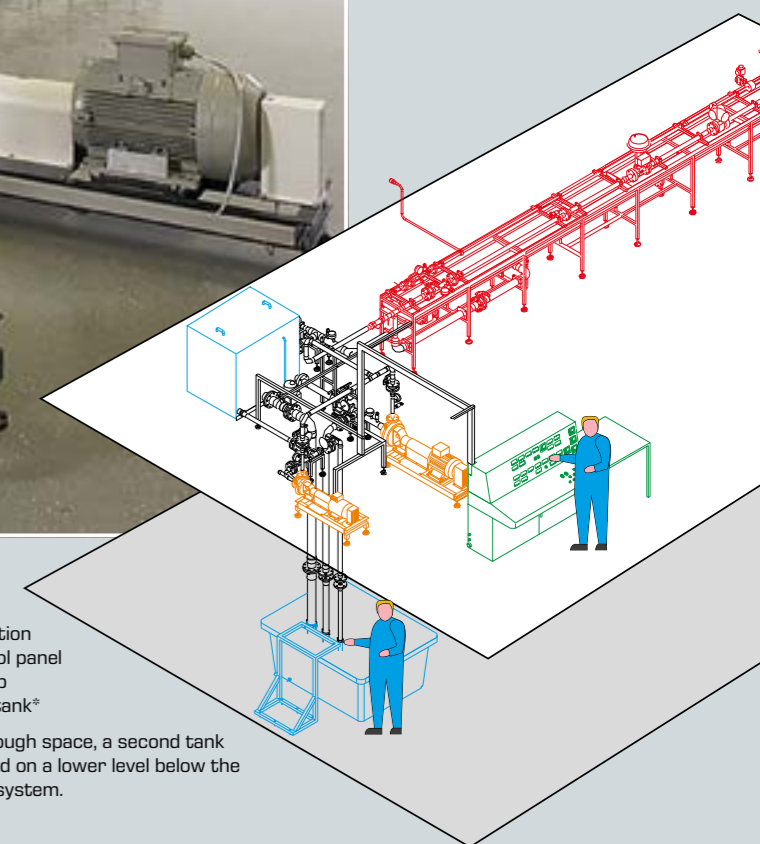
Fluidic experimental plants



HM 124
Fluid mechanics experimental plant
 Investigations on centrifugal pumps, control valves, piping and fittings. Large scale industrial components and high-quality instrumentation deliver realistic measurement results.

red = pipe section
 green = control panel
 orange = pump
 blue = supply tank*

*if there is enough space, a second tank can be installed on a lower level below the experimental system.



HM 362
Comparison of pumps
 Investigate operating behaviour of centrifugal pumps, piston pump and side channel pump, system control via PLC



HM 405
Axial-flow turbomachines
 Function of a turbomachine; configuration as pump or turbine with interchangeable rotor/impeller and stator/guide vane system



Fluidic experimental plants

HL 962 Assembly stand for pumps

Base unit when constructing a complex piping system



HL 962.01 Standard chemicals pump

Typical pump as used in process engineering



HL 962.02 Canned motor pump

Hermetic centrifugal pump, particularly suitable for pumping liquid gases



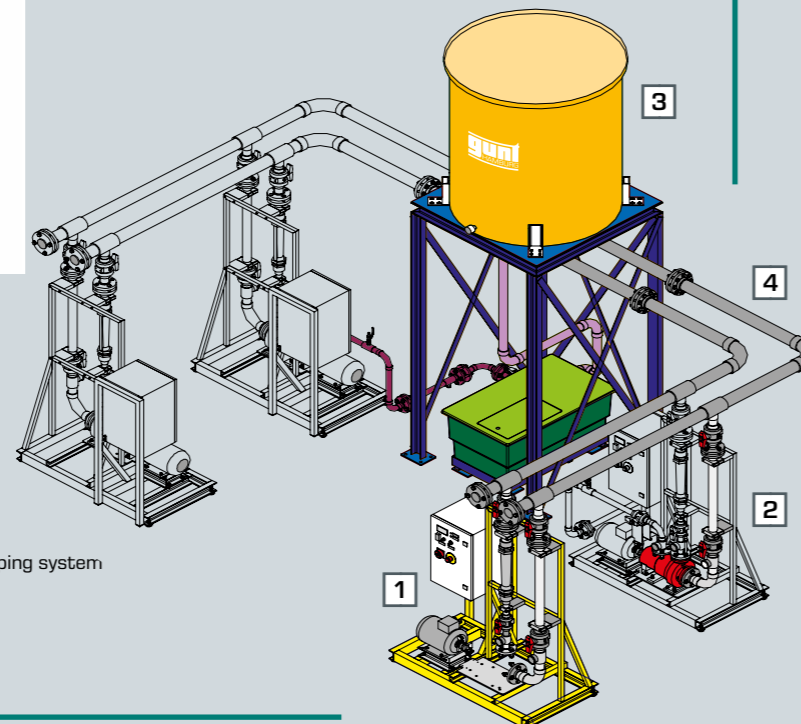
HL 962.03 Side channel pump

Self-priming three-stage pump



HL 962.04 Standard chemicals pump with magnetic clutch

Hermetic centrifugal pump according to ISO 5199



Possible combination of individual components into a functional pumping system

- 1 assembly stand for pumps (HL 962)
- 2 pumps, various types (HL 962.01 – HL 962.04)
- 3 tank installation (HL 962.30)
- 4 piping system to interconnect the plant components (HL 962.32)

HM 215 Two-stage axial fan

Determining the characteristics of a two stage axial fan



HL 710 Air duct systems

Planning and setup of simple and complex air duct systems



ST 510 Full-scale sewerage system

Demonstration of key aspects of wastewater technology. Transparent piping system allows view of the inside to observe the flow conditions.



Illustrate complex theory with GUNT's SMART features



ET500 Two-stage piston compressor

About the product:



4 | Fluid machinery



Fundamentals

Fluid mechanics	174
Thermodynamics	176
Dynamics of machinery	178



Driving machines

Gas turbines	179
Air turbines	180
Hydraulic turbines	181
Internal combustion engines	184



Driven machines

Centrifugal pumps	185
Axial-flow pumps	188
Positive displacement pumps	189
Fans and compressors	192



Power plants and applied cyclic processes

194




Equipment series

GUNT Labline	198
GUNT FEMLine: water pumps	200
GUNT FEMLine: oil pumps	202
GUNT FEMLine: turbines	203
GUNT FEMLine: engines	204
GUNT FEMLine: plants	205



Fluid machinery




**Fundamentals
Fluid mechanics**
HM 115
Hydrostatics trainer

Experiments on buoyancy, density, capillarity etc.; various methods of pressure measurement


HM 112
Fluid mechanics trainer

Interchangeable measuring objects and different pipe sections


HM 230
Flow of compressible fluids

Subsonic and sonic flow through different measuring objects


HM 122
Pressure losses in pipes

Experimental determination of important coefficients related to pressure loss in various pipe systems


HM 380
Cavitation in pumps

Visualisation of cavitation effects in a transparent pump; how speed, inlet pressure, flow rate and temperature affect cavitation


ST 250
Cavitation

Visualisation of the formation of vapour bubbles in a Venturi nozzle


HM 150.09
Horizontal flow from a tank

Recording the trajectory of the water jet at different outlet velocities

For free
Multimedia instructional materials via Internet


HM 250
Fundamentals of fluid mechanics

Base module for experiments in fluid mechanics, system control via PLC

Extensive selection of accessories enables a complete course in the fundamentals of fluid mechanics


HM 152
Potential flow

Visualisation of streamlines in a Hele-Shaw cell, ink as contrast medium


HM 133
Visualisation of flow fields

Visualisation of laminar and turbulent flow processes in a water channel using electrolytically generated hydrogen bubbles


HM 260
Characteristics of nozzles

Measuring the impact or thrust force for determining the discharge velocity and the nozzle efficiency


HM 261
Nozzle pressure distribution

Measuring the pressure curves in a convergent nozzle and in Laval nozzles


HM 226
Wind tunnel for visualisation of streamlines

Illuminated test section, various models, fog generator included


HM 241
Fundamentals of water flow

Experiments on water flow in open flumes and in pipes. Transparent design allows observation of the flow processes.



Fundamentals
Thermodynamics

WL 110 series
www.gunt.de



WL 102
Change of state of gases

Isothermal and isochoric change of state of air



ET 351C
Thermodynamics of the refrigeration circuit

Compression refrigeration system for thermodynamic investigations, measurement of the mechanical compressor output



WL 204
Vapour pressure of water – Marcet boiler

Pressure and temperature measurement in a steam boiler



WL 205
Vapour pressure curve of water – Marcet boiler

Pressure and temperature measurement in a steam boiler, software-supported experiments and evaluation

WL 440
Free and forced convection

Calculation of convective heat transfer at different geometries: flat plate, cylinder, tube bundle



WL 372
Radial and linear heat conduction

Study of heat conduction in solids



WL 210
Evaporation process

Different forms of evaporation in an externally heated pipe



WL 220
Boiling process

Visualisation of different forms of evaporation in a transparent pressure vessel



WL 230
Condensation process

Measurement of heat transfer in dropwise and film condensation



WL 110
Heat exchanger supply unit

Measuring the transfer characteristics of five different heat exchanger models, system control via PLC



WL 110.02
Plate heat exchanger

Typical plate heat exchanger in parallel flow and counterflow operation



WL 110.01
Tubular heat exchanger

Transparent heat exchanger with additional temperature measuring point after half of the transfer section; parallel flow and counterflow operation



WL 110.04
Stirred tank with double jacket and coil

Heating using jacket or coiled tube; stirrer for improved mixing of medium



WL 110.03
Shell & tube heat exchanger

Transparent shell and tube heat exchanger in cross parallel flow and cross counterflow operation



WL 110.05
Finned tube heat exchanger Heat transfer between water and air; cross-flow operation



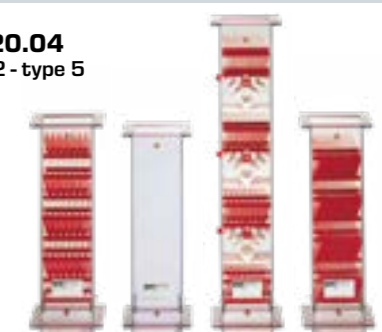
WL 320
Wet cooling tower

Principle of operation and characteristic variables of a wet cooling tower with forced ventilation



WL 320.01 - WL 320.04
Cooling columns, type 2 - type 5

Cooling columns with different wetting areas



Fundamentals Dynamics of machinery

RT 050 Training system speed control, HSI

Fundamentals of control engineering using the example of a speed control system with first order lag

For free
Multimedia instructional materials via Internet



TM 632 Centrifugal governor

Characteristic curves of different centrifugal force governors



TM 180 Forces in reciprocating engines

Investigation of mass forces on a reciprocating piston machine



TM 620 Bending elasticity in rotors

Investigation of bending vibrations and resonance of a rotating shaft



Driving machines Gas turbines

HM 270 Impulse turbine

Investigation of a compressed air driven axial impulse turbine



HM 272 Reaction turbine

Investigation of a compressed air driven radial reaction turbine



ET 792 Gas turbine

Operation with power turbine or as jet engine with propelling nozzle using liquid gas

ET 794 Gas turbine with power turbine

Two-shaft arrangement with high-pressure turbine and power turbine using liquid gas



Driving machines
Air turbines

ET 220
Energy conversion
in a wind
power plant

Conversion of
kinetic wind
energy into
electrical energy



ET 220.01
Wind power plant

Connection to ET 220
or ET 220.10;
outdoor installation
allows practically relevant
investigations



ET 220.10
Control unit for wind power plant ET 220.01

Use of wind energy
in stand-alone
operation under
real weather
conditions



ET 224
Operating behaviour of wind turbines

Characteristic and control on a wind power drive train



ET 210
Fundamentals of
wind power plants

Wind power plant with
rotor blade adjustment and
yaw angle adjustment



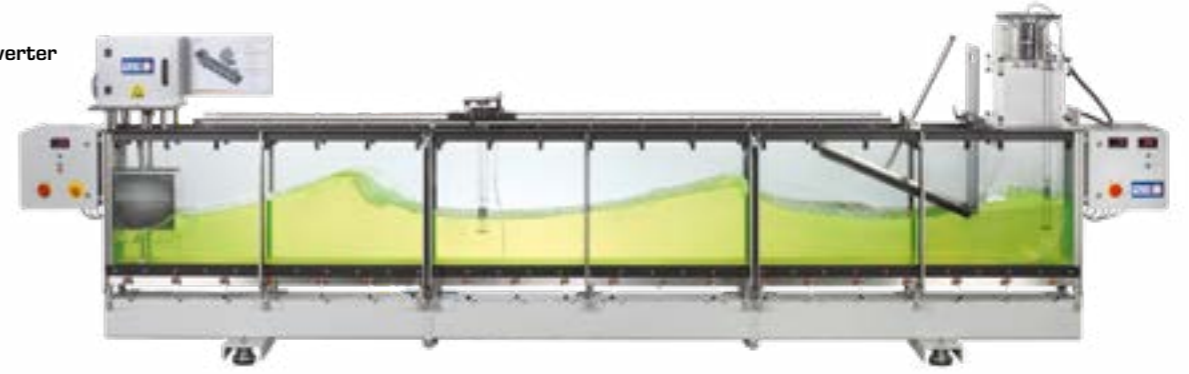
ET 222
Wind power drive train

Experiments on conversion of rotational energy
into electrical energy



ET 270
Wave energy converter

Turbine unit with
Wells turbine
and electric
generator;
configurable
wave generator

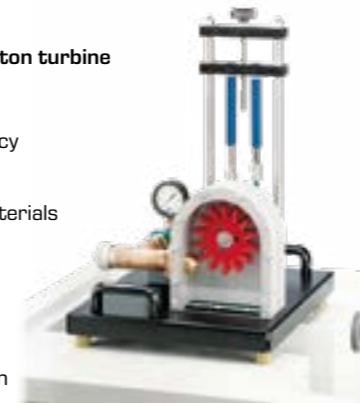


Driving machines
Hydraulic turbines

HM 150.19
Operating principle of a Pelton turbine

Model of an impulse turbine
with adjustable nozzle;
determination of the efficiency

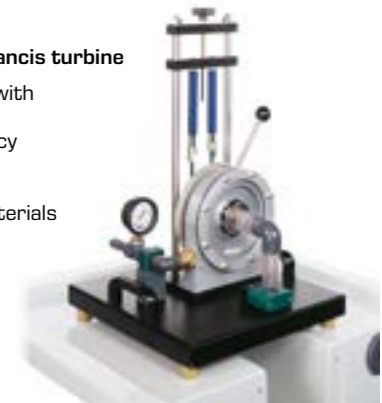
For free
Multimedia instructional materials
via Internet



HM 150.20
Operating principle of a Francis turbine

Model of a reaction turbine with
adjustable guide vanes and
determination of the efficiency

For free
Multimedia instructional materials
via Internet



HM 287
Experiments with an
axial turbine

Record character-
istics of an axial
reaction turbine



HM 405
Axial-flow turbomachines

Function of a
turbomachine;
configuration as
pump or turbine
with interchange-
able rotor / impeller
and stator / guide
vane system



Driving machines
Hydraulic turbines

HM 450C
Characteristic variables of hydraulic turbomachines

Determination of output and efficiency of turbines and pumps; demonstration of a pumped storage plant



HM 450.01
Pelton turbine

Model of an impulse turbine with speed and torque measurement



HM 450.02
Francis turbine

Model of a reaction turbine with speed and torque measurement; adjustable guide vanes



HM 450.03
Propeller type turbine

Six-bladed propeller type turbine with guide vane adjustment for varying power; measurement of speed and torque



HM 450.04
Kaplan turbine

Five-bladed Kaplan turbine with blade and guide vane adjustment for varying power; measurement of speed and torque



HM 430C
Francis turbine trainer

Characteristics of a powerful Francis turbine with adjustable guide vanes



HM 421
Propeller type turbine trainer

Four-bladed propeller type turbine with guide vane adjustment for varying power



HM 288
Experiments with a reaction turbine

Record characteristics of a turbine based on the reaction force



HM 289
Experiments with a Pelton turbine

Record characteristics of a free jet turbine



HM 291
Experiments with an action turbine

Record characteristics of an axial impulse turbine



HM 290
Base unit for turbines

Water supply for HM 288, HM 289 and HM 291



HM 365.31
Pelton and Francis turbine

Comparison of impulse and reaction turbines



HM 365.32
Turbine supply unit

Water supply for HM 365.31



Trainer for turbines with Pelton turbine HM 365.31, supply unit HM 365.32 and brake unit HM 365

Driving machines
Internal combustion engines



Modular test stand for single cylinder test engines CT 159, test engine CT 151 and brake unit HM 365

CT 159
Modular test stand for single-cylinder engines, 3 kW

Mounting the engine, supply with fuel and air; measurement of characteristic engine data



HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines



CT 150
Four-stroke petrol engine for CT 159

Air-cooled overhead valve four-stroke petrol engine



CT 151
Four-stroke diesel engine for CT 159

Air-cooled four-stroke diesel engine with direct injection



CT 153
Two-stroke petrol engine for CT 159

Air-cooled two-stroke petrol engine



Driven machines
Centrifugal pumps

HM 150.04
Centrifugal pump

Determining the characteristics of a typical centrifugal pump
Required for water supply: HM 150

For free
Multimedia instructional materials via Internet



HM 150.16
Series and parallel configuration of pumps

Characteristic curves and hydraulic power; comparison of operating modes

For free
Multimedia instructional materials via Internet



CFD simulation



HM 283
Experiments with a centrifugal pump

Determination of characteristic pump variables



HM 450C
Characteristic variables of hydraulic turbomachines

Determination of output and efficiency of turbines and pumps; demonstration of a pumped storage plant



HM 284
Series and parallel configuration of pumps

Demonstration of series, parallel and the individual operation of centrifugal pumps



HM 300
Hydraulic circuit with centrifugal pump

Measurement of pressure conditions in valves and fittings and a pump



HM 305
Centrifugal pump trainer

Pressure, flow rate, speed, torque and pump power available as measurement values



Driven machines

Centrifugal pumps

HM 365.11 Centrifugal pump, standard design

Standard pumps are pumps that are designed in accordance with international standards



HM 365.12 Centrifugal pump, self-priming

Self-priming pumps are able to suck in and transport air and water



HM 365.13 Centrifugal pump, multistage

In centrifugal pumps with multiple stages several impellers are arranged in series



HM 365.15 Side channel pump

Investigation of a self-priming, single-stage side channel pump



Trainer for centrifugal pumps with supply unit HM 365.10, centrifugal pump HM 365.11 and drive unit HM 365

HM 365.14 Centrifugal pumps, series and parallel connected

Investigation of the pump characteristic of series and parallel configurations of two centrifugal pumps



HM 365.10 Supply unit for water pumps

Water supply for HM 365.11 to HM 365.19



HM 332 Pump characteristics for parallel and series configuration

Investigation of the behaviour of two identical centrifugal pumps in operation, system control via PLC



HM 362 Comparison of pumps

Investigate operating behaviour of centrifugal pumps, piston pump and side channel pump, system control via PLC



Driven machines

Axial-flow pumps

HM 365

Universal drive and brake unit

Core component for experiments on various driving and driven machines



HM 365.45

Axial-flow pump

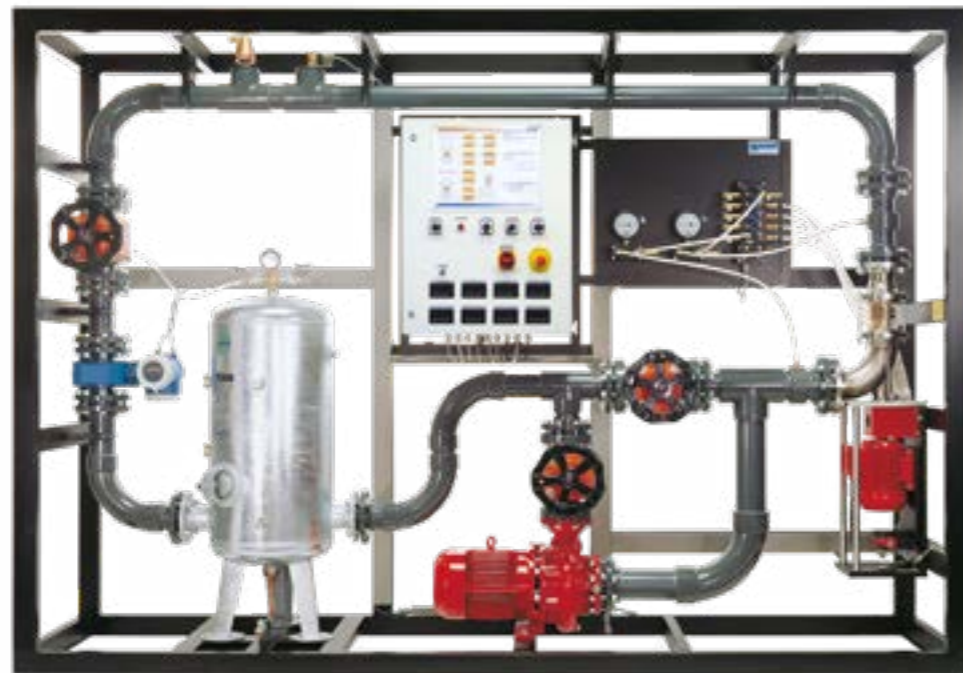
Operating behaviour of an axial propeller pump



HM 405

Axial-flow turbomachines

Function of a turbomachine; configuration as pump or turbine with interchangeable rotor/impeller and stator/guide vane system



Driven machines

Positive displacement pumps

HM 285

Experiments with a piston pump

Record characteristics of a reciprocating positive displacement pump



HM 286

Experiments with a gear pump

Record characteristics of a rotary positive displacement pump



CE 271

Multi-head diaphragm pump

Metering pump with three pump heads



CE 272

Rotary vane vacuum pump

Generation of negative pressure over time



Driven machines
Positive displacement pumps



Trainer for positive displacement pumps with supply unit HM 365.10, piston pump HM 365.17 and drive unit HM 365

HM 365.16
Lobe pump

Lobe pumps are used for delivering highly viscous and highly abrasive media



HM 365.17
Reciprocating piston pump

The most simple type of reciprocating piston pump consists of a piston that moves in a cylinder with one inlet and one outlet valve



HM 365.18
Gear pump

A gear pump is characterised by a steady flow rate



HM 365.19
Vane pump

Vane pumps can be used both for liquid and gaseous media



HM 365.10
Supply unit for water pumps

Water supply for HM 365.11 to HM 365.19



HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines



Trainer for positive displacement pumps with supply unit HM 365.20, screw pump HM 365.21 and drive unit HM 365

HM 365.21
Screw pump

Screw pumps are able to provide continuous delivery of even viscous media without pulsation or turbulence



HM 365.22
External gear pump

The pumping medium is transported between the gears and the housing



HM 365.23
Vane pump

Vane pumps can be used both for liquid and gaseous media



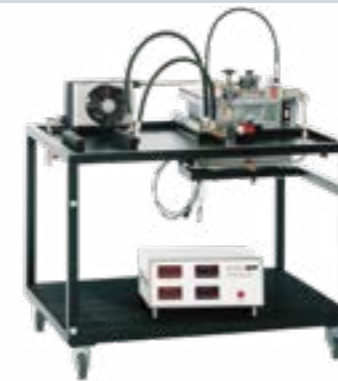
HM 365.24
Internal gear pump

Operating behaviour of an internal gear pump



HM 365.20
Oil pump supply unit

Supply of oil pumps HM 365.21 to HM 365.24



HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines



Driven machines
Fans and compressors

HM 280
Experiments with a radial fan
Operating behaviour and characteristic variables of a radial fan; two interchangeable rotors



HM 210
Characteristic variables of a radial fan
Determination of flow rate via iris diaphragm or Venturi nozzle



HM 292
Experiments with a radial compressor
Two-stage compressor: recording of the compressor curve for both stages



HM 282
Experiments with an axial fan
Operating behaviour and characteristic variables of an axial fan



ET 513
Single-stage piston compressor
Investigations on an air compressor including the determination of the mechanical power consumption.
Together with the HM365 drive unit, the single-stage piston compressor forms a complete compressed air generation system.



HM 299
Comparison of positive displacement machines and turbomachines
Interchangeable driven machines: piston compressor, piston pump, impeller pump, centrifugal pumps

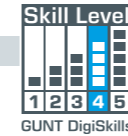


HM 215
Two-stage axial fan
Determining the characteristics of a two stage axial fan



ET 500
Two-stage piston compressor
Recording the characteristic of an industrial two-stage compressor, system control via PLC

For free
Multimedia instructional materials via Internet



MT 141
Assembly exercise: piston compressor
Function and design of a piston compressor; planning, assembly, disassembly

For free
Multimedia instructional materials via Internet



MT 142
Energy efficiency in piston compressors
Installation of the assembled MT 141 piston compressor: functional test; balancing of energies

For free
Multimedia instructional materials via Internet



How to achieve the digital transformation to Industry 4.0

MT 175
Energy efficiency in compressed air systems
Energy efficiency of an industrial plant for metalworking and mechatronics, system control via PLC

For free
Multimedia instructional materials via Internet

Power plants and applied cyclic processes

ET 810
Steam power plant with steam engine
 Single-cylinder piston steam engine with gas-fired boiler for steam generation



ET 850
Steam generator
 Laboratory scale gas-fired steam generator for wet or superheated steam; integrated condenser



ET 851
Axial steam turbine
 Single-stage steam turbine with power output measurement; steam supply via ET 850, gas-fired or ET 852, electrical



ET 852 Steam generator, electrical
 Laboratory scale electrical steam generator for superheated steam; integrated condenser; alternative to the gas-fired steam generator ET 850 for the supply of the steam turbine ET 851



Experimental plant with two-cylinder steam engine ET 813, steam generator ET 813.01 and brake unit HM 365

ET 813
Two-cylinder steam engine
 Single-acting steam engine with condensation for determining mechanical power and efficiency



HM 365
Universal drive and brake unit
 Core component for experiments on various driving and driven machines



ET 830
Steam power plant, 1,5kW
 Oil-fired boiler, single-stage small industry turbine, condenser and feed water treatment and monitoring via PLC



Wet cooling towers ET 830.01 (115kW) or ET 830.02 (140kW) for steam power plant ET 830 for re-cooling the cooling water

ET 794
Gas turbine with power turbine
 Two-shaft arrangement with high-pressure turbine and power turbine using liquid gas



ET 796
Gas turbine jet engine
 Small single-shaft gas turbine with thrust measurement using either kerosene or petroleum



Power plants and applied cyclic processes



Compression refrigeration system ET 165
with drive unit HM 365

ET 165

Refrigeration system
with open compressor

Capacity measurement
at the open compressor
with variable speed;
refrigeration chamber
with adjustable cooling
load



HM 365

Universal drive and
brake unit

Core component for
experiments on various
driving and driven
machines



ET 352

Vapour jet compressor in refrigeration

Cold production using thermal energy. Transparent condenser
and evaporator allow the view into the inner workings.



ET 430

Refrigeration system with two-stage compression

Low temperature refrigeration system; compression with
injection intercooler and additional refrigerant supercooling



GUNT-Service Laboratory and conceptual design

Are you planning a new laboratory?
A new specialist room?
An entire department?
Do you want to modernize?

Then take advantage of our know-how
and experience! Our engineers design
complete laboratories and fit them out.
We provide an individual response to
your requirements, taking into account
the specific local environment:

- room drawings
- supply connections
- equipment lists
- performance specifications, etc.

If you have any questions please
contact our sales or customer service,
who would be glad to help you.



Contact form


Equipment series
GUNT Labline
HM 288
 Experiments with a reaction turbine

Record characteristics of a turbine based on the reaction force


HM 289
 Experiments with a Pelton turbine

Record characteristics of a free jet turbine


HM 291
 Experiments with an action turbine

Record characteristics of an axial impulse turbine


HM 290
 Base unit for turbines
 Water supply for HM 288,
 HM 289 and HM 291

HM 287
 Experiments with an axial turbine

Record characteristics of an axial reaction turbine


HM 283
 Experiments with a centrifugal pump

Determination of characteristic pump variables


HM 284
 Series and parallel configuration of pumps

Demonstration of series, parallel and the individual operation of centrifugal pumps


HM 285
 Experiments with a piston pump

Record characteristics of a reciprocating positive displacement pump


HM 280
 Experiments with a radial fan

Operating behaviour and characteristic variables of a radial fan; two interchangeable rotors


HM 282
 Experiments with an axial fan

Operating behaviour and characteristic variables of an axial fan


HM 286
 Experiments with a gear pump

Record characteristics of a rotary positive-displacement pump


HM 292
 Experiments with a radial compressor

Two-stage compressor: recording of the compressor curve for both stages



Equipment series
GUNT FEMLine: water pumps

HM 365.11
Centrifugal pump,
standard design

Standard pumps are pumps that are designed in accordance with international standards



HM 365.12
Centrifugal pump,
self-priming

Self-priming pumps are able to suck in and transport air and water



HM 365.13
Centrifugal pump,
multistage

In centrifugal pumps with multiple stages several impellers are arranged in series



HM 365.15
Side channel pump

Investigation of a self-priming, single-stage side channel pump



HM 365.14
Centrifugal pumps, series and parallel connected

Investigation of the pump characteristic of series and parallel configurations of two centrifugal pumps



HM 365.45
Axial-flow pump

Operating behaviour of an axial propeller pump



Trainer for centrifugal pumps with supply unit HM 365.10, centrifugal pump HM 365.11 and drive unit HM 365

HM 365.18
Gear pump

A gear pump is characterised by a steady flow rate



HM 365.10
Supply unit
for water pumps

Water supply for HM 365.11 to HM 365.19



HM 365.16
Lobe pump

Lobe pumps are used for delivering highly viscous and highly abrasive media



HM 365.17
Reciprocating piston pump

The most simple type of reciprocating piston pump consists of a piston that moves in a cylinder with one inlet and one outlet valve



HM 365.19
Vane pump

Vane pumps can be used both for liquid and gaseous media



HM 365
Universal drive and
brake unit

Core component for experiments on various driving and driven machines



Equipment series
GUNT FEMLine: oil pumps



Trainer for positive displacement pumps with supply unit HM 365.20, screw pump HM 365.21 and drive unit HM 365

HM 365.21
Screw pump

Screw pumps are able to provide continuous delivery of even viscous media without pulsation or turbulence



HM 365.22
External gear pump

The pumping medium is transported between the gears and the housing



HM 365.23
Vane pump

Vane pumps can be used both for liquid and gaseous media



HM 365.24
Internal gear pump

Operating behaviour of an internal gear pump



HM 365.20
Oil pump supply unit

Supply of oil pumps HM 365.21 to HM 365.24



HM 365
Universal drive and brake unit

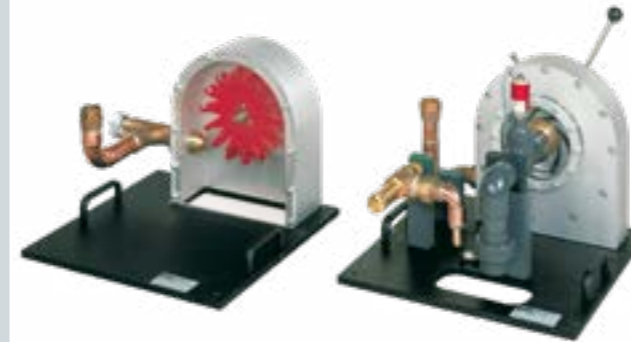
Core component for experiments on various driving and driven machines



Equipment series
GUNT FEMLine: turbines

HM 365.31
Pelton and Francis turbine

Comparison of impulse and reaction turbines



HM 365.32
Turbine supply unit

Water supply for HM 365.31



Trainer for turbines with Pelton turbine HM 365.31, supply unit HM 365.32 and brake unit HM 365

Equipment series
GUNT FEMLine: engines



Modular test stand for single cylinder test engines CT 159, test engine CT 151 and brake unit HM 365

CT 159
Modular test stand for single-cylinder engines, 3 kW

Mounting the engine, supply with fuel and air; measurement of characteristic engine data



HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines



CT 150
Four-stroke petrol engine for CT 159

Air-cooled overhead valve four-stroke petrol engine



CT 151
Four-stroke diesel engine for CT 159

Air-cooled four-stroke diesel engine with direct injection



CT 153
Two-stroke petrol engine for CT 159

Air-cooled two-stroke petrol engine



Equipment series
GUNT FEMLine: plants

ET 813
Two-cylinder steam engine

Single-acting steam engine with condensation for determining mechanical power and efficiency



Experimental plant with two-cylinder steam engine ET 813, steam generator ET 813.01 and brake unit HM 365



ET 165
Refrigeration system with open compressor

Capacity measurement at the open compressor with variable speed; refrigeration chamber with adjustable cooling load



ET 513
Single-stage piston compressor

Investigations on an air compressor including the determination of the mechanical power consumption.



Active Grid in an experimental flume

with GUNT's SMART features



4 | Hydraulics for civil engineering



Fundamentals of fluid mechanics

Hydrostatics	208
Discharge	209
Hydrodynamics	210
Pipe flow	212
Transient flow	213
Turbomachines	214



Hydraulic engineering

Open-channel flow	214
Models for GUNT experimental flumes	216
Measuring instruments for GUNT experimental flumes	218
Other accessories for GUNT experimental flumes	219
Sediment transport	220
Seepage flow	221

About GUNT experimental flumes



Hydraulics for civil engineering



Fundamentals of fluid mechanics
Hydrostatics

HM 115
Hydrostatics trainer
Experiments on buoyancy, density, capillarity etc.; various methods of pressure measurement



HM 150.06
Stability of floating bodies
Determining metacentre and buoyancy using a rectangular hull cross-section



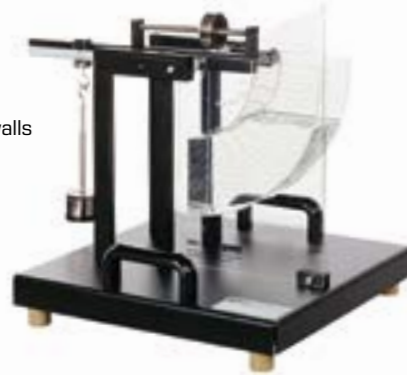
HM 150.39
Floating bodies for HM 150.06
Comparison of two different frame shapes: hard chine and round bilge



HM 150.02
Calibration of pressure gauges
Operation of a Bourdon tube pressure gauge and a piston manometer



HM 150.05
Hydrostatic pressure in liquids
Investigation of fluid pressure on vessel walls



Fundamentals of fluid mechanics
Discharge

HM 250.06
Free discharge
Recording the trajectory of the water jet and discharge coefficients at different outlet velocities



HM 250
Fundamentals of fluid mechanics
Base module for experiments in fluid mechanics, system control via PLC



Patented

HM 150.09
Horizontal flow from a tank
Recording the trajectory of the water jet at different outlet velocities

For free
Multimedia instructional materials via Internet

CFD simulation



HM 150.12
Vertical flow from a tank
Determination of pressure losses and discharge coefficient for different outlet contours

For free
Multimedia instructional materials via Internet

CFD simulation



Fundamentals of fluid mechanics
Hydrodynamics



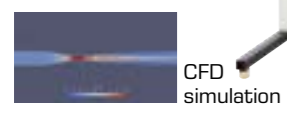
For free
The GUNT Media Center provides extensive multimedia teaching material for the experiments.



HM 150.07
Bernoulli's principle

Static pressure and total pressure distribution along the Venturi nozzle

For free
Multimedia instructional materials via Internet



HM 150.18
Osborne reynolds experiment

Visualisation of laminar and turbulent flow

For free
Multimedia instructional materials via Internet



HM 150.08
Measurement of jet forces

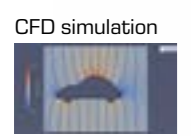
Demonstration of the principle of linear momentum and impact forces on interchangeable deflectors with different deflection angles

For free
Multimedia instructional materials via Internet



HM 150.10
Visualisation of streamlines

Investigation of flow around models in laminar, two-dimensional flow using ink as contrast medium

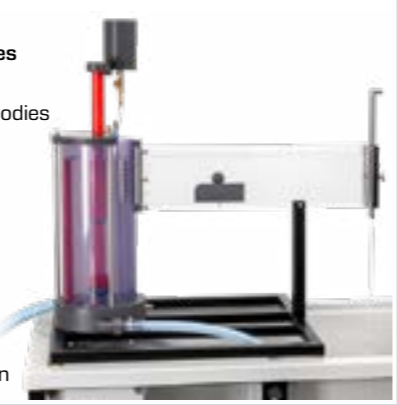


For free
Multimedia instructional materials via Internet

HM 150.21
Visualisation of streamlines in an open channel

Flow around various drag bodies and incident flow of weirs; ink as contrast medium

For free
Multimedia instructional materials via Internet



HM 150
Base module for experiments in fluid mechanics

Volumetric flow measurement for large and small flow rates



HM 150 DIGITAL
www.gunt.de



Fluid Line – HM 250
www.gunt.de

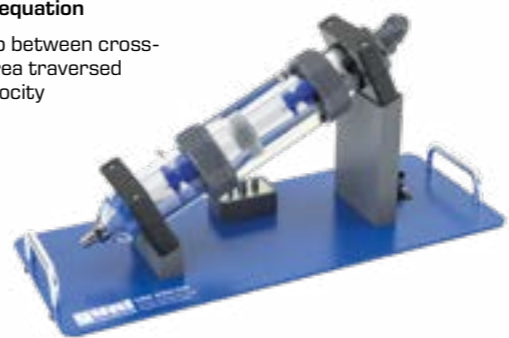
HM 250
Fundamentals of fluid mechanics

Base module for experiments in fluid mechanics, system control via PLC



HM 250.04
Continuity equation

Relationship between cross-sectional area traversed and flow velocity



HM 250.03
Visualisation of streamlines

Investigation of cross-sectional changes in laminar, two-dimensional flow; visualisation using electrolytically generated hydrogen bubbles



HM 250.07
Bernoulli's principle

Static pressure and total pressure distribution along the Venturi nozzle



HM 250.05
Measurement of jet forces

Demonstration of the principle of linear momentum; interchangeable deflectors with different deflection angles

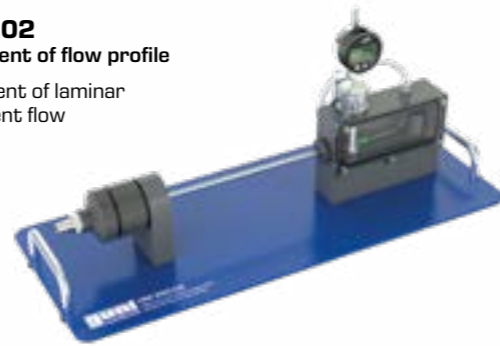


Fundamentals of fluid mechanics
Pipe flow

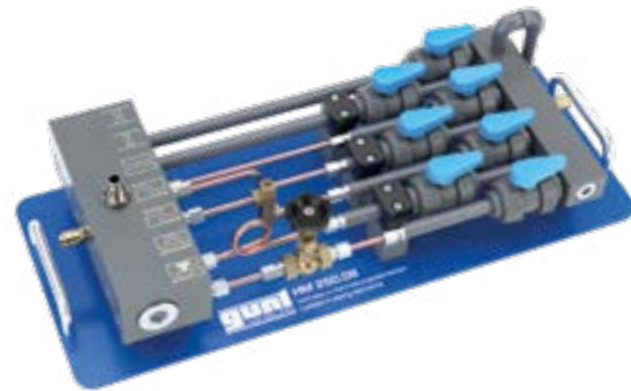
HM 250.01
Visualisation of pipe flow
Visualisation of laminar and turbulent flow



HM 250.02
Measurement of flow profile
Measurement of laminar and turbulent flow



HM 250.08
Losses in pipe elements
Influence of flow velocity on pressure loss, didactically successive pipe sections



HM 250.09
Fundamentals of pipe friction
Pipe friction for laminar/turbulent flow, Reynolds number and pipe friction factor



HM 250.10
Pressure curve along the inlet section
Friction losses in the inlet as well as with different pipe geometries and surface roughnesses



HM 150.01
Pipe friction for laminar/turbulent flow
Determining the critical Reynolds number
Recommended for water supply; HM 150 Base module for experiments in fluid mechanics



For free
Multimedia instructional materials via Internet

CFD simulation

HM 150.11
Losses in a pipe system
Influence of flow velocity on pressure loss
For free
Multimedia instructional materials via Internet



CFD simulation

HM 164
Open channel and closed channel flow
Flow processes on different structures in open and closed channel flows; losses at inlet and outlet



HM 111
Pipe networks
Pressure losses at various piping elements and pipe networks; parallel and series connection of pipe sections



Fundamentals of fluid mechanics
Transient flow

HM 156
Water hammer and surge chamber
Investigation of formation, effect and function



HM 143
Transient drainage processes in storage reservoirs
Demonstration of the function of a rainwater retention basin and a storage lake



Fundamentals of fluid mechanics
Turbomachines

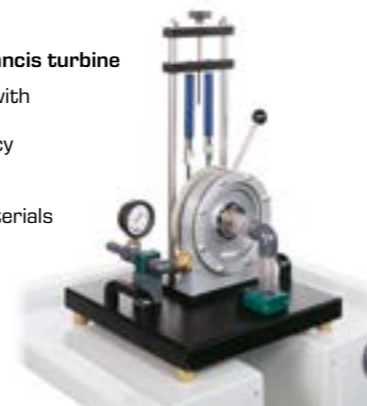
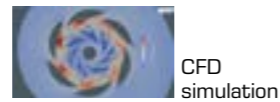
HM 150.19
Operating principle of a Pelton turbine
Model of an impulse turbine with adjustable nozzle; determination of the efficiency

For free
Multimedia instructional materials via Internet



HM 150.20
Operating principle of a Francis turbine
Model of a reaction turbine with adjustable guide vanes and determination of the efficiency

For free
Multimedia instructional materials via Internet



HM 150.04
Centrifugal pump
Determining the characteristics of a typical centrifugal pump
Required for water supply: HM 150

For free
Multimedia instructional materials via Internet

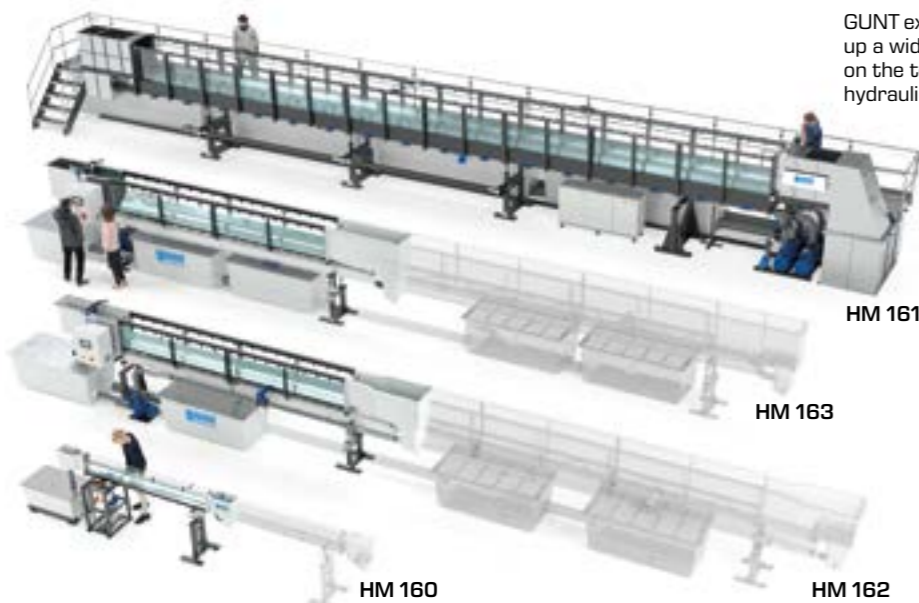


HM 150.16
Series and parallel configuration of pumps
Characteristic curves and hydraulic power; comparison of operating modes

For free
Multimedia instructional materials via Internet



Hydraulic engineering
Open-channel flow



GUNT experimental flumes and their accessories open up a wide range of experiments and demonstrations on the topics of open-channel flow, running waters, hydraulic engineering and coastal protection.

In addition to our standard variants, we at GUNT offer innovative experimental flumes that are customised to customer requirements and adapted to the premises.



GUNT experimental flumes
www.gunt.de



HM 160
Experimental flume 86 x 300 mm

Experimental section lengths of 2,5 m or 5 m available, closed water circuit and inclination adjustment



HM 162 / 163
Experimental flume

Experimental section for performing flow experiments in open flumes with lengths of 5 m, 7,5 m, 10 m or 12,5 m available, closed water circuit and inclination adjustment

Flow cross-section W x H:
309 x 450 mm (HM 162) /
409 x 500 mm (HM 163)



HM 161
Experimental flume 600 x 800 mm

Experimental section for performing flow experiments in open flumes of 16 m length, closed water circuit, inclination adjustment



HM 250.11
Open channel

Flow around various drag bodies and incident flow of weirs



HM 250
Fundamentals of fluid mechanics
Base module for experiments in fluid mechanics, system control via PLC



Hydraulic engineering
Models for GUNT experimental flumes



HM 162.29 Sluice gate



HM 162.40 Radial gate



HM 162.36 Siphon weir



HM 162.32 Ogee-crested weir with two weir outlets



HM 162.35 Elements for energy dissipation



HM 162.38 Rake



HM 162.31 Broad-crested weir



HM 162.33 Crump weir



HM 162.34 Ogee-crested weir with pressure measurement



HM 162.30 Set of plate weirs, four types



HM 162.63 Trapezoidal flume



HM 162.44 Sill



HM 162.46 Set of piers, seven profiles



HM 162 with an experimental section of 7,5m



HM 162.55 Parshall flume



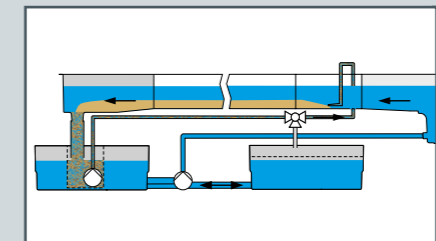
HM 162.51 Venturi flume



HM 162.45 Culvert



HM 162.77 Flume bottom with pebble stones



HM 162.71 Closed sediment circuit



HM 162.61 Vibrating piles



HM 162.80 Set of beaches



HM 162.41 Wave generator



HM 162.72 Sediment trap



HM 162.73 Sediment feeder

- Control structures
- Changes in cross-section (losses, flow formulae)
- Discharge measurement
- Other experiments: including waves, sediment transport

The appropriate instrumentation for measuring the discharge depth and the flow velocity is also available as additional accessories.

A wide range of typical models allows the user to design a broad and individual programme of experiments with GUNT experimental flumes. The programme of experiments shown in this catalogue for HM 162 applies, in principle, for all GUNT experimental flumes.

The models of the other GUNT experimental flumes are similar.

Hydraulic engineering
Measuring instruments for GUNT experimental flumes

HM 160

- HM 160.52 Level gauge
- HM 160.64 Velocity meter
- HM 160.53 Ten tube manometers



- HM 160.91 Digital level gauge
- HM 160.50 Pitotstatic tube
- HM 160.85 Digital measurement: water level, flow, and inclination

HM 161

- HM 161.52 Level gauge
- HM 161.64 Velocity meter
- HM 161.53 20 tube manometers
- HM 161.59 Instrument carrier
- HM 161.82 Instrument carrier for PIV system



- HM 161.91 Digital level gauge
- HM 161.50 Pitotstatic tube
- HM 161.13 Electronic pressure measurement
- HM 161.81 PIV-System
- HM 161.83 Glass cut-out for PIV system

HM 162

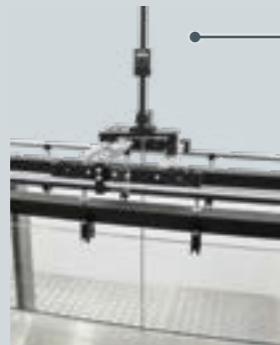
- HM 162.52 Level gauge
- HM 162.64 Velocity meter
- HM 162.53 Ten tube manometers
- HM 162.59 Instrument carrier
- HM 162.82 Instrument carrier for PIV system



- HM 162.91 Digital level gauge
- HM 162.50 Pitotstatic tube
- HM 162.13 Electronic pressure measurement
- HM 162.81 PIV-System
- HM 162.83 Glass cut-out for PIV system

HM 163

- HM 163.52 Level gauge
- HM 163.64 Velocity meter
- HM 163.53 Ten tube manometers
- HM 163.59 Instrument carrier
- HM 163.82 Instrument carrier for PIV system



- HM 163.91 Digital level gauge
- HM 163.50 Pitotstatic tube
- HM 162.13 Electronic pressure measurement
- HM 163.81 PIV-System
- HM 163.83 Glass cut-out for PIV system

Hydraulic engineering
Other accessories for GUNT experimental flumes

- HM 160.10 Extension element of the experimental flume
- HM 160.19 UV system for disinfection



Wind and waves in the experimental flume

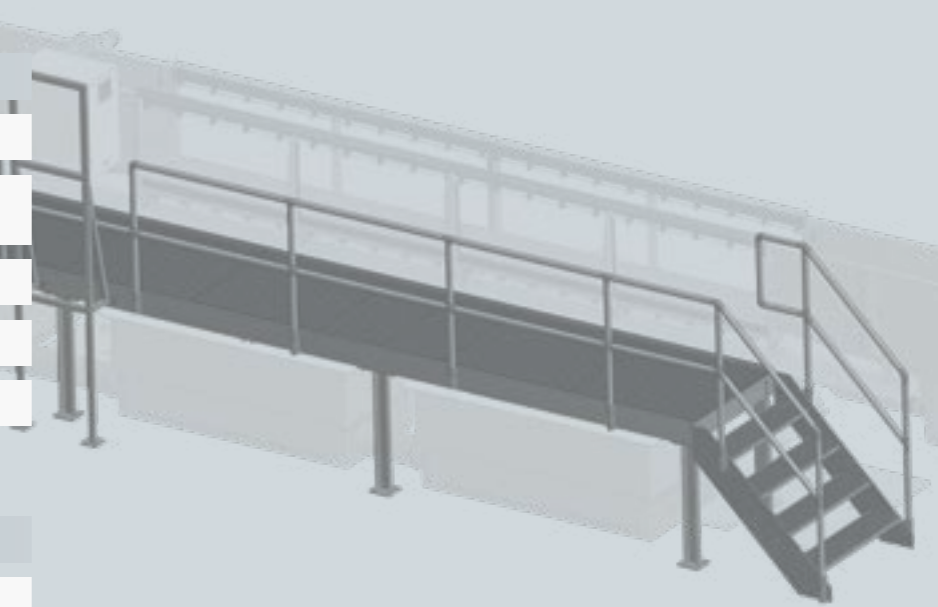
Active Grid

As a customized design, GUNT has developed a combined wind/water flume based on an HM 161 experimental flume. An **Active Grid** is installed within the water-filled cross-section, enabling controlled turbulent flow conditions.



- HM 162.57 Electrical inclination adjustment
- HM 162.10 Extension element of the experimental flume
- HM 162.20 Water tank
- HM 162.14 Gallery
- HM 162.15 Extension element of the gallery

- HM 162.57 Electrical inclination adjustment
- HM 163.10 Extension element of the experimental flume
- HM 163.20 Water tank
- HM 163.14 Gallery
- HM 163.15 Extension element of the gallery



Hydraulic engineering
Sediment transport

HM 166
Fundamentals of sediment transport

Starting conditions for bed-load transport



HM 140
Open-channel sediment transport

Observation of bed formation; visualisation of flow with contrast medium



HM 142
Separation in sedimentation tanks

Solid/liquid separation in a sedimentation tank, visualisation of flow conditions



HM 144
Formation of river courses

Compact experimental flume for modelling small river courses; inclination of the experimental flume adjustable



HM 168
Sediment transport in river courses

Investigation of sediment migration with and without structures



Hydraulic engineering
Seepage flow

HM 152
Potential flow

Visualisation of streamlines in a Hele-Shaw cell, ink as contrast medium



HM 167
Groundwater flow

Three-dimensional investigations; demonstration of lowering of groundwater; investigation of excavation pits



CE 116
Cake and depth filtration

Fundamentals of filtration: Darcy's equation



HM 165
Studies in hydrology

Investigation of precipitation-discharge relationships, storage capacity of soils, seepage flows and groundwater flows



HM 145
Advanced hydrological investigations

Seepage flows and groundwater flows in soils; sediment transport and obstacles in running waters



HM 141
Hydrographs after precipitation

Correlations between precipitation and seepage; various drainage methods



HM 169
Visualisation of seepage flows

Graphical determination of flow nets; investigation of water pressure on structures

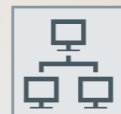


Sensors in process engineering

RT 452 Flow control with GUNT's SMART features



About the product:



5 | Process engineering



Mechanical process engineering

Separation methods:	
▶ classifying and sorting	224
▶ separation in a gravity field	225
▶ separation in a centrifugal force field	226
▶ filtration	226
Comminution	227
Mixing and agglomeration	228
Storage and flow of bulk solids	228
Fluidised beds and pneumatic transport	229



Thermal process engineering

Drying and evaporation	230
Distillation / rectification	231
Absorption and adsorption	232
Crystallisation and membrane separation processes	233
Extraction	234
Mass transfer	234
Food engineering	235



Chemical process engineering

Thermal activation	236
Catalytic and photochemical activation	237
Electrolysis	238



Biological process engineering

Aerobic processes	240
Anaerobic processes	241



Pilot plants

Maintenance	242
Oil & gas industry	244
Chemical industry	246
Power plant industry	247



Process engineering



Mechanical process engineering
Separation methods: classifying and sorting

MT 174
Sorting plant

Preventive maintenance based on the example of a separation process, system control via PLC

For free
 Multimedia instructional materials via Internet



Mechanical process engineering
Separation methods: separation in a gravity field

HM 142
Separation in sedimentation tanks
 Solid/liquid separation in a sedimentation tank, visualisation of flow conditions



CE 115
Fundamentals of sedimentation
 Separation of suspensions



CE 588
Demonstration of dissolved air flotation
 Basic function and visualisation of the process



CE 275
Gas flow classification
 Zigzag sifter to separate solid compounds



CE 280
Magnetic separation
 Sorting with a drum-type magnetic separator



CE 587
Dissolved air flotation
 Removal of solids from raw water using dissolved air flotation



Mechanical process engineering
Separation methods: separation in a centrifugal force field

CE 282
 Disc centrifuge
 Continuous separation of emulsions



CE 225
 Hydrocyclone
 Separation of solids from liquids by using a centrifugal force



CE 235
 Gas cyclone
 Solid separation from gases using a cyclone



CE 287
 Plate and frame filter press
 Discontinuous cake filtration for separating solids out of suspensions



CE 283
 Drum cell filter
 Continuous cake filtration for separating solids from suspensions



CE 284
 Nutsche vacuum filter
 Discontinuous cake filtration by negative pressure



CE 286
 Nutsche pressure filter
 Discontinuous cake filtration by positive pressure



CE 285
 Suspension production unit
 Supply unit for experimental filtration units CE 284 and CE 286



CE 579
 Depth filtration
 Demonstration of depth filtration and backwashing of filters



Mechanical process engineering
Separation methods: filtration

CE 116
 Cake and depth filtration
 Fundamentals of filtration: Darcy's equation



CE 117
 Flow through particle layers
 Investigation of the properties of fixed and fluidised beds subjected to liquid flow



Mechanical process engineering
Comminution

CE 245
 Ball mill
 Observation of the milling process: comminution of solids



CE 264
 Screening machine
 Professional analyser for CE 245 and CE 275; determination of particle size distributions



Mechanical process engineering
Mixing and agglomeration

CE 320
Stirring

Visualization of flow fields when using various stirrer types



CE 255
Rolling agglomeration

Dish granulator with adjustable speed and angle of inclination



CE 322

Rheology and mixing quality in a stirred tank

Stirring machine with direct torque measurement to determine the power curves



Mechanical process engineering
Storage and flow of bulk solids

CE 210

Flow of bulk solids from silos

Influence of wall material and inclination of hopper wall on flow profile and outflow time



Mechanical process engineering
Fluidised beds and pneumatic transport

CE 220

Fluidised bed formation

Investigation of fluidised bed formation of solids in air and water



CE 250

Pneumatic transport

Pneumatic pressure-lifting of solids in a vertical transparent tube



CE 222

Comparison of fluidised beds

Two transparent columns with different diameters for observation of fluidised bed formation in gases



Thermal process engineering
Drying and evaporation

CE 715
Rising film evaporation

Concentration of temperature-sensitive solutions



CE 130
Convection drying

Drying curves for granular solids



Thermal process engineering
Distillation / rectification

CE 600
Continuous rectification

Continuous and discontinuous rectification with packed, sieve tray and bubble cap tray column, system control via PLC



For free
Multimedia instructional materials
via Internet

CE 610
Comparison of
rectification columns

PLC controlled continuous
rectification with packed
and sieve tray column



CE 602
Discontinuous rectification

Comparison of packed and sieve tray columns in rectification



Thermal process engineering Absorption and adsorption

CE 400 Gas absorption

Separating a carbon dioxide/air mixture by absorption in counterflow



CE 402 Gas absorption with continuous gas analysis

Separating a carbon dioxide/air mixture by absorption in counterflow; system control via PLC with data acquisition



CE 405 Falling film absorption

Separation of oxygen from an air flow by absorption in a falling film column



CE 583 Adsorption

Adsorption of dissolved substances on activated carbon



CE 540 Adsorptive air drying

Basic principle of adsorption and desorption



CE 545 N₂ - Pressure swing adsorption PSA

Basic principle of pressure swing adsorption (PSA) for production of nitrogen from air



Thermal process engineering Crystallisation and membrane separation processes

CE 520 Cooling crystallisation

Investigation of crystal growth in a fluidised bed



CE 550 N₂ - Membrane separation process

Demonstration of gas separation, SEPURAN® hollow fibre membrane for nitrogen production, purity up to 99,5%, plant control via integrated PLC with data acquisition



CE 530 Reverse osmosis

Membrane separation process for obtaining solvent from a salt solution, system control via PLC



Thermal process engineering Extraction

CE 620 Liquid-liquid extraction

Separation of a two-component liquid mixture by extraction in counterflow with a solvent



CE 630 Solid-liquid extraction

Continuous and discontinuous extraction of the soluble components of a solid



Thermal process engineering Food engineering

CE 750 Pasteurisation process

Pasteuriser on an industrial scale with extensive operating functions and maintenance work; system control via PLC



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Multimedia instructional materials via Internet

CE 715 Rising film evaporation

Concentration of temperature-sensitive solutions



Thermal process engineering Mass transfer

CE 110 Diffusion in liquids and gases

Use of Fick's law



CE 520 Cooling crystallisation

Investigation of crystal growth in a fluidised bed



CE 530 Reverse osmosis

Membrane separation process for obtaining solvent from a salt solution, system control via PLC



 Chemical process engineering
Thermal activation

CE 310
Supply unit for chemical reactors

Basic unit for investigation and comparison of different reactors during a saponification reaction



CE 310.01
Continuous stirred tank reactor

Tank for continuous or batch operation with agitator, heat exchanger and overflow



CE 310.02
Tubular reactor

Tube coil as a reaction tube in a water bath for continuous reaction operation



CE 310.03
Stirred tanks in series

Series connection of three stirred tank reactors



CE 310.04
Discontinuous stirred tank reactor

Dewar vessel with stirrer and heat exchanger for isothermal saponification reaction



CE 310.05
Plug-flow reactor

Continuously operated tubular reactor; fixed bed with glass spheres



CE 310.06
Laminar flow reactor

Continuously operated tubular reactor



CE 100
Tubular reactor

Demonstration of the influence of temperature and reaction period on the alkaline saponification reaction



Chemical process engineering
Catalytic and photochemical activation

CE 380
Fixed bed catalysis

Investigation of catalytic reactions



CE 380.01
Flow injection analysis

Professional analysis unit for CE 380: detection of glucose



CE 584
Advanced oxidation

Oxidation of organic substances with hydrogen peroxide and UV light



CE 650
Biodiesel plant

Chemical transesterification of vegetable oils, system control via PLC



Chemical process engineering
Electrolysis

ET 278
Principles of the H₂ circuit (PEM)

Hydrogen circuit: production of hydrogen by PEM electrolysis and generation of electrical energy using a PEM fuel cell



For free
Multimedia instructional materials via Internet

ET 280
Modular electrolyser for H₂ (AEM)

AEM electrolysis for hydrogen production by converting electrical energy into chemical energy; optionally in combination with the ET 255 energy system for solar and wind power



For free
Multimedia instructional materials via Internet

ET 282
Industrial electrolyser for H₂ (PEM)

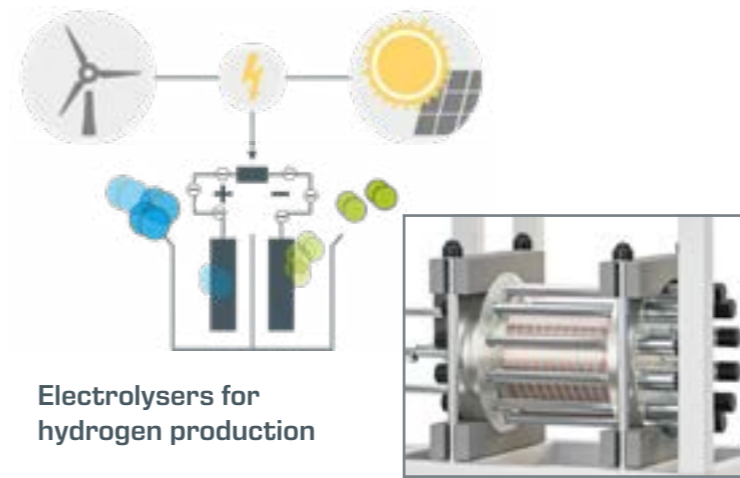
Industrial process: PEM electrolysis for hydrogen production with GUNT software for monitoring and controlling the plant



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Multimedia instructional materials via Internet



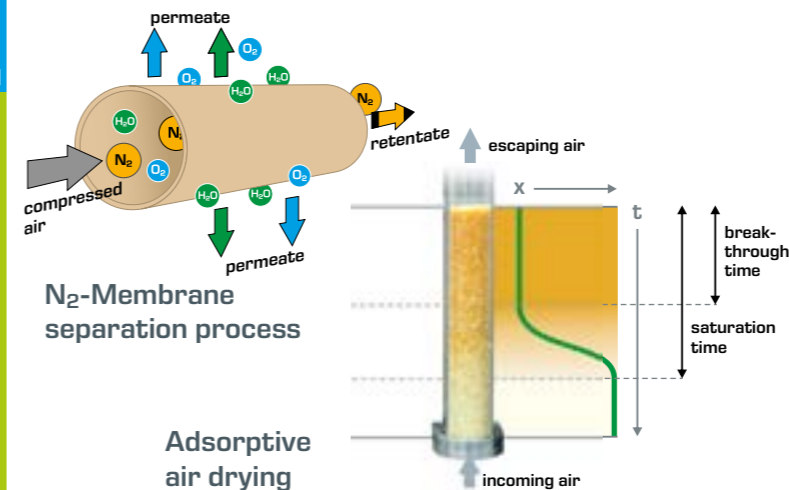
Upstream



Electrolysers for hydrogen production



Midstream

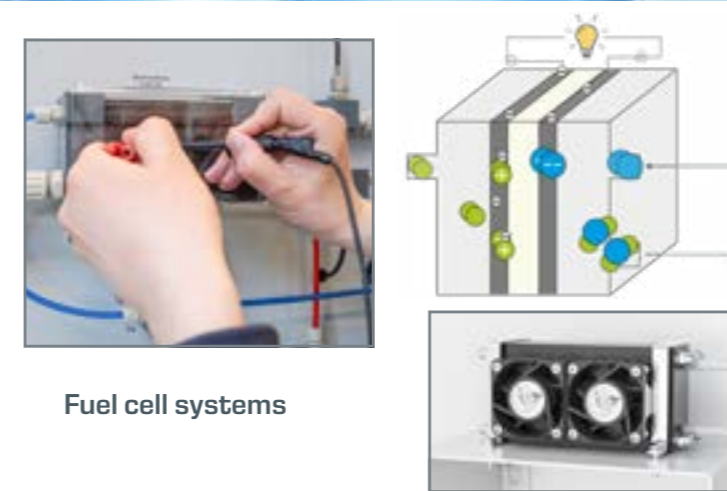


N₂-Membrane separation process

Adsorptive air drying



Downstream



Fuel cell systems



H₂SKILLS
Green hydrogen expertise

Future expertise for education

The GUNT range of units for the development of H₂SKILLS enables future specialists in the hydrogen industry to receive practical training. For teachers, the hydrogen devices are didactically incorporated into the classroom to ensure the effective transfer of knowledge.



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 Biological process engineering
Aerobic processes

CE 701**Biofilm process**

Biological, aerobic water treatment by the biofilm process: trickling filter

**CE 730****Airlift reactor**

Aerobic submerged reactor

**CE 704****SBR process**

Sequencing batch reactor

**CE 705****Activated sludge process**

Wastewater treatment plant in laboratory scale: aerobic biological degradation of organic substances, system control via PLC



Biological process engineering
Anaerobic processes

CE 702**Anaerobic water treatment**

Anaerobic degradation of organic substances in the stirred tank and UASB reactor for biogas production (UASB: Upflow Anaerobic Sludge Blanket)

**CE 640****Biotechnological production of ethanol**

Batch conversion of starch-based raw materials into ethanol, system control via PLC

**CE 642****Biogas plant**

Two-stage continuous degradation of organic substances. First stage: hydrolysis and acidification, second stage: anaerobic degradation, system control via PLC



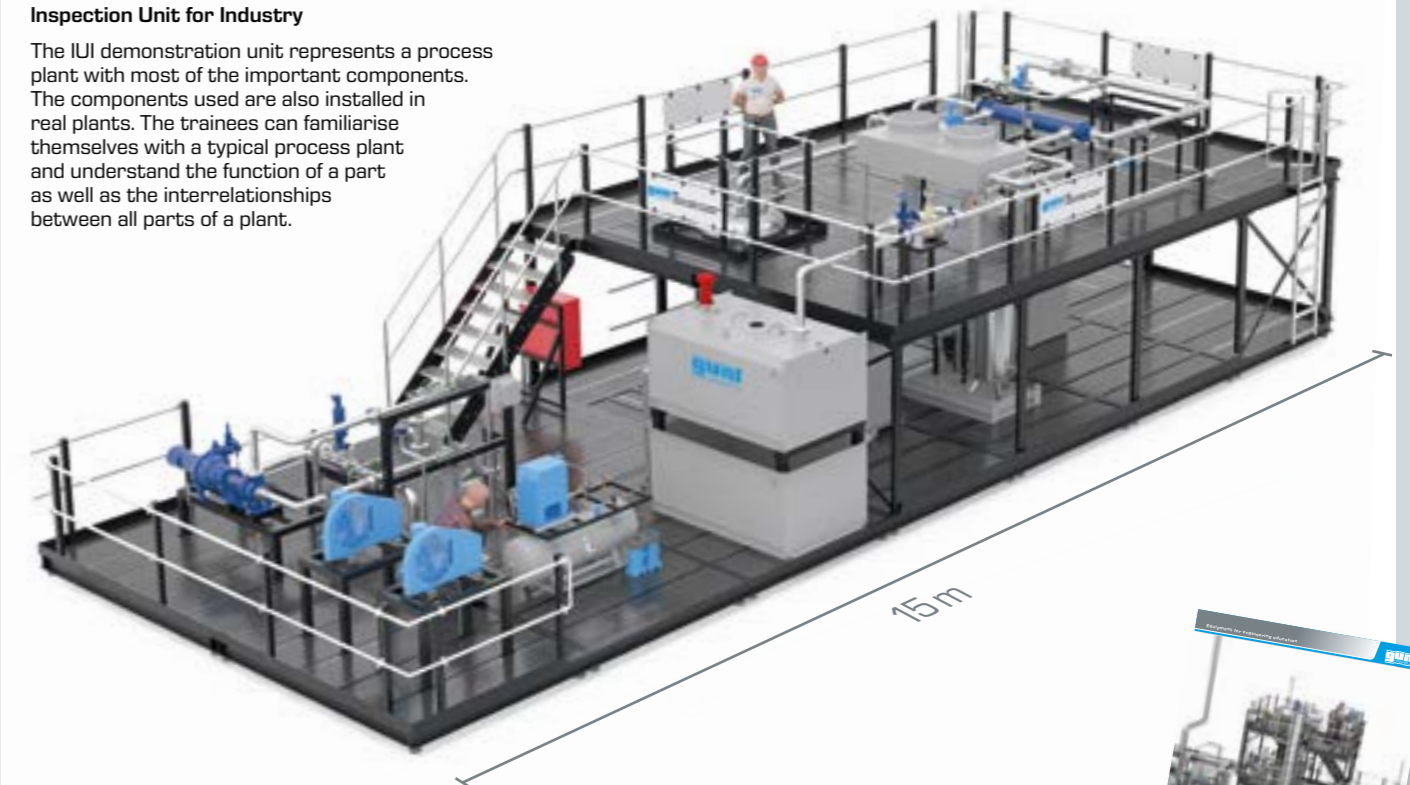

**Pilot plants
Maintenance**
MMTS
Mechanical Maintenance Training Skid

The training system MMTS is used for the maintenance of mechanical components as well as for the measurement and control of various parameters in a piping system with two different working media (oil and water).

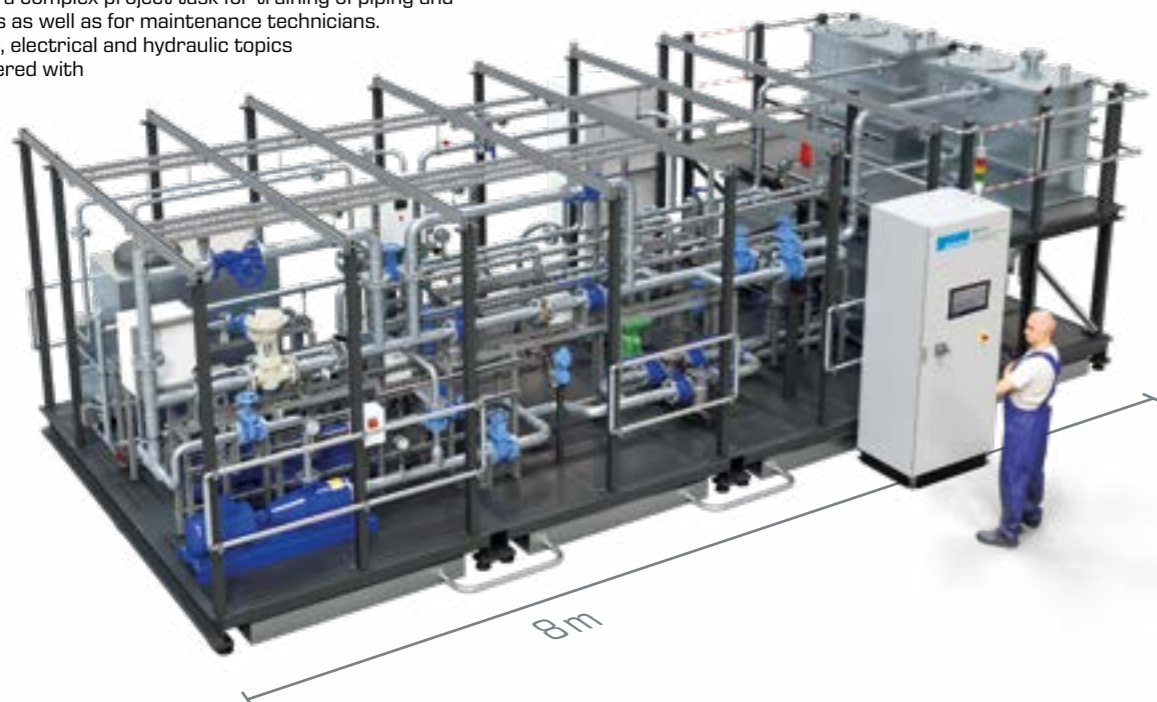
In real applications, such systems can be found in power stations or in facilities for oil refining and natural gas processing.


IUI
Inspection Unit for Industry

The IUI demonstration unit represents a process plant with most of the important components. The components used are also installed in real plants. The trainees can familiarise themselves with a typical process plant and understand the function of a part as well as the interrelationships between all parts of a plant.


MPTR
Main Process Training Rig

The training rig is based entirely on industrial technologies. It presents a complex project task for training of piping and plant fitters as well as for maintenance technicians. Mechanical, electrical and hydraulic topics can be covered with this rig.



Pilot plants
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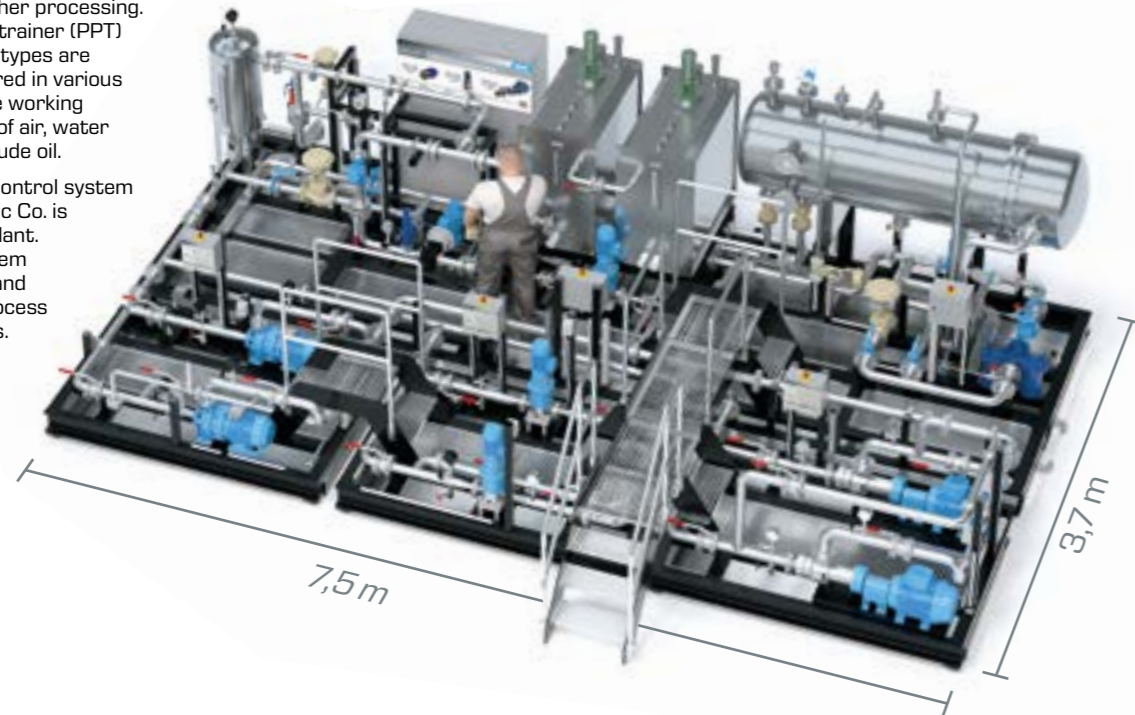
Pilot plants Oil & gas industry

PPT Process Pump Trainer

In oil industry, crude oil is extracted from a well and then pumped for further processing. In the process pump trainer (PPT) three different pump types are operated and compared in various operation modes. The working medium is a mixture of air, water and oil to simulate crude oil.

The DeltaV process control system from Emerson Electric Co. is used to control the plant. This automation system is very user-friendly and widely used in the process and energy industries.

DeltaV has modern control functions and allows the operator optimum control of the plant at all times.

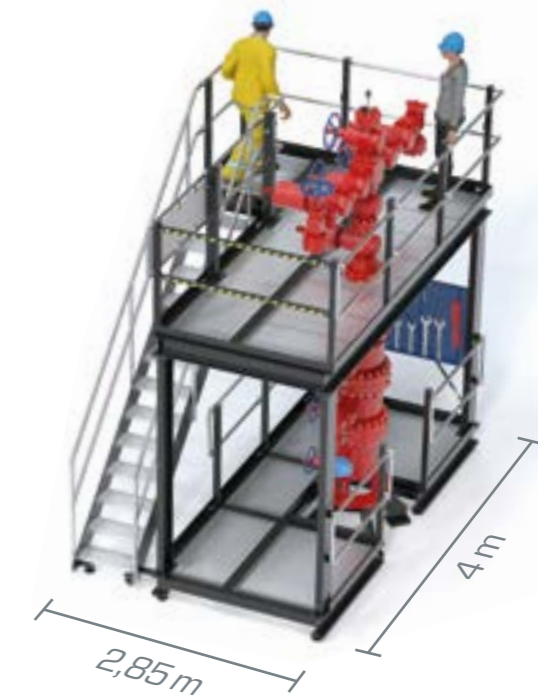


WaXTMT Wellhead and Xmas-Tree Maintenance Trainer

In the oil industry, crude oil is extracted from a well and then pumped for further processing.

A wellhead is installed at the top of the oil well as an interface between the drilling equipment and production equipment. Connected to the wellhead is an eruption cross (Xmas-Tree) with valves, coils and fittings for oil processing.

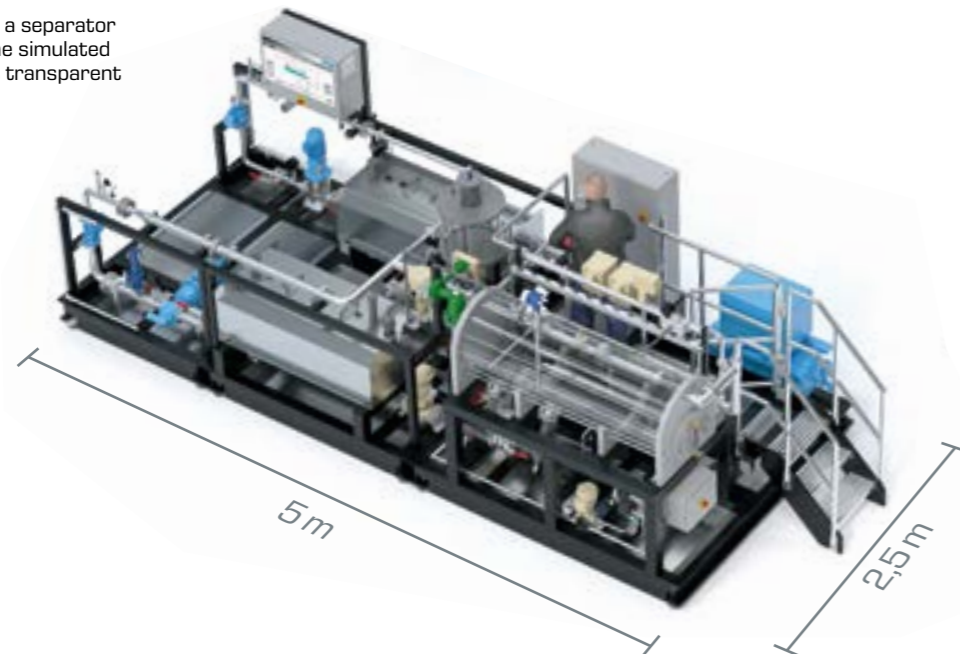
The trainer is used to assemble and disassemble the wellhead and the eruption cross. No fluids are pumped through the trainer. The tools required for the work are included.



PST Phase Separation Trainer

The phase separation trainer demonstrates the separation of simulated crude oil into air, water and oil.

Main part of the trainer is a separator using gravity to split up the simulated crude oil. The separator is transparent to enable observing the separation process.

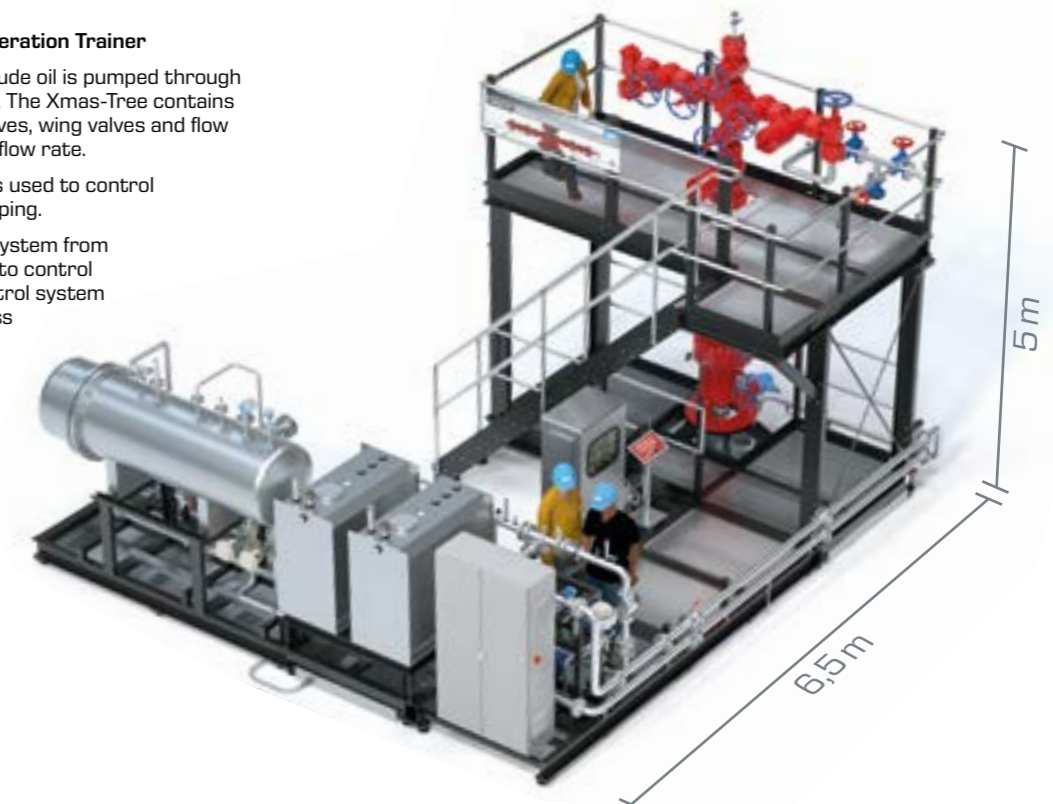


WaXTOT Wellhead and Xmas-Tree Operation Trainer

In this trainer, a simulated crude oil is pumped through a wellhead and an Xmas-Tree. The Xmas-Tree contains the lower and upper main valves, wing valves and flow control valves to control the flow rate.

A commercial control panel is used to control the safety functions and pumping.

The DeltaV process control system from Emerson Electric Co. is used to control the trainer. This process control system is very common in the process and energy industry.

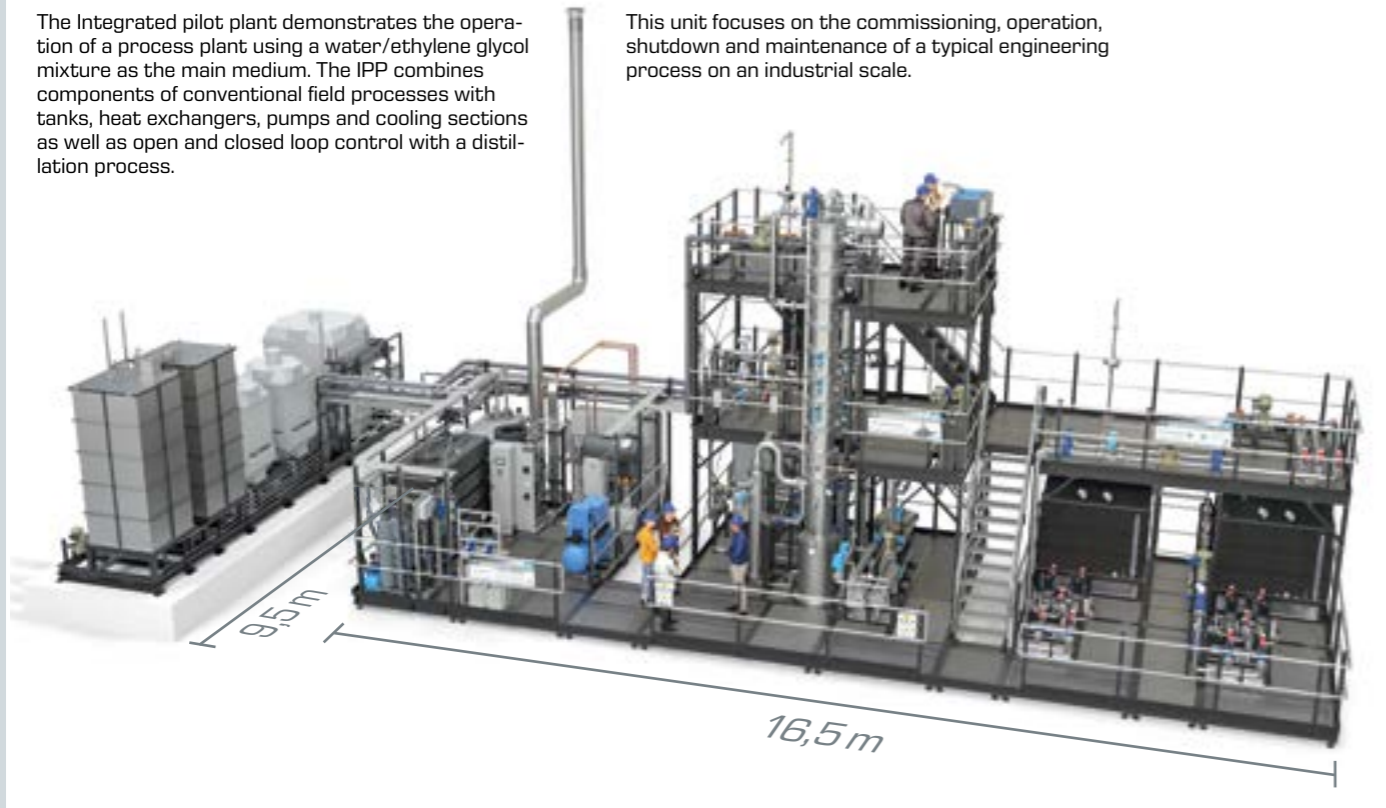


Pilot plants Chemical industry

IPP Integrated Pilot Plant

The Integrated pilot plant demonstrates the operation of a process plant using a water/ethylene glycol mixture as the main medium. The IPP combines components of conventional field processes with tanks, heat exchangers, pumps and cooling sections as well as open and closed loop control with a distillation process.

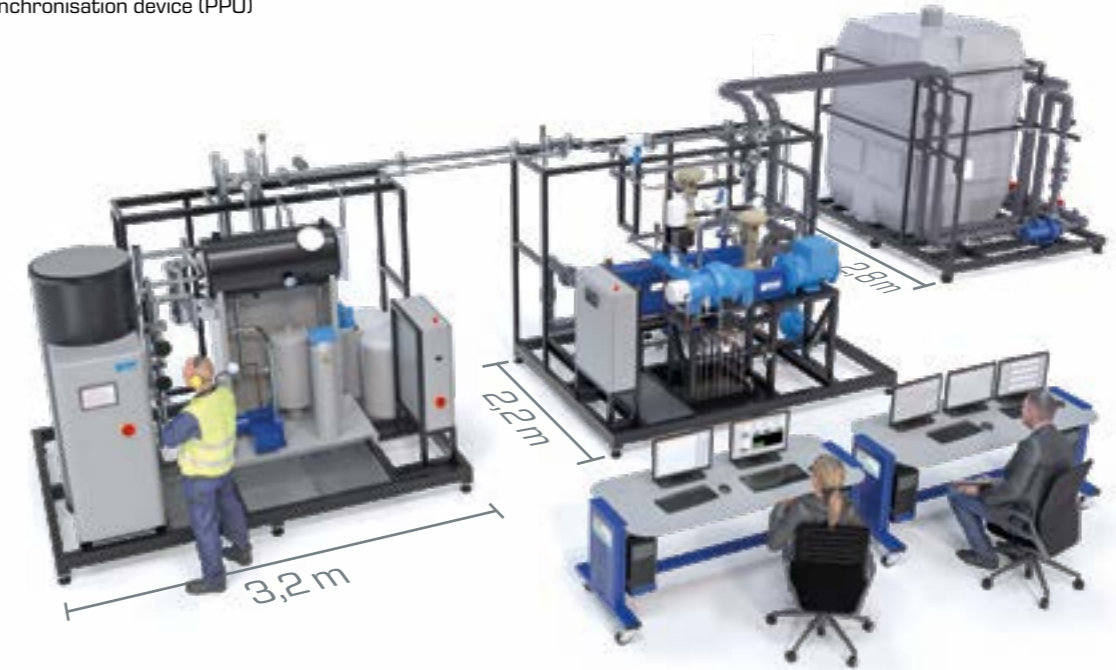
This unit focuses on the commissioning, operation, shutdown and maintenance of a typical engineering process on an industrial scale.



Pilot plants Power plant industry

ET 805 Steam power plant 20kW with process control system

Steam turbine with synchronous generator for grid-connected or stand-alone operation. Fully equipped with oil-fired or gas-fired boiler, condenser, cooling tower, feed water purification and modern synchronisation device (PPU)



The ET 805 steam power plant is specially designed for education and training in the field of power plant technology with process control system.

Due to the size and complexity of the plant, the operating behaviour corresponds to many aspects of real large-scale plants and thus enables practical training. With this plant, all relevant characteristics of a steam turbine power plant can be investigated.

The integrated process control system enables students to practise the operation of an automated power plant. All important variables for the process are clearly displayed in process diagrams and converted into characteristic values.



Solar Line – Energy use

with GUNT's SMART features



ET 203 Parabolic trough collector
with solar tracking

To Solar Line:



6 | Renewable energies and sustainability



Solar energy

Photovoltaics	250
Solar thermal energy	251
Solar cooling	252



Wind power

Fundamentals of wind energy technology	254
Application technology for wind power plants	256



Green hydrogen technology

258



Hydropower and ocean energy

262



Biomass

264



Geothermal energy

Heat exchangers	265
Shallow geothermal energy	266
Deep geothermal energy	267



Energy systems

Storage in energy systems	268
Conversion in energy systems	270



Energy efficiency in buildings

Business and industry	271
Heat supply and air conditioning	273
Inclusion of renewable energies	275



Renewable energies
and sustainability



Solar energy
Photovoltaics

Photovoltaics
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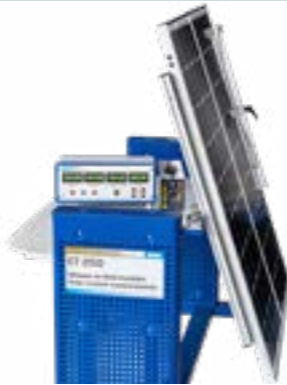
ET 252
Solar cell measurements

Investigation of the properties of solar cells; objective measurements by extensive temperature control of solar cells



ET 250
Photovoltaic modules measurements

Determining the characteristic parameters of a photovoltaic system



ET 250.01
Photovoltaic in grid-connected operation

Expansion module for ET 250 with components for feeding solar power into a public grid



ET 250.02
Stand-alone operation of photovoltaic modules

Expansion module for ET 250 with components for independent use of electricity from photovoltaic modules



ET 255
Energy system for solar and wind power

Electrical components of a photovoltaic installation in practice; operation with real photovoltaic modules or a photovoltaic simulator



ET 255.01
Photovoltaic simulator

Simulation of the current and voltage characteristics of photovoltaic modules

ET 255.02
Photovoltaic modules

Operating behaviour of photovoltaic modules with varying temperature and illuminance; illumination by sunlight or light source HL 313.01

ET 255.03
Consumers

Controllable electrical consumers for utilisation simulation in solar electricity systems

ET 255.04
Wind power plant

Combination of wind and solar energy, investigation of all relevant parameters, connection to ET 255



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Solar energy
Solar thermal energy

Solar thermal energy
www.gunt.de



ET 202
Principles of solar thermal energy

Determining characteristic parameters of a solar thermal system; model fitted with artificial radiation source



ET 202.01
Parabolic trough collector

Function and operating behaviour of a parabolic trough collector, accessories for ET 202



ET 203
Parabolic trough collector with solar tracking

Function and operating behavior of a parabolic trough collector, astronomical and sensor-based sun tracking, system control via PLC



HL 320.03
Flat collector

Pivotable flat collector for converting solar energy into heat



WL 377
Convection and radiation

Heat transport between heating element and vessel wall by convection and radiation



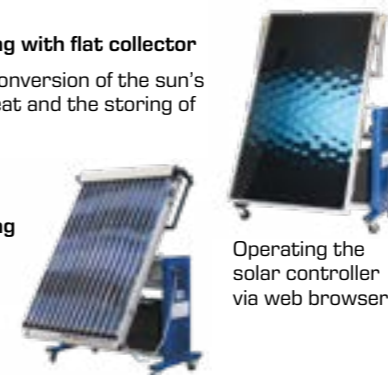
HL 320.04
Evacuated tube collector

Conversion of solar energy into heat in the evacuated tube collector



HL 313
Domestic water heating with flat collector

Demonstration of the conversion of the sun's radiation energy into heat and the storing of that heat



HL 314
Domestic water heating with tube collector

Familiarisation with the functions of the evacuated tube collector and the solar circuit

Operating the solar controller via web browser

HL 320.05
Central storage module with controller

Module with buffer storage and bivalent storage for heating systems with renewable energies, operating the heating controller via touch screen or web browser



Solar energy

Solar cooling

ET 256

Cooling with solar electricity

Compression refrigeration system for operation with solar current from ET 250 or ET 255.02



ET 250

Photovoltaic modules measurements

Determining the characteristic parameters of a photovoltaic system



ET 352.01

Solar heat for refrigeration

Solar thermal operation of a vapour jet compressor



ET 352

Vapour jet compressor in refrigeration

Cold production using thermal energy. Transparent condenser and evaporator allow the view into the inner workings.



HL 313

Domestic water heating with flat collector

Demonstration of the conversion of the sun's radiation energy into heat and the storing of that heat, operating the solar controller via web browser



HL 314

Domestic water heating with tube collector

Familiarisation with the functions of the evacuated tube collector and the solar circuit, operating the solar controller via web browser



GUNT-Service Training for laboratory and teaching staff

We provide support that is perfectly tailored to your needs:

- general handling of the equipment
- how the equipment and its components work
- safety instructions for operating the equipment
- aspects of commissioning, starting the equipment and its maintenance
- introduction to the software (if available)
- explanation of the various experiments and details about the operating manual

Our experienced team is available at any time, anywhere.

The GUNT Technical Academy is the international information centre for practical engineering education. A visit to the GUNT Technical Academy is always worthwhile – for our customers, our partners, our employees.

Get in touch!

Wind power
Fundamentals of wind energy technology

ET 220
Energy conversion
in a wind
power plant

Conversion of
kinetic wind
energy into
electrical energy



ET 220.10
Control unit for wind power plant ET 220.01

Use of wind energy
in stand-alone
operation under
real weather
conditions



ET 220.01
Wind power plant

Connection to ET 220
or ET 220.10;
outdoor installation
allows practically relevant
investigations



ET 210
Fundamentals of wind power plants

Wind power plant with rotor blade adjustment and yaw angle adjustment



HM 226
Wind tunnel for visualisation of streamlines

Illuminated test section, various models, fog generator included



E-Learning
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HM 170
Open wind tunnel

Experiments from the field of aerodynamics and fluid mechanics with an "Eiffel" type wind tunnel



HM 170.70
Wind power plant with rotor blade adjustment

Extension to wind tunnel HM 170



HM 170.05
Drag body
square plate

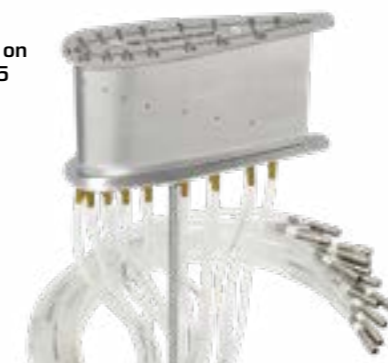


HM 170.09
Lift body
airfoil NACA 0015



HM 170.22
Pressure distribution on
an airfoil NACA 0015

Experiments with
different airfoil
angles of attack



Wind power
Application technology for wind power plants

GL 210
Dynamic behaviour of multistage spur gears

Investigation of the dynamics of rotation of one-, two- and three-stage spur gear units



GL 212
Dynamic behaviour of multistage planetary gears

Investigation of rotational dynamics of a two-stage epicyclic gear with three planetary gears each; four different transmissions adjustable



ET 224
Operating behaviour of wind turbines

Characteristic and control on a wind power drive train



ET 222
Wind power drive train

Experiments on conversion of rotational energy into electrical energy



PT 500.11
Crack detection in rotating shaft kit

Vibrational behaviour of a shaft with a radial crack



PT 500.12
Roller bearing faults kit

Assessment of bearing condition by vibration analysis



PT 500.15
Damage to gears kit

Vibration analysis of gearing damage



PT 500.19
Electromechanical vibrations kit

Investigation of vibrational behaviour of an electric motor



PT 500
Machinery diagnostic system, base unit

Base unit for setting up wide ranging experiments in machinery diagnostics using modular accessory sets



AT 200
Determination of gear efficiency

Test system for determining mechanical drive and braking efficiency for spur and worm gears



H₂ Green hydrogen technology

ET 282
Industrial electrolyser for H₂ (PEM)
Industrial process: PEM electrolysis for hydrogen production with GUNT software for monitoring and controlling the plant



For free
Multimedia instructional materials via Internet

ET 278
Principles of the H₂ circuit (PEM)
Hydrogen circuit: production of hydrogen by PEM electrolysis and generation of electrical energy using a PEM fuel cell



For free
Multimedia instructional materials via Internet

ET 280
Modular electrolyser for H₂ (AEM)
AEM electrolysis for hydrogen production by converting electrical energy into chemical energy; optionally in combination with the ET 255 energy system for solar and wind power



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Multimedia instructional materials via Internet

ET 255
Energy system for solar and wind power
Electrical components of a photovoltaic installation in practice; operation with real photovoltaic modules or a photovoltaic simulator



ET 255.02
Photovoltaic modules
Operating behaviour of photovoltaic modules with varying temperature and illuminance; illumination by sunlight or light source HL 313.01



ET 255.04
Wind power plant
Combination of wind and solar energy, investigation of all relevant parameters, connection to ET 255



MT 220
Assembly station gas booster in hydrogen technology
Assembly of a pipe section with industrial gas booster and various valves and fittings: pipe assembly, leak testing, typical maintenance tasks; 3 assemblies possible

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H₂SKILLS
Green hydrogen expertise



Future expertise for education – experience green hydrogen technology

The GUNT range of units for the development of H₂SKILLS enables future specialists in the hydrogen industry to receive practical training. For teachers, the hydrogen devices are didactically incorporated into the classroom to ensure the effective transfer of knowledge.

CE 815
Components & fittings in hydrogen technology
Familiarization with high pressure components and safety devices in H₂ technology



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Multimedia instructional materials via Internet

CE 810
Gas booster in hydrogen technology
Single-stage gas booster with pneumatic drive, visualising the processes and functions, supported by augmented reality



For free
Multimedia instructional materials via Internet

Green hydrogen technology

ET 292
Fuel cell system
Water-cooled polymer-membrane fuel cell combined heat and power



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Multimedia instructional materials via Internet

CE 545
N₂ - Pressure swing adsorption PSA
Basic principle of pressure swing adsorption (PSA) for production of nitrogen from air



CE 540
Adsorptive air drying
Basic principle of adsorption and desorption



CE 550
N₂ - Membrane separation process
Demonstration of gas separation, SEPURAN® hollow fibre membrane for nitrogen production, purity up to 99,5%, plant control via integrated PLC with data acquisition



CE 300
Ion exchange
Softening and desalination of water by ion exchange



CE 530
Reverse osmosis
Membrane separation process for obtaining solvent from a salt solution, system control via PLC



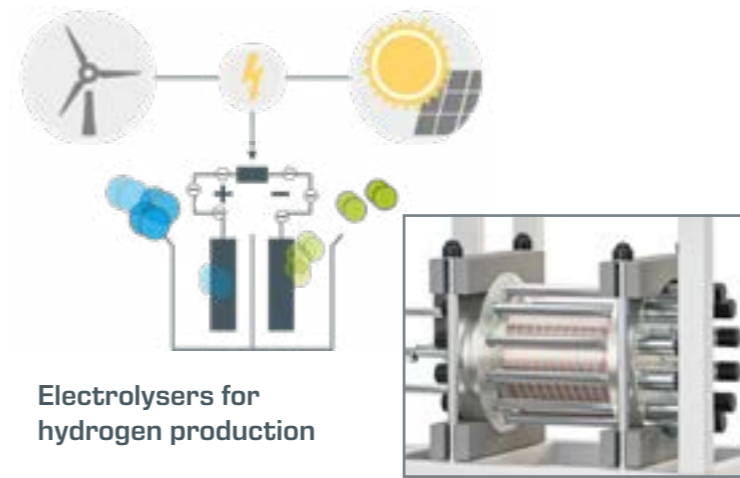
CE 585
Water purification process
Industrial-scale water purification plant with extensive operating functions and maintenance work; system control via PLC



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Multimedia instructional materials via Internet



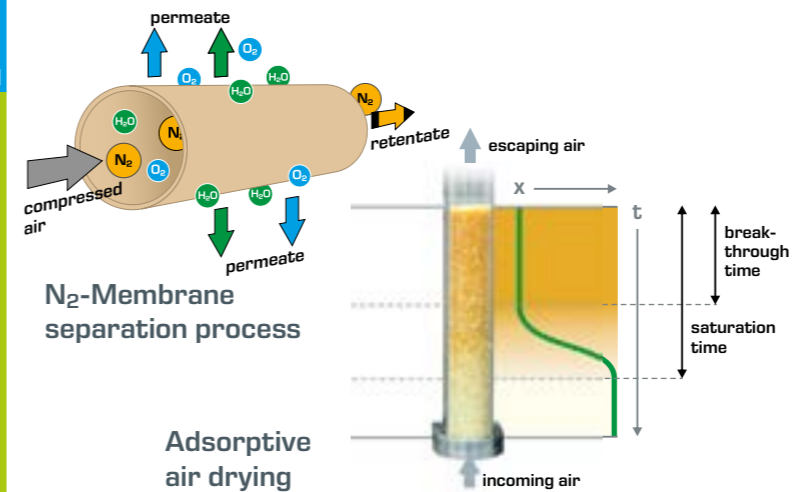
Upstream



Electrolyzers for hydrogen production



Midstream



N₂-Membrane separation process

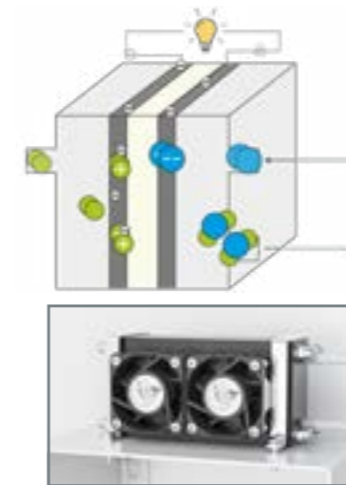
Adsorptive air drying



Downstream



Fuel cell systems



H₂SKILLS
Green hydrogen expertise

Future expertise for education

The GUNT range of units for the development of H₂SKILLS enables future specialists in the hydrogen industry to receive practical training. For teachers, the hydrogen devices are didactically incorporated into the classroom to ensure the effective transfer of knowledge.



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Hydropower and ocean energy

HM 150.19
Operating principle of a Pelton turbine

Model of an impulse turbine with adjustable nozzle; determination of the efficiency

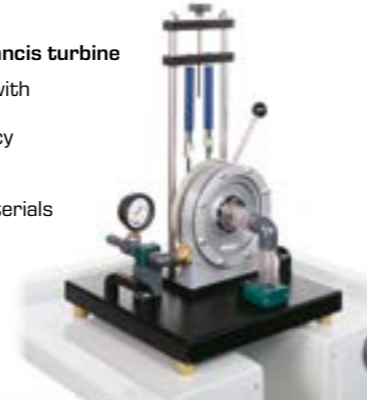
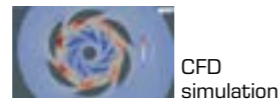
For free
Multimedia instructional materials via Internet



HM 150.20
Operating principle of a Francis turbine

Model of a reaction turbine with adjustable guide vanes and determination of the efficiency

For free
Multimedia instructional materials via Internet



HM 365.31
Pelton and Francis turbine

Comparison of impulse and reaction turbines



HM 365.32
Turbine supply unit

Water supply for HM 365.31



Trainer for turbines with Pelton turbine HM 365.31, supply unit HM 365.32 and brake unit HM 365

HM 421
Propeller type turbine trainer

Four-bladed propeller type turbine with guide vane adjustment for varying power



HM 430C
Francis turbine trainer

Characteristics of a powerful Francis turbine with adjustable guide vanes



HM 450C
Characteristic variables of hydraulic turbomachines

Determination of output and efficiency of turbines and pumps; demonstration of a pumped storage plant



HM 450.01
Pelton turbine

Model of an impulse turbine with speed and torque measurement



HM 450.02
Francis turbine

Model of a reaction turbine with speed and torque measurement; adjustable guide vanes



HM 450.03
Propeller type turbine

Six-bladed propeller type turbine with guide vane adjustment for varying power; measurement of speed and torque



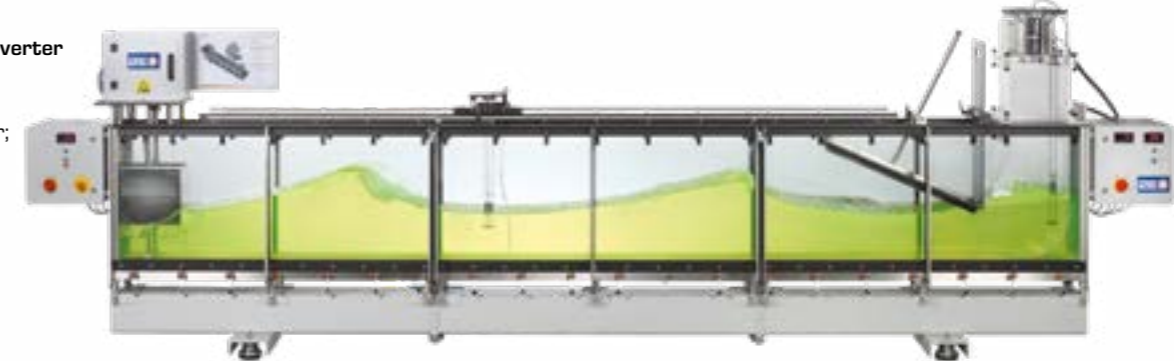
HM 450.04
Kaplan turbine

Five-bladed Kaplan turbine with blade and guide vane adjustment for varying power; measurement of speed and torque



ET 270
Wave energy converter

Turbine unit with Wells turbine and electric generator; configurable wave generator



Biomass

CE 640
Biotechnological production of ethanol

Batch conversion of starch-based raw materials into ethanol, system control via PLC



CE 642
Biogas plant

Two-stage continuous degradation of organic substances. First stage: hydrolysis and acidification, second stage: anaerobic degradation, system control via PLC



CE 650
Biodiesel plant

Chemical transesterification of vegetable oils, system control via PLC



Geothermal energy
Heat exchangers

WL 110 series
www.gunt.de



WL 110
Heat exchanger supply unit

Measuring the transfer characteristics of five different heat exchanger models, system control via PLC



WL 110.02
Plate heat exchanger

Typical plate heat exchanger in parallel flow and counterflow operation



WL 110.01
Tubular heat exchanger

Transparent heat exchanger with additional temperature measuring point after half of the transfer section; parallel flow and counterflow operation



WL 110.04
Stirred tank with double jacket and coil

Heating using jacket or coiled tube; stirrer for improved mixing of medium



WL 110.03
Shell & tube heat exchanger

Transparent shell and tube heat exchanger in cross parallel flow and cross counterflow operation



WL 110.05
Finned tube heat exchanger Heat transfer between water and air; cross-flow operation



WL 315C
Comparison of various heat exchangers

Comparison of plate heat exchanger, tubular heat exchanger, shell and tube heat exchanger, finned cross-flow heat exchanger, and stirred tank with double jacket and coiled tube, system control via PLC



Geothermal energy

Shallow geothermal energy

ET 101 Simple compression refrigeration circuit

Demonstration of a heat pump: cooling and heating of the heat exchangers directly tangible



ET 262 Geothermal probe with heat pipe principle

Transparent components allow observing how the state of the heat transfer medium changes



ET 264 Geothermal energy with two-well system

Use of geothermal energy in an open system without thermal repercussion



HL 320.01 Heat pump

Heat pump for operation with different sources, operating the heating controller via touch screen or web browser



HL 320.07 Underfloor heating / geothermal energy absorber

Can be used as heat sink or heat source



HL 320.08 Fan heater / air heat exchanger

Can be used as heat sink or heat source



Geothermal energy

Deep geothermal energy

ET 850 Steam generator

Laboratory scale gas-fired steam generator for wet or superheated steam; integrated condenser



ET 851 Axial steam turbine

Single-stage steam turbine with power output measurement; steam supply via ET 850, gas-fired or ET 852, electrical



ET 852 Steam generator, electrical

Laboratory scale electrical steam generator for superheated steam; integrated condenser; alternative to the gas-fired steam generator ET 850 for the supply of the steam turbine ET 851



Energy systems
Storage in energy systems

MT 175
Energy efficiency in compressed air systems
Energy efficiency of an industrial plant for metalworking and mechatronics, system control via PLC



Skill Level
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ET 513
Single-stage piston compressor
Investigations on an air compressor including the determination of the mechanical power consumption.
Together with the HM365 drive unit, the single-stage piston compressor forms a complete compressed air generation system.



ET 220
Energy conversion in a wind power plant
Conversion of kinetic wind energy into electrical energy



ET 220.01
Wind power plant
Connection to ET 220 or ET 220.10; outdoor installation allows practically relevant investigations



ET 220.10
Control unit for wind power plant ET 220.01

Use of wind energy in stand-alone operation under real weather conditions



ET 255
Energy system for solar and wind power
Electrical components of a photovoltaic installation in practice; operation with real photovoltaic modules or a photovoltaic simulator



HM 143
Transient drainage processes in storage reservoirs
Demonstration of the function of a rainwater retention basin and a dam



ET 420
Ice stores in refrigeration
Industrial refrigeration system with ice store, dry cooling tower and wet cooling tower



HL 320.03
Flat collector
Pivotable flat collector for converting solar energy into heat



HL 320.05
Central storage module with controller
Module with buffer storage and bivalent storage for heating systems with renewable energies, operating the heating controller via touch screen or web browser



Energy systems
Conversion in energy systems

ET 292
Fuel cell system
Water-cooled polymer-membrane fuel cell combined heat and power

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ET 102
Heat pump
Utilisation of ambient heat for water heating



ET 794
Gas turbine with power turbine
Two-shaft arrangement with high-pressure turbine and power turbine using liquid gas



HL 320.01
Heat pump
Heat pump for operation with different sources, operating the heating controller via touch screen or web browser



HL 320.07
Underfloor heating / geothermal energy absorber
Can be used as heat sink or heat source



HL 320.05
Central storage module with controller
Module with buffer storage and bivalent storage for heating systems with renewable energies, operating the heating controller via touch screen or web browser



HL 320.08
Fan heater / air heat exchanger
Can be used as heat sink or heat source



Energy efficiency in buildings
Business and industry

ET 420
Ice stores in refrigeration
Industrial refrigeration system with ice store, dry cooling tower and wet cooling tower



ET 428
Energy efficiency in refrigeration systems
Refrigeration system with three compressors in interconnected operation; adaptation to the capacity requirement



RT 682
Multivariable control: stirred tank
Heated stirrer tank with heat recovery as model: coupled level and temperature control



RT 396
Pump and valves and fittings test stand
Recording characteristic curves of industrial fittings and a centrifugal pump



Energy efficiency in buildings
Business and industry

ET 500
Two-stage piston compressor

Recording the characteristic of an industrial two-stage compressor, system control via PLC

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MT 141
Assembly exercise: piston compressor

Function and design of a piston compressor; planning, assembly, disassembly

For free
Multimedia instructional materials via Internet



MT 142
Energy efficiency in piston compressors

Installation of the assembled MT 141 piston compressor: functional test; balancing of energies

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Multimedia instructional materials via Internet



How to achieve the digital transformation to Industry 4.0

MT 175
Energy efficiency in compressed air systems

Energy efficiency of an industrial plant for metalworking and mechatronics, system control via PLC

For free
Multimedia instructional materials via Internet



Energy efficiency in buildings
Heat supply and air conditioning

WL 110 series
www.gunt.de



WL 376
Thermal conductivity of building materials

Investigation of the insulation properties of typical materials from the building materials sector



WL 110
Heat exchanger supply unit

Measuring the transfer characteristics of five different heat exchanger models, system control via PLC



WL 110.02
Plate heat exchanger

Typical plate heat exchanger in parallel flow and counterflow operation



WL 110.01
Tubular heat exchanger

Transparent heat exchanger with additional temperature measuring point after half of the transfer section; parallel flow and counterflow operation



WL 110.04
Stirred tank with double jacket and coil

Heating using jacket or coiled tube; stirrer for improved mixing of medium



WL 110.03
Shell & tube heat exchanger

Transparent shell and tube heat exchanger in cross parallel flow and cross counterflow operation



WL 110.05
Finned tube heat exchanger

Heat transfer between water and air; cross-flow operation



Energy efficiency in buildings
Heat supply and air conditioning

HL 305
Hydronic balancing of radiators
Hydronic balancing of a heating system: three heating subcircuits with radiators, thermostatic valves and circulation pump



HL 630
Efficiency in heating technology
Basic principles of energy efficient heating technology with a computer-supported learning process



ET 630
Split system air conditioner
Modern air conditioning unit with heat pump function: cooling or heating



HM 283
Experiments with a centrifugal pump
Determination of characteristic pump variables



Energy efficiency in buildings
Inclusion of renewable energies



HL 320.01
Heat pump
Heat pump for operation with different sources, operating the heating controller via touch screen or web browser



HL 320.02
Conventional heating
Electric complementary heater for the HL 320 modular system

HL 320.03
Flat collector
Pivotable flat collector for converting solar energy into heat



HL 320.04
Evacuated tube collector
Conversion of solar energy into heat in the evacuated tube collector



HL 320.05
Central storage module with controller
Module with buffer storage and bivalent storage for heating systems with renewable energies, operating the heating controller via touch screen or web browser



HL 320.07
Underfloor heating / geothermal energy absorber
Can be used as heat sink or heat source

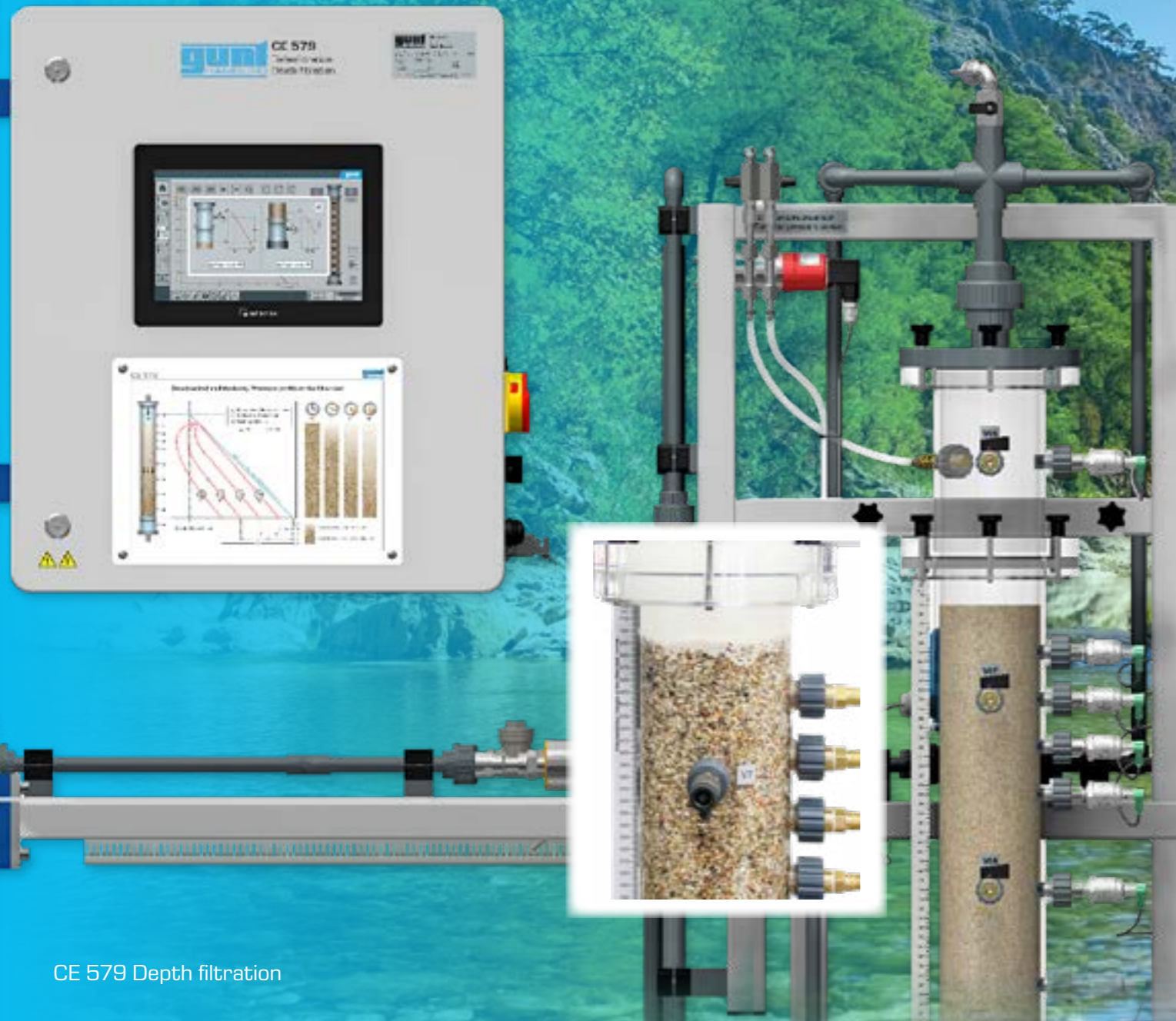


HL 320.08
Fan heater / air heat exchanger
Can be used as heat sink or heat source



Experimental equipment for a clean environment

with GUNT's SMART features



CE 579 Depth filtration

About the product:



6 | Environmental engineering



Air

Mechanical waste air purification	278
Thermal waste air purification	278



Water

Mechanical water treatment	279
Biological water treatment	280
Physical / chemical water treatment	281
Multistage water treatment	282



Soil

Hydrogeology	283
Soil treatment	283



Waste

Separation processes	284
Comminution	284



Environmental engineering



 Air
Mechanical waste air purification

CE 235
Gas cyclone
Solid separation from gases using a cyclone



Air
Thermal waste air purification

CE 400
Gas absorption
Separating a carbon dioxide/air mixture by absorption in counterflow



CE 540
Adsorptive air drying
Basic principle of adsorption and desorption



 Water
Mechanical water treatment

CE 579
Depth filtration
Demonstration of depth filtration and backwashing of filters



CE 579
Dissolved air flotation
Removal of solids from raw water using dissolved air flotation



HM 142
Separation in sedimentation tanks
Solid/liquid separation in a sedimentation tank, visualisation of flow conditions



CE 588
Demonstration of dissolved air flotation
Basic function and visualisation of the process



Water Biological water treatment

CE 705 Activated sludge process

Wastewater treatment plant in laboratory scale: aerobic biological degradation of organic substances, system control via PLC



CE 701 Biofilm process

Biological, aerobic water treatment by the biofilm process: trickling filter



CE 702 Anaerobic water treatment

Anaerobic degradation of organic substances in the stirred tank and UASB reactor for biogas production (UASB: Upflow Anaerobic Sludge Blanket)



CE 730 Airlift reactor

Aerobic submerged reactor



CE 704 SBR process

Sequencing batch reactor



Water Physical/chemical water treatment

CE 583 Adsorption

Adsorption of dissolved substances on activated carbon



CE 300 Ion exchange

Softening and desalination of water by ion exchange



CE 584 Advanced oxidation

Oxidation of organic substances with hydrogen peroxide and UV light



CE 530 Reverse osmosis

Membrane separation process for obtaining solvent from a salt solution, system control via PLC



CE 586 Precipitation and flocculation

Removal of dissolved substances by precipitation, flocculation and sedimentation of the flocs in the lamella separator



Water Multistage water treatment

CE 581 Water treatment plant 1

Three basic procedures of water treatment: depth filtration, adsorption and ion exchange, system control via PLC



CE 582 Water treatment plant 2

Two basic procedures of water treatment: depth filtration and ion exchange



CE 585 Water purification process

Industrial-scale water purification plant with extensive operating functions and maintenance work; system control via PLC



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Soil Hydrogeology

HM 165 Studies in hydrology

Investigation of precipitation-discharge relationships, storage capacity of soils, seepage flows and groundwater flows



HM 141 Hydrographs after precipitation

Correlations between precipitation and seepage; storage capacity and drainage methods



HM 167 Groundwater flow

Three-dimensional investigations; demonstration of lowering of groundwater; investigation of excavation pits



HM 169 Visualisation of seepage flows

Graphical determination of flow nets; investigation of water pressure on structures



Soil Soil treatment

CE 225 Hydrocyclone

Separation of solids from liquids by using a centrifugal force



CE 630 Solid-liquid extraction

Continuous and discontinuous extraction of the soluble components of a solid



Waste Separation processes

MT 174
Sorting plant
 Preventive maintenance based on the example of a separation process, system control via PLC

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CE 275
Gas flow classification
 Zigzag sifter to separate solid compounds



CE 280
Magnetic separation
 Sorting with a drum-type magnetic separator



Waste Comminution

CE 245
Ball mill
 Observation of the milling process: comminution of solids



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Augmented reality in the class-room

GUNT educational equipment offers a wide range of digital features



Augmented reality interface for **immersive learning**



Visual learning for more **motivation to learn**



QR codes on GUNT devices for ease of use



Digital content on GUNT's own web platform

Our product programme



1

Engineering mechanics and engineering design

- statics
- strength of materials
- dynamics
- machine dynamics
- engineering design
- materials testing



2

Mechatronics

- engineering drawing
- cutaway models
- dimensional metrology
- fasteners and machine parts
- manufacturing engineering
- assembly projects
- maintenance
- machinery diagnosis
- automation and process control engineering



3

Thermal engineering

- fundamentals of thermodynamics
- heat exchangers
- thermal fluid energy machines
- internal combustion engines
- refrigeration
- HVAC



4

Fluid mechanics

- physical principles
- steady flow
- transient flow
- flow around bodies
- fluid machinery
- components in piping systems and plant design
- fluid machinery
- hydraulics for civil engineering



5

Process engineering

- mechanical process engineering
- thermal process engineering
- chemical process engineering
- biological process engineering



6

Energy & Environment

- Energy**
- solar energy
 - wind power
 - green hydrogen technology
 - hydropower and ocean energy
 - biomass
 - geothermal energy
 - energy systems
 - energy efficiency in buildings
- Environment**
- water
 - air
 - soil
 - waste

Product overview

AT		
AT 200	Determination of gear efficiency	35, 56, 257
CE		
CE 100	Tubular reactor	236
CE 105	Corrosion of metals	41
CE 110	Diffusion in liquids and gases	234
CE 115	Fundamentals of sedimentation	225
CE 116	Cake and depth filtration	221, 226
CE 117	Flow through particle layers	226
CE 130	Convection drying	230
CE 210	Flow of bulk solids from silos	228
CE 220	Fluidised bed formation	158, 228
CE 222	Comparison of fluidised beds	229
CE 225	Hydrocyclone	226, 283
CE 235	Gas cyclone	226, 278
CE 245	Ball mill	227, 284
CE 250	Pneumatic transport	229
CE 255	Rolling agglomeration	228
CE 264	Screening machine	227
CE 271	Multi-head diaphragm pump	189
CE 272	Rotary vane vacuum pump	189
CE 275	Gas flow classification	224, 284
CE 280	Magnetic separation	224, 284
CE 282	Disc centrifuge	226
CE 283	Drum cell filter	227
CE 284	Nutsche vacuum filter	227
CE 285	Suspension production unit	227
CE 286	Nutsche pressure filter	227
CE 287	Plate and frame filter press	227
CE 300	Ion exchange	260, 281
CE 310	Supply unit for chemical reactors	236
CE 310.01	Continuous stirred tank reactor	236
CE 310.02	Tubular reactor	236
CE 310.03	Stirred tanks in series	236
CE 310.04	Discontinuous stirred tank reactor	236
CE 310.05	Plug-flow reactor	236
CE 310.06	Laminar flow reactor	236
CE 320	Stirring	228
CE 322	Rheology and mixing quality in a stirred tank	228
CE 380	Fixed bed catalysis	237
CE 380.01	Flow injection analysis	237
CE 400	Gas absorption	232, 278
CE 402	Gas absorption with continuous gas analysis	232
CE 405	Falling film absorption	232
CE 520	Cooling crystallisation	233, 235
CE 530	Reverse osmosis	233, 235, 260, 281
CE 540	Adsorptive air drying	232, 260, 278
CE 545	N ₂ - Pressure swing adsorption PSA	232, 260
CE 550	N ₂ - Membrane separation process	233, 260
CE 579	Depth filtration	227, 279
CE 581	Water treatment plant 1	282
CE 582	Water treatment plant 2	282
CE 583	Adsorption	232, 281
CE 584	Advanced oxidation	237, 281
CE 585	Water purification process	67, 260, 282
CE 586	Precipitation and flocculation	281
CE 587	Dissolved air flotation	225, 279
CE 588	Demonstration of dissolved air flotation	225, 279
CE 600	Continuous rectification	231
CE 602	Discontinuous rectification	231
CE 610	Comparison of rectification columns	231
CE 620	Liquid-liquid extraction	234
CE 630	Solid-liquid extraction	234, 283

CE 640	Biotechnical production of ethanol	241, 264
CE 642	Biogas plant	241, 264
CE 650	Biodiesel plant	237, 264
CE 701	Biofilm process	240, 280
CE 702	Anaerobic water treatment	241, 280
CE 704	SBR process	240, 280
CE 705	Activated sludge process	240, 280
CE 715	Rising film evaporation	230, 235
CE 730	Airlift reactor	240, 280
CE 750	Pasteurisation process	67, 235
CE 810	Gas booster in hydrogen technology	62, 259
CE 815	Components & fittings in hydrogen technology	259

CT		
CT 100.20	Four-stroke petrol engine for CT 110	102
CT 100.21	Two-stroke petrol engine for CT 110	102
CT 100.22	Four-stroke diesel engine for CT 110	102
CT 100.23	Water-cooled four-stroke diesel engine for CT 110	102
CT 110	Test stand for single-cylinder engines, 7,5kW	102
CT 150	Four-stroke petrol engine for CT 159	101, 184, 204
CT 151	Four-stroke diesel engine for CT 159	101, 184, 204
CT 153	Two-stroke petrol engine for CT 159	101, 184, 204
CT 159	Modular test stand for single-cylinder engines, 3kW	101, 184, 204
CT 300	Engine test stand, 11kW	103
CT 300.04	Two-cylinder petrol engine for CT 300	103
CT 300.05	Two-cylinder diesel engine for CT 300	103
CT 400	Load unit, 75kW, for four-cylinder engines	103
CT 400.01	Four-cylinder petrol engine for CT 400	103
CT 400.02	Four-cylinder diesel engine for CT 400	103

EM		
EM 049	Equilibrium of moments on a two-arm lever	9

ET		
ET 101	Simple compression refrigeration circuit	106, 266
ET 102	Heat pump	115, 130, 270
ET 120	Cooling using the Peltier effect	106
ET 122	Vortex cooling device	106
ET 144	Electrical installation in refrigeration systems	117
ET 165	Refrigeration system with open compressor	111, 196, 205
ET 170	Electrical faults in simple air conditioning systems	118
ET 171	Electrical connection of refrigerant compressors	117
ET 172	Electrical faults in refrigerant compressors	118
ET 174	Electrical faults in full air conditioning systems	118
ET 180	Pressure switches in refrigeration	112
ET 182	Secondary controllers in refrigeration systems	112
ET 192	Replacement of refrigeration components	119
ET 195	Process cooling	67, 119
ET 202	Principles of solar thermal energy	127, 134, 251
ET 202.01	Parabolic trough collector	127, 134, 251
ET 203	Parabolic trough collector with solar tracking	127, 134, 251
ET 210	Fundamentals of wind power plants	180, 254
ET 220	Energy conversion in a wind power plant	180, 254, 269
ET 220.01	Wind power plant	180, 254, 269
ET 220.10	Control unit for wind power plant ET 220.01	180, 254, 269
ET 224	Wind power drive train	180, 256
ET 222	Operating behaviour of wind turbines	180, 256
ET 250	Photovoltaic modules measurements	126, 250, 252
ET 250.01	Photovoltaic in grid-connected operation	126, 250
ET 250.02	Stand-alone operation of photovoltaic modules	126, 250
ET 252	Solar cell measurements	126, 250
ET 255	Energy system for solar and wind power	126, 250, 258, 268
ET 255.01	Photovoltaic simulator	126, 250
ET 255.02	Photovoltaic modules	126, 250, 258

ET 255.03	Consumers	126, 250
ET 255.04	Wind power plant	250, 258
ET 256	Cooling with solar electricity	116, 126, 252
ET 262	Geothermal probe with heat pipe principle	128, 266
ET 264	Geothermal energy with two-well system	128, 266
ET 270	Wave energy converter, OWC	181, 263
ET 278	Principles of the H ₂ circuit (PEM)	238, 258
ET 280	Modular electrolyser for H ₂ (AEM)	238, 258
ET 282	Industrial electrolyser for H ₂ (PEM)	238, 258
ET 292	Fuel cell system	128, 260, 270
ET 300	Finned tube heat exchanger water/air	94
ET 350	Changes of state in the refrigeration circuit	107
ET 350.01	Hot water generator	107
ET 351C	Thermodynamics of the refrigeration circuit	109, 176
ET 352	Vapour jet compressor in refrigeration	106, 116, 196, 252
ET 352.01	Solar heat for refrigeration	116, 252
ET 360	Refrigeration circuit with propane	106
ET 380	Refrigeration cycle: refrigeration plant and heat pump	109
ET 400	Refrigeration circuit with variable load	107
ET 405	Heat pump for cooling and heating operation	112, 115, 130
ET 411C	Compression refrigeration system	107
ET 412C	Refrigeration system with refrigeration and freezing chamber	109
ET 420	Ice stores in refrigeration	115, 130, 268, 271
ET 422	Capacity control and faults in refrigeration systems	119
ET 426	Capacity control in refrigeration systems	112
ET 428	Energy efficiency in refrigeration systems	111, 271
ET 430	Refrigeration system with two-stage compression	109, 196
ET 431	Heat exchangers in the refrigeration circuit	112
ET 432	Piston compressor in refrigeration	99, 111
ET 441	Refrigeration chamber and defrosting methods	109
ET 450	Vehicle air conditioning	124
ET 460	Oil return in refrigeration systems	113
ET 480	Absorption refrigeration system	106, 116
ET 499.01	Cutaway model: hermetic refrigerant compressor	48, 113
ET 499.02	Cutaway model: semi-hermetic refrigerant compressor	48, 113
ET 499.03	Cutaway model: open refrigerant compressor, two-cylinder	48, 113
ET 499.12	Cutaway model: block drier	48, 114
ET 499.13	Cutaway model: oil separator	48, 114
ET 499.14	Cutaway model: liquid separator	49, 114
ET 499.16	Cutaway model: ball valve	49, 114
ET 499.18	Cutaway model: thermostatic expansion valve	49, 114
ET 499.19	Cutaway model: automatic expansion valve	49, 114
ET 499.21	Cutaway model: sight glass with humidity indicator	49, 114
ET 499.25	Cutaway model: 4-way reversing valve	49, 114
ET 499.26	Cutaway model: condensation pressure control valve	49, 114
ET 499.30	Cutaway model: ceiling air cooler	48, 113
ET 500	Two-stage piston compressor	100, 193, 272
ET 508	Simulation of a two-stage air compressor	99
ET 513	Single-stage piston compressor	99, 192, 205, 268
ET 600	Conditioning of room air	124
ET 605	Air conditioning system model	122
ET 611	Air conditioning system with chamber	124
ET 620	Air conditioning and ventilation system	124
ET 630	Split system air conditioner	124, 274
ET 792	Gas turbine	98, 179
ET 794	Gas turbine with power turbine	98, 179, 195, 270
ET 796	Gas turbine jet engine	98, 195
ET 805.50	Determination of the vapour content	97
ET 810	Steam power plant with steam engine	96, 194
ET 813	Two-cylinder steam engine	96, 195, 205
ET 830	Steam power plant, 1,5kW	97, 194
ET 833	Steam power plant 1,5kW with process control system	97
ET 850	Steam generator	96, 194, 267
ET 851	Axial steam turbine	96, 194, 267

ET 852	Steam generator, electrical	96, 194, 267
ET 860	Safety devices on steam boilers	96
ET 900	Introduction to refrigeration	110
ET 910	Refrigeration training system, base unit	110
ET 910.10	Refrigeration components for basic experiments	110
ET 910.11	Refrigeration components for advanced experiments	110
ET 915	HSI training system refrigeration and air conditioning technology, base unit	108, 122
ET 915.01	Refrigerator model	108
ET 915.02	Model of a refrigeration system with refrigeration and freezing stage	108
ET 915.06	Model of a simple air conditioning system	122
ET 915.07	Air conditioning model	122
ET 930	Evaporator control with electronic expansion valve	117

FL		
FL 100	Strain gauge training system	19, 73
FL 101	Strain gauge application set	19
FL 102	Determining the gauge factor of strain gauges	19
FL 111	Forces in a simple bar structure	9
FL 120	Stress and strain analysis on a membrane	20
FL 130	Stress and strain analysis on a thin-walled cylinder	20
FL 140	Stress and strain analysis on a thick-walled cylinder	20
FL 152	Multi-channel measuring amplifier	12, 20
FL 160	Unsymmetrical bending	19
FL 170	Deformation of curved-axis beams	15
FL 200	Photoelastic experiments with a transmission polariscope	20
FL 210	Photoelastic demonstration	20

FT		
FT 100	Cutting forces during drilling	72
FT 102	Cutting forces during turning	72
FT 200	Forming by bending	72
FT 901	Drilling kit	71
FT 903	Countersinking kit	71
FT 905	Reaming kit	71
FT 907	Grinding kit	71
FT 909	Turning kit	71
FT 913	Milling kit	71

GL		
GL 100	Principle of gear units	34, 56
GL 105	Kinematic model: gear drive	21
GL 110	Cam mechanism	34, 56
GL 112	Investigation of cam mechanisms	26
GL 200	Lathe gear	35, 56
GL 210	Dynamic behaviour of multistage spur gears	22, 256
GL 212	Dynamic behaviour of multistage planetary gears	22, 256
GL 300.01	Cutaway model: worm gear	31, 46
GL 300.02	Cutaway model: mitre gear	31, 46
GL 300.03	Cutaway model: spur gear	31, 46
GL 300.04	Cutaway model: two-stage spur gear	31, 46
GL 300.05	Cutaway model: planetary gear	31, 46
GL 300.06	Cutaway model: variable speed belt drive	31, 47
GL 300.07	Cutaway model: control gear	31, 47
GL 300.08	Cutaway model: multiple-disc clutch	31, 47
GL 300.10	Cutaway model electromagnetic single disk brake	32, 47
GL 300.12	Cutaway model: pedestal bearing	32, 47
GL 410	Assembly simple gears	35, 58
GL 420	Assembly combined gears	35, 58
GL 430	Assembly control gear	35, 58

GU		
GU 100	Web Access Box	75

HL		
HL 101	Thermal expansion training panel	132
HL 102	Installation technology: losses in different pipes	132, 151
HL 103	Installation technology: losses in pipe bends	132, 151
HL 104	Temperature measurement training panel	132
HL 105	Three-way mixing valve training panel	132
HL 106	Four-way mixing valve training panel	133
HL 107	Circulating pumps training panel	133
HL 108	Domestic heating circuit training panel	133
HL 109	Safety devices training panel	133
HL 110	Expansion vessel training panel	133
HL 111	Installation technology: losses in straight pipes	132, 151
HL 112	Radiator training panel	133
HL 113	Installation technology: losses in valves and fittings	132, 151
HL 210	Installation technology: losses in a pipe system	132, 151
HL 300	Hot water heating system	134
HL 305	Hydronic balancing of radiators	134, 274
HL 313	Domestic water heating with flat collector	116, 127, 134, 251, 252
HL 314	Domestic water heating with tube collector	127, 251, 252
HL 320.01	Heat pump	115, 129, 130, 266, 270, 275
HL 320.02	Conventional heating	129, 275
HL 320.03	Flat collector	127, 129, 251, 269, 275
HL 320.04	Evacuated tube collector	127, 129, 251, 275
HL 320.05	Central storage module with controller	127, 129, 251, 269, 270, 275
HL 320.07	Underfloor heating / geothermal energy absorber	115, 128, 129, 266, 270, 275
HL 320.08	Fan heater / air heat exchanger	115, 129, 266, 270, 275
HL 350	Oil burner demonstrator	135
HL 351	Domestic heating boiler	135
HL 352	Test stand for oil, natural gas and propane gas burners	135
HL 353	Hot water generator	135
HL 353.01	Comparison of different heating types	135
HL 353.02	Heat distribution and control in heating systems	135
HL 356	Demo unit, gas burner	136
HL 358	Forced air gas burner training panel	136
HL 360	Oil tank safety trainer	135
HL 392C	Safety & control in heating systems	136
HL 500	Instantaneous gas heater	136
HL 510	Domestic gas supply training panel	136
HL 530	Training panel function of gas heater	136
HL 620	Domestic heating system control training panel	136
HL 630	Efficiency in heating technology	136, 274
HL 710	Air duct systems	125, 171
HL 720	Ventilation system	125
HL 722	Control unit for ventilation system	125
HL 860	Exhaust gas analyser	135
HL 960	Assembly station pipes and valves and fittings	63, 168
HL 960.01	Assembly and alignment of pumps and drives	63, 168
HL 961	Compact assembly station pipes, valves and fittings	168
HL 962	Assembly stand for pumps	65, 170
HL 962.01	Standard chemicals pump	65, 170
HL 962.02	Canned motor pump	65, 170
HL 962.03	Side channel pump	65, 170
HL 962.04	Standard chemicals pump with magnetic clutch	65, 170

HM 135	Determination of the settling velocity	141
HM 136	Flow through packed columns	158
HM 140	Open-channel sediment transport	220
HM 141	Hydrographs after precipitation	221, 283
HM 142	Separation in sedimentation tanks	220, 225, 279
HM 143	Transient drainage processes in storage reservoirs	155, 213, 268
HM 144	Formation of river courses	220
HM 145	Advanced hydrological investigations	221
HM 150	Base module for experiments in fluid mechanics	142, 210
HM 150.01	Pipe friction for laminar/turbulent flow	143, 213
HM 150.02	Calibration of pressure gauges	140, 208
HM 150.03	Plate weirs for HM150	145
HM 150.04	Centrifugal pump	144, 185, 214
HM 150.05	Hydrostatic pressure in liquids	141, 208
HM 150.06	Stability of floating bodies	141, 208
HM 150.07	Bernoulli's principle	142, 210
HM 150.08	Measurement of jet forces	142, 210
HM 150.09	Horizontal flow from a tank	142, 155, 174, 209
HM 150.10	Visualisation of streamlines	141, 157, 210
HM 150.11	Losses in a pipe system	143, 213
HM 150.12	Vertical flow from a tank	142, 155, 209
HM 150.13	Methods of flow measurement	143
HM 150.14	Vortex formation	142, 155
HM 150.15	Hydraulic ram - pumping using water hammer	155
HM 150.16	Series and parallel configuration of pumps	144, 185, 214
HM 150.18	Osborne Reynolds experiment	142, 210
HM 150.19	Operating principle of a Pelton turbine	144, 181, 214, 262
HM 150.20	Operating principle of a Francis turbine	144, 181, 214, 262
HM 150.21	Visualisation of streamlines in an open channel	145, 210
HM 150.29	Energy losses in piping elements	143
HM 150.39	Floating bodies for HM150.06	141, 208
HM 152	Potential flow	157, 175, 221
HM 153	Visualisation of different flows	158
HM 155	Water hammer in pipes	155
HM 156	Water hammer and surge chamber	155, 213
HM 159.11	Natural vibration on a ship model	25
HM 160	Experimental flume 86x300mm	145, 215
HM 160.10	Extension element of the experimental flume	219
HM 160.19	UV system for disinfection	219
HM 160.50	Pitotstatic tube	218
HM 160.52	Level gauge	218
HM 160.53	Ten tube manometers	218
HM 160.64	Velocity meter	218
HM 160.85	Digital measurement: water level, flow, and inclination	218
HM 160.91	Digital level gauge	218
HM 161	Experimental flume 600x800mm	215
HM 161.13	Electronic pressure measurement	218
HM 161.50	Pitotstatic tube	218
HM 161.52	Level gauge	218
HM 161.53	20 tube manometers	218
HM 161.59	Instrument carrier	218
HM 161.64	Velocity meter	218
HM 161.81	PIV-System	218
HM 161.82	Instrument carrier for PIV system	218
HM 161.83	Glass cut-out for PIV system	218
HM 161.91	Digital level gauge	218
HM 162	Experimental flume 309x450mm	215
HM 162.10	Extension element of the experimental flume	219
HM 162.13	Electronic pressure measurement	218
HM 162.14	Gallery	219
HM 162.15	Extension element of the gallery	219
HM 162.20	Water tank	219
HM 162.29	Sluice gate	216
HM 162.30	Set of plate weirs, four types	217

HM 162.31	Broad-crested weir	216
HM 162.32	Ogee-crested weir with two weir outlets	217
HM 162.33	Crump weir	216
HM 162.34	Ogee-crested weir with pressure measurement	217
HM 162.35	Elements for energy dissipation	217
HM 162.36	Siphon weir	216
HM 162.38	Rake	216
HM 162.40	Radial gate	216
HM 162.41	Wave generator	216
HM 162.44	Sill	216
HM 162.45	Culvert	216
HM 162.46	Set of piers, seven profiles	216
HM 162.50	Pitotstatic tube	218
HM 162.51	Venturi flume	217
HM 162.52	Level gauge	218
HM 162.53	Ten tube manometers	218
HM 162.55	Parshall flume	217
HM 162.57	Electrical inclination adjustment	219
HM 162.59	Instrument carrier	218
HM 162.61	Vibrating piles	216
HM 162.63	Trapezoidal flume	217
HM 162.64	Velocity meter	218
HM 162.71	Closed sediment circuit	217
HM 162.72	Sediment trap	217
HM 162.73	Sediment feeder	217
HM 162.77	Flume bottom with pebble stones	216
HM 162.80	Set of beaches	216
HM 162.81	PIV-System	218
HM 162.82	Instrument carrier for PIV system	218
HM 162.83	Glass cut-out for PIV system	218
HM 162.91	Digital level gauge	218
HM 163	Experimental flume 409x500mm	215
HM 163.10	Extension element of the experimental flume	219
HM 163.14	Gallery	219
HM 163.15	Extension element of the gallery	219
HM 163.20	Water tank	219
HM 163.50	Pitotstatic tube	218
HM 163.52	Level gauge	218
HM 163.53	Ten tube manometers	218
HM 163.59	Instrument carrier	218
HM 163.64	Velocity meter	218
HM 163.81	PIV-System	218
HM 163.82	Instrument carrier for PIV system	218
HM 163.83	Glass cut-out for PIV system	218
HM 163.91	Digital level gauge	218
HM 164	Open channel and closed channel flow	145, 213
HM 165	Studies in hydrology	221, 283
HM 166	Fundamentals of sediment transport	220
HM 167	Groundwater flow	221, 283
HM 168	Sediment transport in river courses	220
HM 169	Visualisation of seepage flows	221, 283
HM 170	Open wind tunnel	156, 255
HM 170.05	Drag body square plate	255
HM 170.09	Lift body aerofoil NACA0015	255
HM 170.22	Pressure distribution on an aerofoil NACA0015	156, 255
HM 170.24	Boundary layer analysis with Pitot tube	156
HM 170.28	Wake measurement	156
HM 170.70	Wind power plant with rotor blade adjustment	156, 255
HM 172	Supersonic wind tunnel with Schlieren optics	150
HM 210	Characteristic variables of a radial fan	192
HM 215	Two-stage axial fan	171, 192
HM 220	Air flow experimental plant	149
HM 220.01	Venturi tube	149
HM 220.02	Measurement of boundary layers	149

HM 222	Air flow in pipes and pipe elements	151
HM 225	Aerodynamics trainer	149, 157
HM 225.02	Boundary layers	157
HM 225.03	Bernoulli's principle	149
HM 225.04	Drag forces	157
HM 225.05	Flow in a pipe bend	149
HM 225.06	Coanda effect	157
HM 225.07	Free jet	149
HM 225.08	Visualisation of streamlines	157
HM 226	Wind tunnel for visualisation of streamlines	158, 175, 254
HM 230	Flow of compressible fluids	150, 175
HM 240	Principles of air flow	148
HM 240.03	Electronic total pressure sensor	148
HM 240.04	Pressure distribution on a cylinder	148
HM 240.05	Pressure losses in pipe elements	148
HM 240.06	Heat transfer at a cylinder in transverse flow	148
HM 241	Fundamentals of water flow	144, 148, 175
HM 250	Fundamentals of fluid mechanics	146, 174, 209, 211, 215
HM 250.01	Visualisation of pipe flow	146, 212
HM 250.02	Measurement of flow profile	146, 212
HM 250.03	Visualisation of streamlines	146, 211
HM 250.04	Continuity equation	146, 211
HM 250.05	Measurement of jet forces	146, 211
HM 250.06	Free discharge	147, 209
HM 250.07	Bernoulli's principle	147, 211
HM 250.08	Losses in pipe elements	147, 212
HM 250.09	Fundamentals of pipe friction	147, 212
HM 250.10	Pressure curve along the inlet section	147, 212
HM 250.11	Open channel	147, 215
HM 250.90	Laboratory shelf	147
HM 260	Characteristics of nozzles	150, 174
HM 261	Nozzle pressure distribution	150, 174
HM 270	Impulse turbine	179
HM 272	Reaction turbine	179
HM 280	Experiments with a radial fan	192, 199
HM 282	Experiments with an axial fan	192, 199
HM 283	Experiments with a centrifugal pump	161, 185, 199, 274
HM 284	Series and parallel configuration of pumps	161, 185, 199
HM 285	Experiments with a piston pump	161, 189, 199
HM 286	Experiments with a gear pump	161, 189, 199
HM 287	Experiments with an axial turbine	159, 181, 198
HM 288	Experiments with a reaction turbine	160, 183, 198
HM 289	Experiments with a Pelton turbine	160, 183, 198
HM 290	Base unit for turbines	160, 183, 198
HM 291	Experiments with an action turbine	160, 183, 198
HM 292	Experiments with a radial compressor	192, 199
HM 299	Comparison of positive displacement machines and turbomachines	160, 192
HM 300	Hydraulic circuit with centrifugal pump	161, 185
HM 305	Centrifugal pump trainer	185
HM 332	Pump characteristics for parallel and series configuration	161, 187
HM 362	Comparison of pumps	169, 187
HM 365	Universal drive and brake unit	96, 101, 111, 184-196, 201-204
HM 365.10	Supply unit for water pumps	186, 190, 201
HM 365.11	Centrifugal pump, standard design	186, 200
HM 365.12	Centrifugal pump, self-priming	186, 200
HM 365.13	Centrifugal pump, multistage	186, 200
HM 365.14	Centrifugal pumps, series and parallel connected	186, 200
HM 365.15	Side channel pump	186, 200
HM 365.16	Lobe pump	190, 201
HM 365.17	Reciprocating piston pump	190, 201
HM 365.18	Gear pump	190, 201
HM 365.19	Vane pump	190, 201
HM 365.20	Oil pump supply unit	191, 202

HM 365.21	Screw pump	191, 202
HM 365.22	External gear pump	191, 202
HM 365.23	Vane pump	191, 202
HM 365.24	Internal gear pump	191, 202
HM 365.31	Pelton and Francis turbine	183, 203, 262
HM 365.32	Turbine supply unit	183, 203, 262
HM 365.45	Axial-flow pump	188, 200
HM 380	Cavitation in pumps	154, 175
HM 405	Axial-flow turbomachines	159, 169, 181, 188
HM 421	Propeller type turbine trainer	182, 262
HM 430C	Francis turbine trainer	182, 262
HM 450.01	Pelton turbine	159, 182, 263
HM 450.02	Francis turbine	159, 182, 263
HM 450.03	Propeller type turbine	159, 182, 263
HM 450.04	Kaplan turbine	159, 182, 263
HM 450C	Characteristic variables of hydraulic turbomachines	159, 182, 185, 263
HM 500	Flow meter trainer	73, 153
HM 700.01	Cutaway model: standard orifice plate	50, 162
HM 700.02	Cutaway model: flow nozzle	50, 162
HM 700.03	Cutaway model: standard Venturi meter	50, 162
HM 700.04	Cutaway model: straight-way valve	50, 162
HM 700.05	Cutaway model: corner valve	50, 162
HM 700.06	Cutaway model: angle seat valve	50, 162
HM 700.07	Cutaway model: non-return valve	50, 162
HM 700.08	Cutaway model: pressure reducing valve	50, 162
HM 700.09	Cutaway model: strainer	51, 163
HM 700.10	Cutaway model: gate valve	51, 163
HM 700.11	Cutaway model: straight-way plug valve	51, 163
HM 700.12	Cutaway model: three-way plug valve	51, 163
HM 700.13	Cutaway model: ball valve	51, 163
HM 700.14	Cutaway model: safety valve	51, 163
HM 700.15	Cutaway models: various screwed pipe connections	51, 163
HM 700.16	Cutaway models: pressure gauges	51, 163
HM 700.17	Cutaway model: centrifugal pump	52, 164
HM 700.20	Cutaway model: piston pump	52, 164
HM 700.22	Cutaway model: gear pump	52, 164

IA		
IA 110	Calibrating a pressure sensor	72
IA 120	Principles of industrial sensors	72
IA 130	PLC module	83
IA 210	PLC application: transport and sorting	83
IA 500	Automated process with cobot	82
IA 501	Programming a servo drive	82
IA 520	Computer integrated manufacturing and handling system	82

KI		
KI 110	Kinematic model: crank mechanism	21
KI 120	Kinematic model: crank slider	21
KI 130	Kinematic model: four-joint link	21
KI 140	Kinematic model: Whitworth quick return mechanism	21
KI 150	Kinematic model: Hooke's coupling	21
KI 160	Kinematic model: Ackermann steering mechanism	21

MG		
MG 100	Instructional kit: assembly with dowel pins	54
MG 110	Instructional kit: assembly with keys	54
MG 120	Instructional kit: assembly with taper keys	54
MG 200	Instructional kit: threaded joints	54
MG 901	Nuts and bolts kit	32, 54
MG 903	Screw-locking devices kit	32, 54
MG 905	Thread types kit	32, 55
MG 911	Roller bearings kit	33, 55

MT		
MT 101	Assembly exercise: pneumatically driven control valve	61, 74, 166
MT 102	Assembly exercise: electrically driven control valve	61, 74, 166
MT 110.10	Cutaway model: spur and worm gear	60
MT 120	Assembly exercise: spur gear	36, 60
MT 121	Assembly exercise: mitre gear	36, 60
MT 122	Assembly exercise: planetary gear	36, 60
MT 123	Assembly exercise: spur and worm gear	36, 60
MT 130	Assembly exercise: centrifugal pump	64, 167
MT 134	Assembly exercise: piston pump	64, 167
MT 136	Assembly exercise: gear pump	60, 64
MT 141	Assembly exercise: piston compressor	62, 100, 193, 272
MT 142	Energy efficiency in piston compressors	62, 100, 193, 272
MT 154	Assembly exercise: shut-off valve	61, 166
MT 156	Assembly exercise: wedge gate valve and angle seat valve	61, 166
MT 157	Assembly exercise: butterfly valve and non-return valve	61, 166
MT 158	Assembly exercise: ball valve and shut-off valve	61, 166
MT 162	Hydraulic valves and fittings test stand	61, 166
MT 171	Assembly hydrodynamic journal bearing	36, 60
MT 173	Test stand for gears	37, 59
MT 174	Sorting plant	37, 59, 66, 224, 284
MT 175	Energy efficiency in compressed air systems	100, 193, 268, 272
MT 181	Assembly & maintenance exercise: multistage centrifugal pump	64, 167
MT 182	Assembly & maintenance exercise: screw pump	64, 167
MT 183	Assembly & maintenance exercise: diaphragm pump	64, 167
MT 185	Assembly & maintenance exercise: in-line centrifugal pump	64, 167
MT 190	Assembly materials tester	36, 58
MT 190.01	Assembly data acquisition for materials tester	36, 58
MT 210	Assembly & maintenance exercise: refrigeration	66, 119
MT 220	Assembly station gas booster in hydrogen technology	62, 67, 259

Pilot plants		
ET 805	Heat transfer in pipes in mixed flow	97, 247
IPP	Integrated Pilot Plant	246
IUI	Inspection Unit for Industry	243
MMTS	Mechanical Maintenance Training Skid	242
MPTR	Main Process Training Rig	242
PPT	Process Pump Trainer	244
PST	Phase Separation Trainer	244
WaXTMT	Wellhead und XmasTree Maintenance Trainer	245
WaXTOT	Wellhead und XmasTree Operation Trainer	245

PT		
PT 102	Dimensional metrology, spacer plate	70
PT 104	Dimensional metrology, angle piece	70
PT 105	Dimensional metrology, shaft	70
PT 107	Dimensional metrology, flange housing	70
PT 108	Dimensional metrology, output shaft	70
PT 109	Dimensional metrology, hub	70
PT 500	Machinery diagnostic system, base unit	28, 68, 257
PT 500.04	Computerised vibration analyser	29, 69
PT 500.05	Brake & load unit	29, 69
PT 500.10	Elastic shaft kit	28, 68
PT 500.11	Crack detection in rotating shaft kit	28, 68, 257
PT 500.12	Roller bearing faults kit	28, 68, 257
PT 500.13	Couplings kit	28, 68
PT 500.14	Belt drive kit	28, 68
PT 500.15	Damage to gears kit	28, 68, 257
PT 500.16	Crank mechanism kit	28, 68
PT 500.17	Cavitation in pumps kit	29, 69
PT 500.18	Vibrations in fans kit	29, 69
PT 500.19	Electromechanical vibrations kit	29, 69, 257
PT 501	Roller bearing faults	29, 69
PT 502	Field balancing	26

RT		
RT 010	Training system level control, HSI	77
RT 020	Training system flow control, HSI	77
RT 030	Training system pressure control, HSI	77
RT 040	Training system temperature control, HSI	77
RT 050	Training system speed control, HSI	77, 178
RT 060	Training system position control, HSI	77
RT 304	Calibration trainer	76
RT 306	Adjustment of level sensors	73
RT 310	Calibration station	76
RT 350	Operation of industrial controllers	75
RT 380	Optimization of control loops	75
RT 390	Test stand for control valves	74, 153
RT 395	Maintenance of valves and fittings and actuators	66, 74
RT 396	Pump and valves and fittings test stand	66, 74, 153, 271
RT 451	Level control	78
RT 452	Flow control	78
RT 453	Pressure control	78
RT 454	Temperature control	78
RT 455	pH value control	78
RT 460	Hands-on mechatronics project: level control	63, 67, 81, 168
RT 578	Control of four variables from process engineering	84
RT 580	Control systems and fault finding	84
RT 586	Control of water quality	84
RT 590	Process control engineering experimental plant	84
RT 614	Level control demonstration unit	79
RT 624	Flow control demonstration unit	79
RT 634	Pressure control demonstration unit	79
RT 644	Temperature control demonstration unit	79
RT 674	Flow / level control demonstration unit	79
RT 681	Multivariable control: vacuum degassing	83
RT 682	Multivariable control: stirred tank	83, 271
RT 700	Training system: fundamentals of hydraulics	76
RT 701	Components set electrohydraulics	76
RT 710	Hydraulic servo system	76
RT 770	Training system: pneumatics, electro-pneumatics and PLC	76
RT 800	PLC application: mixing process	83

SE		
SE 100	Frame for load testing, 400kN	38
SE 110.12	Lines of influence on the Gerber beam	10
SE 110.14	Elastic line of a beam	14
SE 110.16	Parabolic arch	10
SE 110.17	Three-hinged arch	10
SE 110.18	Forces on a suspension bridge	9
SE 110.19	Investigation of simple stability problems	18
SE 110.20	Deformation of frames	15
SE 110.21	Forces in various single plane trusses	12
SE 110.22	Forces in an indeterminate truss	12
SE 110.29	Torsion of bars	14
SE 110.44	Deformation of trusses	15
SE 110.47	Methods to determine the elastic line	14
SE 110.48	Bending test, plastic deformation	38
SE 110.50	Cable under dead-weight	11
SE 110.53	Equilibrium in a single plane, statically determinate system	8
SE 110.57	Buckling of bars	18
SE 110.58	Free vibrations in a bending beam	24
SE 112	Mounting frame	8
SE 130	Forces in a Howe truss	12
SE 130.01	Truss beam: Warren girder	12
SE 200	MEC - Frame digital & smart	12
SE 200.01	MEC - Forces in trusses	12
SE 200.02	MEC - Forces on a suspension bridge	9
SE 200.03	MEC - Parabolic arch bridge	10

SE 200.04	MEC - Friction on the inclined plane	13
SE 200.05	MEC - Cable forces and pulley blocks	8
SE 200.06	MEC - Three-hinged arch	10
SE 200.07	MEC - Gerber beam	10
SE 200.08	MEC - Buckling	18
SE 200.09	MEC - Deformation of frames	15
SE 200.10	MEC - Torsion of bars	14
SE 200.21	MEC - Support	17
SE 200.22	MEC - Load unit	17
SE 200.23	MEC - Distance measurement	17
SE 200.24	MEC - Vertical load	17
SE 200.25	MEC - Load	17
SE 200.26	MEC - Line load	17
SE 200.27	MEC - Bar set	17

ST		
ST 210	Sanitation fittings training panel	137
ST 250	Cavitation	154, 175
ST 310	Drinking water installation demonstrator	137
ST 320	Pipe cleaning training panel	137
ST 330	Protection of drinking water training panel	137
ST 510	Full-scale sewerage system	137, 171

TM		
TM 110	Fundamentals of statics	8
TM 110.01	Supplementary set - inclined plane and friction	8
TM 110.02	Supplementary set - pulley blocks	8
TM 110.03	Supplementary set - gear wheels	8
TM 115	Forces in a crane jib	8
TM 121	Equilibrium of moments on pulleys	9
TM 122	Equilibrium of moments on a differential pulley block	9
TM 123	Spur gear unit	34, 57
TM 124	Worm gear unit	34, 57
TM 125	Cable winch	34, 57
TM 140	Free and forced torsional vibrations	25
TM 150	Vibration trainer	24
TM 150.02	Free and damped torsional vibrations	25
TM 155	Free and forced vibrations	25
TM 161	Rod pendulum and thread pendulum	24
TM 162	Bifilar/trifilar suspension of pendulums	24
TM 163	Torsional vibrations	24
TM 164	Coil spring vibrations	24
TM 170	Balancing apparatus	26
TM 180	Forces in reciprocating engines	26, 178
TM 182	Vibrations on machine foundations	27
TM 182.01	Piston compressor for TM182	27
TM 200	Fundamentals of mechanical friction	13
TM 210	Dry friction	13
TM 220	Belt drive and belt friction	13, 34, 57
TM 225	Friction on the inclined plane	13
TM 232	Bearing friction	41, 57
TM 260	Drive unit for tribological investigations	40
TM 260.01	Rolling friction in friction wheels	40
TM 260.02	Elasto-hydrodynamic behaviour	40
TM 260.03	Dynamic friction in pin - disk	40
TM 260.04	Frictional vibrations	40
TM 260.05	Dynamic friction in cylindrical pin - roller	40
TM 260.06	Pressure distribution in journal bearings	40
TM 262	Hertzian pressure	15
TM 280	Pressure distribution in journal bearings	41
TM 282	Friction in journal bearings	41, 57
TM 290	Journal bearing with hydrodynamic lubrication	41
TM 310	Thread testing	33, 55
TM 320	Threaded joint testing	33, 55

TM 400	Hooke's law	15
TM 600	Centrifugal force	23
TM 605	Coriolis force	23, 142
TM 610	Rotational inertia	22
TM 611	Rolling disk on inclined plane	22
TM 612	Kinetic model: flywheel	22
TM 620	Bending elasticity in rotors	25, 178
TM 625	Elastic shafts	25
TM 630	Gyroscope	23
TM 632	Centrifugal governor	23, 178

TZ		
TZ 100	Spatial imagination with three-view display	30, 44
TZ 110	Cylindrical models with cuts parallel to axis	44
TZ 120	Cylindrical models with slanted cuts	44
TZ 130	Prismatic models with cuts parallel to edges	44
TZ 140	Prismatic models with slanted cuts	44
TZ 200.01	Assembly exercise: bending press	30, 45
TZ 200.07	Assembly exercise: lever shear	30, 45
TZ 300	Assembly exercise: lever press	30, 45

VS		
VS 101	Cutaway model: underground hydrant	52, 164
VS 102	Cutaway model: resilient seated gate valve	52, 164
VS 103	Cutaway model: screw down valve	52, 164
VS 104	Cutaway model: changeover valve	52, 164
VS 105	Cutaway model: gas meter	52, 164
VS 106	Cutaway model: backflow preventer	53, 165
VS 107	Cutaway model: non-return butterfly valve	53, 165
VS 108	Cutaway model: water meter	53, 165
VS 109	Cutaway model: strainer	53, 165

WL		
WL 102	Change of state of gases	88, 140, 176
WL 103	Expansion of ideal gases	88, 140
WL 110	Heat exchanger supply unit	93, 177, 265, 273
WL 110.01	Tubular heat exchanger	93, 177, 265, 273
WL 110.02	Plate heat exchanger	93, 177, 265, 273
WL 110.03	Shell & tube heat exchanger	93, 177, 265, 273
WL 110.04	Stirred tank with double jacket and coil	93, 177, 265, 273
WL 110.05	Finned tube heat exchanger	93, 177, 265, 273
WL 201	Fundamentals of humidity measurement	88, 123
WL 202	Fundamentals of temperature measurement	73, 88, 140
WL 203	Fundamentals of pressure measurement	88, 140
WL 204	Vapour pressure of water - Marcet boiler	89, 140, 176
WL 205	Vapour pressure curve of water - Marcet boiler	89, 140, 176
WL 210	Evaporation process	89, 176
WL 220	Boiling process	89, 176
WL 225	Heat transfer in the fluidised bed	95
WL 230	Condensation process	89, 176
WL 302	Heat transfer in the tubular heat exchanger	94
WL 308	Heat transfer in pipe flow	93
WL 312	Heat transfer in air flow	94
WL 314	Convective heat transfer in air flow	92
WL 314.01	Heat transfer in pipes in parallel flow	92
WL 314.02	Heat transfer in pipes in mixed flow	92
WL 314.03	Heat transfer in a tube	92
WL 315.01	Shell & tube heat exchanger steam/water	94
WL 315C	Comparison of various heat exchangers	94, 265
WL 320	Wet cooling tower	95, 123, 177
WL 320.01	Cooling column, type 2	95, 123, 177
WL 320.02	Cooling column, type 3	95, 123, 177
WL 320.03	Cooling column, type 4	95, 123, 177
WL 320.04	Cooling column, type 5	95, 123, 177

WL 362	Energy transfer by radiation	90
WL 372	Radial and linear heat conduction	91, 176
WL 376	Thermal conductivity of building materials	91, 273
WL 377	Convection and radiation	90, 251
WL 420	Heat conduction in metals	91
WL 422	Heat conduction in fluids	91
WL 430	Heat conduction and convection	90
WL 440	Free and forced convection	90, 176
WL 460	Heat transfer by radiation	90
WL 900	Steady-state and non-steady-state heat conduction	91
WL 920	Temperature measurement	88

WP		
WP 100	Deformation of bars under bending or torsion	14
WP 120	Buckling behaviour of bars	18
WP 121	Demonstration of Euler buckling	18
WP 130	Verification of stress hypotheses	19
WP 140	Fatigue strength test	39
WP 300	Materials testing, 20kN	38
WP 310	Materials testing, 50kN	38
WP 400	Impact test, 25Nm	38
WP 410	Impact test, 300Nm	38
WP 500	Torsion test, 30Nm	39
WP 510	Torsion test 200Nm, motor drive	39
WP 600	Creep rupture test	39
WP 950	Deformation of straight beams	14
WP 960	Beam on two supports: shear force & bending moment diagrams	11
WP 961	Beam on two supports: shear force diagram	11
WP 962	Beam on two supports: bending moment diagram	11

1 Engineering mechanics and engineering design

2 Mechatronics

3 Thermal engineering

4 Fluid mechanics

5 Process engineering

6 Renewable energies & Environmental engineering

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