gunt HAMBURG

Equipment
for engineering
education

Brief overview
Entire programme

GUNT – your partner for efficient technology education

Innovative sustainable efficient

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, 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. For over 35 years our motto has been:

From Germany to anywhere in the world

Visit our website: www.gunt.de

The entire GUNT programme – versatile and comprehensive

Five programme areas have been developed and proven for the major fields of engineering education that don't just show products, but also provide valuable advice and information. The content is structured based on the curriculum. The programme areas are available in printed catalogues and online.
With GUNT's 6th programme area 2E ENERGY & ENVIRONMENT, we are assuming the responsibility of ensuring principles of sustainability and holistic thinking are firmly positioned in engineering education.

This catalogue provides a quick overview of more than 650 units from all available GUNT programme areas.

So that you can get there faster, you will find a QR code for each programme area directing you to the respective information page in the online catalogue. Here, you will find pictures, product descriptions and specifications. You can also download datasheets and further background information as pdf files if you wish.

1 Engineering mechanics and engineering design 006

2 Mechatronics 038

3 Thermal engineering and HVAC 074

4 Fluid mechanics 120
▸ Fluid machinery 154
▸ Hydraulics for civil engineers 190

5 Process engineering 200
▸ Process control engineering 238

6 2E Energy & environment 248

GUNT – your partner for efficient technology education

Laboratory and demonstration experiments are vital elements of all areas of engineering education. It is only through experimentation that the theoretical basis becomes an effective tool for use in real applications. G.U.N.T. Gerätebau GmbH has been developing, producing and distributing training systems since 1979, which are used in engineering education in vocational schools, technical colleges and universities. The comprehensive and proven GUNT programme supports vocational education, is suitable for industrial training, and extensively covers the requirements of academic institutions. Many GUNT units have also proven their value in the field of research.

We have close and long-standing partnerships with many universities, which also often give rise to product innovations. The GUNT programme is constantly being redesigned according to curricular criteria.

Many of our customers have become partners or friends.

We provide more than training equipment

We have the expertise and experience to be able to help you build or develop laboratories and laboratory areas.

Discussions and cooperation with many famous universities have aided us in the development of this diverse and challenging programme.

Laboratories on all continents – equipped with GUNT units – constitute a key building block in the practical education of skilled workers, technicians and engineers.

Customer satisfaction is built on the products' longevity and the technical services that are available all over the world.

Engineering mechanics and engineering design

1

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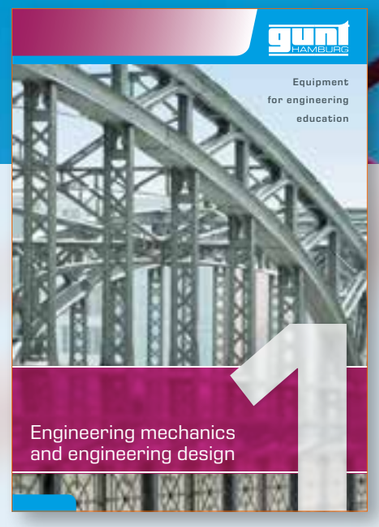
Catalogues

This is where you can find extensive information, product descriptions and data sheets:

Offine
Print catalogue programme area 1
“Statics & strength of materials”

Online
at www.gunt.de

Software for
data acquisition/visualisation



Statics
Forces and moments

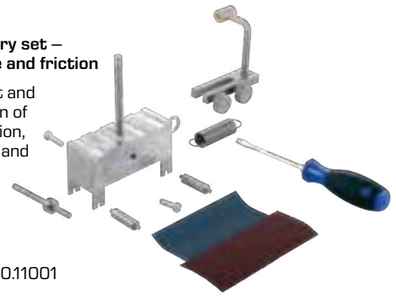
TM 110
Fundamentals of statics

Demonstration of force and moment equilibrium in a mechanical force system

Order No.: 040.11000

TM 110.01
Supplementary set – inclined plane and friction

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



Order No.: 040.11001

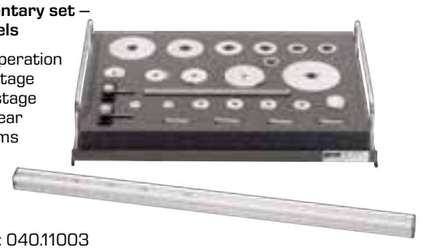
TM 110.02
Supplementary set – pulley blocks

Construction and mode of operation of three different pulley blocks

Order No.: 040.11002

TM 110.03
Supplementary set – gear wheels

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



Order No.: 040.11003

TM 115
Forces in a crane jib

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

Order No.: 040.11500

FL 111
Forces in a simple bar structure

Resolution of forces in a simple bar structure

Order No.: 021.11100

EM 049
Equilibrium of moments on a two-arm lever

Investigation of applied forces, generated moments and equilibrium

Order No.: 049.04900

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

Order No.: 022.11053

TM 121
Wheel and axle apparatus

Clear demonstration of the equilibrium of moments

Order No.: 040.12100

SE 112
Mounting frame

Base unit for clear and simple setup of experiments on statics, strength of materials and dynamics

Order No.: 022.11200

TM 122
Wheel and differential axle apparatus

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

Order No.: 040.12200

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

Order No.: 022.11018

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

Order No.: 022.11012

Statics
Bridges, beams, arches, cables

SE 110.17
Three-hinged arch

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

SE 112 Mounting frame required

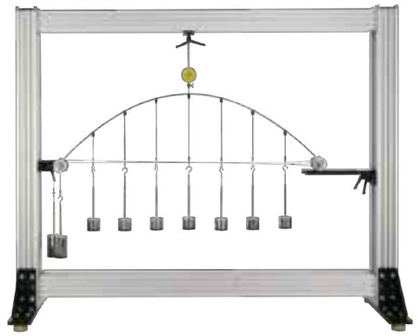
Order No.: 022.11017

SE 110.16
Parabolic arch

Differences between statically determinate and statically indeterminate arches under load

SE 112 Mounting frame required

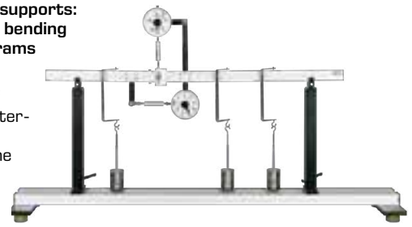
Order No.: 022.11016



Statics
Internal reactions and methods of section

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

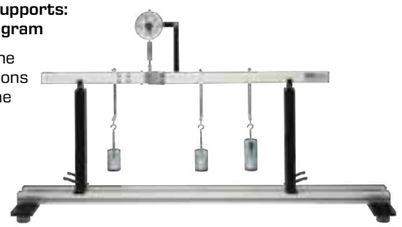
Application of the method of sections to determine internal reactions of the beam



Order No.: 020.96000

WP 961
Beam on two supports: shear force diagram

Application of the method of sections to determine the shear force



Order No.: 020.96100

WP 962
Beam on two supports: bending moment diagram

Application of the method of sections to determine the bending moment

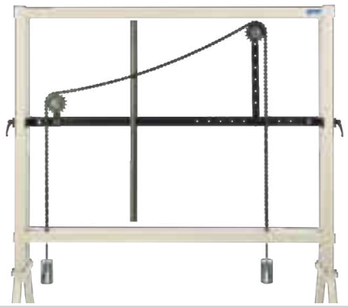
Order No.: 020.96200

SE 110.50
Cable under dead-weight

Catenary of a free-hanging cable under dead-weight

SE 112 Mounting frame required

Order No.: 022.11050



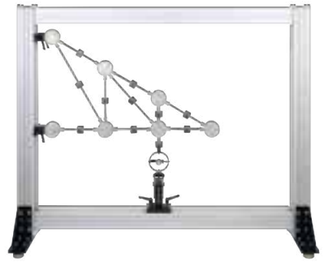
Statics
Forces in a truss

SE 110.21
Forces in various single plane trusses

Using strain gauge technology to measure bar forces

SE 112 Mounting frame required

Order No.: 022.11021

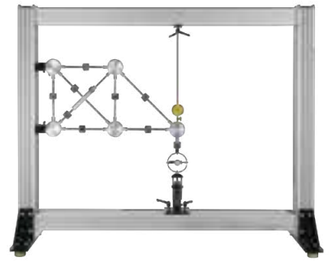


SE 110.22
Forces in an over-determinate truss

Comparison of forces in statically determinate and statically indeterminate trusses

SE 112 Mounting frame required

Order No.: 022.11022



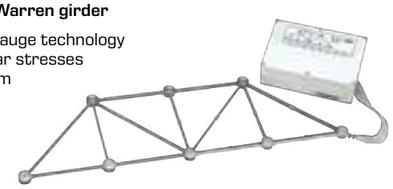
SE 130
Forces in a Howe truss

Investigation of bar forces under different load cases

Order No.: 022.13000

SE 130.01
Truss beam: Warren girder

Using strain gauge technology to measure bar stresses in a truss beam

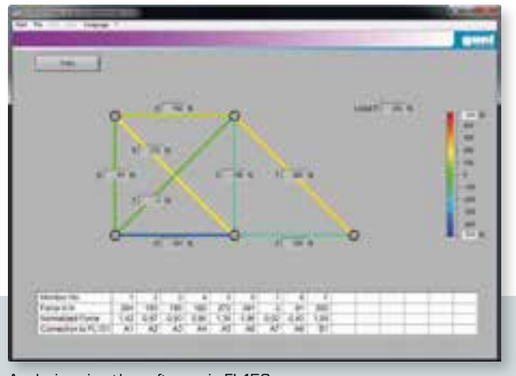


Order No.: 022.13001

FL 152
Multi-channel measurement amplifier

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

Order No.: 021.15100

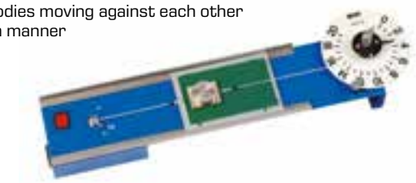


Analysis using the software in FL 152

Statics
Static and kinetic friction

TM 200
Fundamentals of mechanical friction

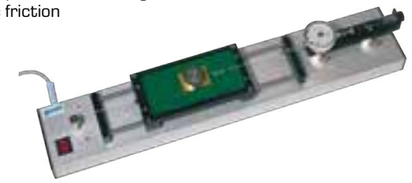
Investigation of mechanical friction forces on two solid bodies moving against each other in a uniform manner



Order No.: 040.20000

TM 210
Dry friction

A range of experiments relating to static and dynamic friction



Order No.: 040.21000

TM 225
Friction on the inclined plane

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

Order No.: 040.22500

TM 220
Belt friction apparatus

Investigating the influence of the angle of contact, coefficient of friction and belt force on belt drives and belt friction

Bestellnr.: 040.22000

Strength of materials
Elastic deformations

SE 110.14
Elastic line of a beam

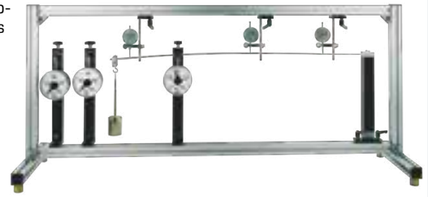
Demonstration of Maxwell-Betti theorem

SE 112 Mounting frame required

Bestellnr.: 022.11014

WP 950
Deformation of straight beams

Elastic lines of statically determinate and indeterminate beams under various clamping conditions



Order No.: 020.95000

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

Order No.: 022.11047

SE 110.29
Torsion of bars

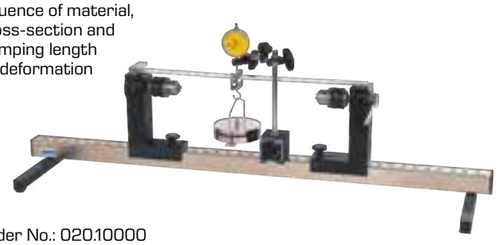
Investigation of elastic torsion of bars with open and closed cross-section

SE 112 Mounting frame required

Order No.: 022.11029

WP 100
Deformation of bars under bending or torsion

Influence of material, cross-section and clamping length on deformation

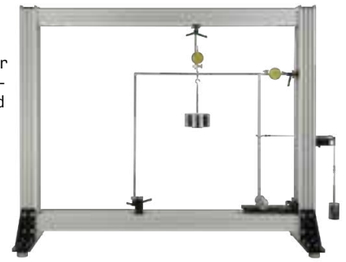


Order No.: 020.10000

SE 110.20
Deformation of frames

Elastic deformation of a statically determinate or indeterminate frame under point load; U-shaped and S-shaped frame

SE 112 Mounting frame required



Order No.: 022.11020

FL 170
Deformation of curved-axis beams

Principle of virtual forces for calculating deformation

Order No.: 021.17000

SE 110.44
Deformation of trusses

Application of Castigliano's first theorem to calculate the deformation at a defined point

SE 112 Mounting frame required

Order No.: 022.11044

Strength of materials
Elastic deformations

TM 262
Hertzian contact apparatus

Demonstration of the resulting characteristics of the contact area as a function of the contact force

Order No.: 040.26200

TM 400
Hooke's law

Elastic behaviour of tension springs under load

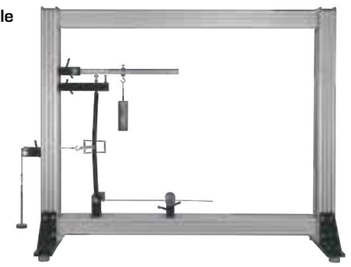
Order No.: 040.40000

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



Order No.: 022.11019

WP 120
Buckling behaviour of bars

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

Order No.: 020.12000

WP 121
Demonstration of Euler buckling

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

Order No.: 020.12100

SE 110.57
Buckling behaviour of bars

Determination of the buckling load: influence of material, support, and shear force

SE 112 Mounting frame required

Order No.: 022.11057

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.

Order No.: 021.16000

WP 130
Verification of stress hypotheses

Multiaxial loading of samples by bending and torsion

Order No.: 020.13000

Strength of materials
Experimental stress and strain analysis

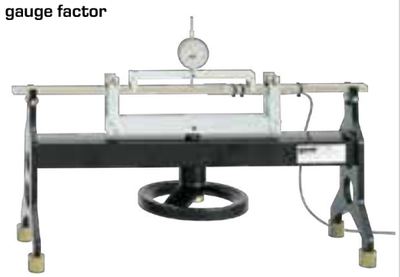
FL 100
Strain gauge training system

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

Order No.: 021.10000

FL 102
Determining the gauge factor of strain gauges

Investigation of deflection and strain to determine the gauge factor of strain gauges



Order No.: 021.10200

FL 101
Strain gauge application set

Complete equipment for practising manual handling of strain gauge technology

Order No.: 021.10100

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

Order No.: 021.12000

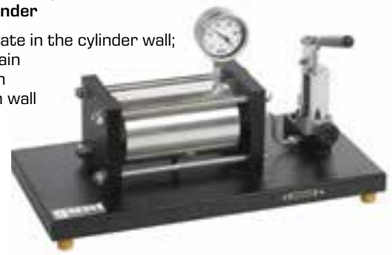
FL 130
Stress and strain analysis on a thin-walled cylinder

Investigation of axial and circumferential stress in a thin-walled cylinder under internal pressure

Order No.: 021.13000

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

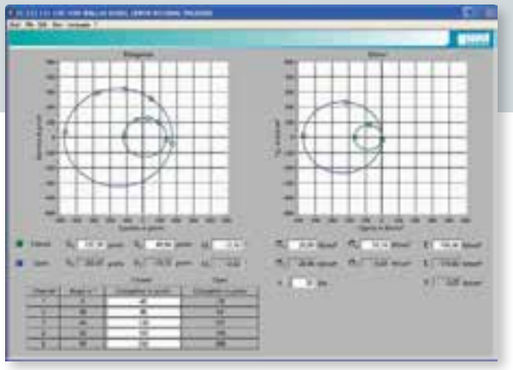


Order No.: 021.14000

FL 152
Multi-channel measurement amplifier

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

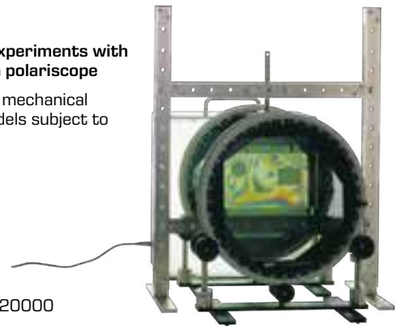
Order No.: 021.15100



Analysis using the software in FL 152

FL 200
Photoelastic experiments with a transmission polariscope

Visualisation of mechanical stresses in models subject to varying loads



Order No.: 021.20000

FL 210
Photoelastic demonstration

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

Order No.: 021.21000

Dynamics
Kinematics

KI 110
Kinematic model: crank mechanism

Conversion of rotary motion into oscillating motion

Order No.: 041.11000

KI 120
Kinematic model: crank disk

Conversion of a uniform rotary motion into a pure harmonic reciprocating motion

Order No.: 041.12000

KI 130
Kinematic model: four bar chain

Conversion of rotary motion into oscillating motion

Order No.: 041.13000

KI 140
Kinematic model: Whitworth's quick return

Uneven reciprocating motion with slow feed and quick return

Order No.: 041.14000

KI 150
Kinematic model: Hooke's coupling

Phenomenon of the gimbal error in Hooke's couplings and how to avoid it

Order No.: 041.15000

KI 160
Kinematic model: "Ackermann" steering mechanism

Determining the lead angle of a steering trapezoid

Order No.: 041.16000

GL 105
Kinematic model: gear drive

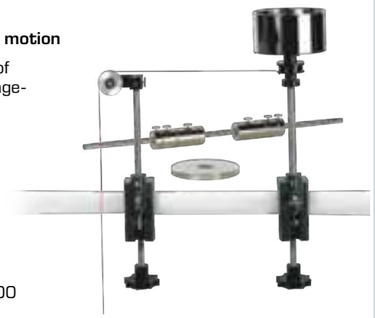
Investigation of transmission ratios on spur gear units

Order No.: 030.10500

Dynamics
Kinetics: basic experiments on dynamics and moment of inertia

TM 610
Inertia in rotational motion

Moments of inertia of different mass arrangements and bodies



Order No.: 040.61000

TM 612
Kinetic model: flywheel

Experimental determination of the moment of mass inertia of a flywheel

Order No.: 040.61200

TM 611
Rolling disc on inclined plane

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

Order No.: 040.61100

GL 210
Dynamic behaviour of multistage spur gears

Investigation of the dynamics of rotation of one-, two- and three-stage spur gear units

Order No.: 030.21000

GL 212
Dynamic behaviour of multistage planetary gears

Investigation of rotational dynamics of a two-stage epicyclic gear with three planetary gears each

Order No.: 030.21200

Dynamics
Kinetics: dynamics of rotation

TM 600
Centrifugal force apparatus

Laws on the behaviour of centrifugal forces on rotating masses

Order No.: 040.60000

TM 605
Coriolis force

Demonstration of the coriolis force in rotating reference systems

Order No.: 040.60500

TM 630
Gyroscope

Experimental verification of the laws of gyroscopes

Order No.: 040.63000

TM 632
Centrifugal governor

Characteristic curves of different centrifugal force governors

Order No.: 040.63200

Dynamics
Vibrations

TM 150
Universal vibration system

Experiments on damping, resonance, two-weight system and vibration absorption

Order No.: 040.15000

SE 110.58
Experimental set free vibration of a bar

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

Order No.: 022.11058

TM 161
Compound pendulum apparatus

Comparison of physical and mathematical pendulum

Order No.: 040.16100

TM 162
Bifilar/trifilar suspension apparatus

Moments of inertia of different bodies in a rotary pendulum experiment

Order No.: 040.16200

TM 163
Torsional vibration apparatus

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

Order No.: 040.16300

TM 164
Vibration of spiral spring apparatus

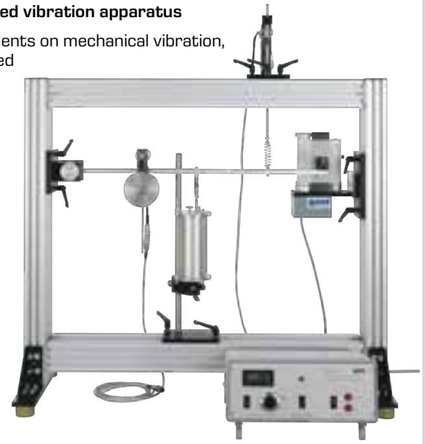
Investigation of vibrations on a spiral spring rotating mass system

Order No.: 040.16400

Machine dynamics
Vibrations in machines

TM 155
Free and forced vibration apparatus

Basic experiments on mechanical vibration, natural damped and forced vibrations



Order No.: 040.15500

TM 150.02
Free and damped torsional vibrations

Influence of rotating mass, torsional rigidity and damping factor on the behaviour of a rotary oscillator

Order No.: 040.15002

TM 140
Torsional vibration system

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

Order No.: 040.14000

HM 159.11
Ship vibration apparatus

Dynamic behaviour of a ship structure in air and in water

Order No.: 070.15611

Machine dynamics
Rotor dynamics

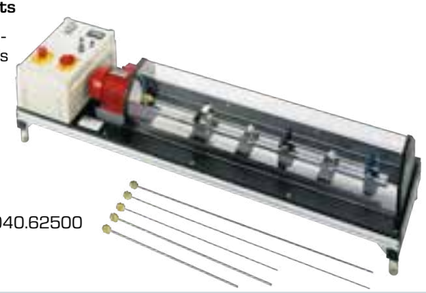
TM 620
Bending elasticity in rotors

Investigation of bending vibrations and resonance of a rotating shaft

Order No.: 040.62000

TM 625
Elastic shafts

Critical rotational speeds on simply loaded and continuous shafts



Order No.: 040.62500

Machine dynamics
Balancing

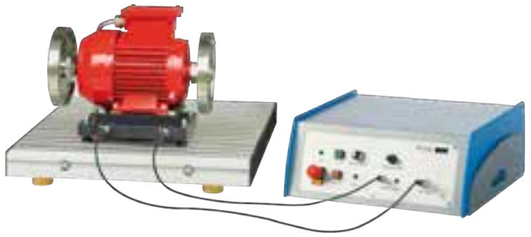
TM 170
Static and dynamic balancing apparatus

Demonstration of the fundamentals of static and dynamic balancing

Order No.: 040.17000

PT 502
Field balancing

Measurement of imbalance vibrations

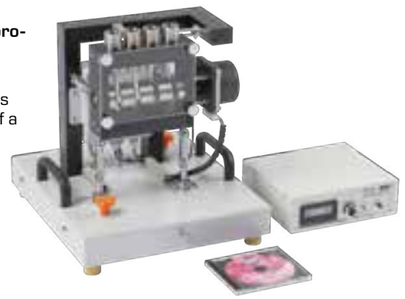


Order No.: 052.50200

Machine dynamics
Mass forces and mass balance

TM 180
Forces at reciprocating engines

Investigation of free mass forces and moments of a reciprocating engine



Order No.: 040.18000

GL 112
Cam analysis apparatus

Comparison and investigation of different cam mechanisms

Order No.: 030.11200

Machine dynamics
Vibration isolation

TM 182
Vibrations on machine foundations

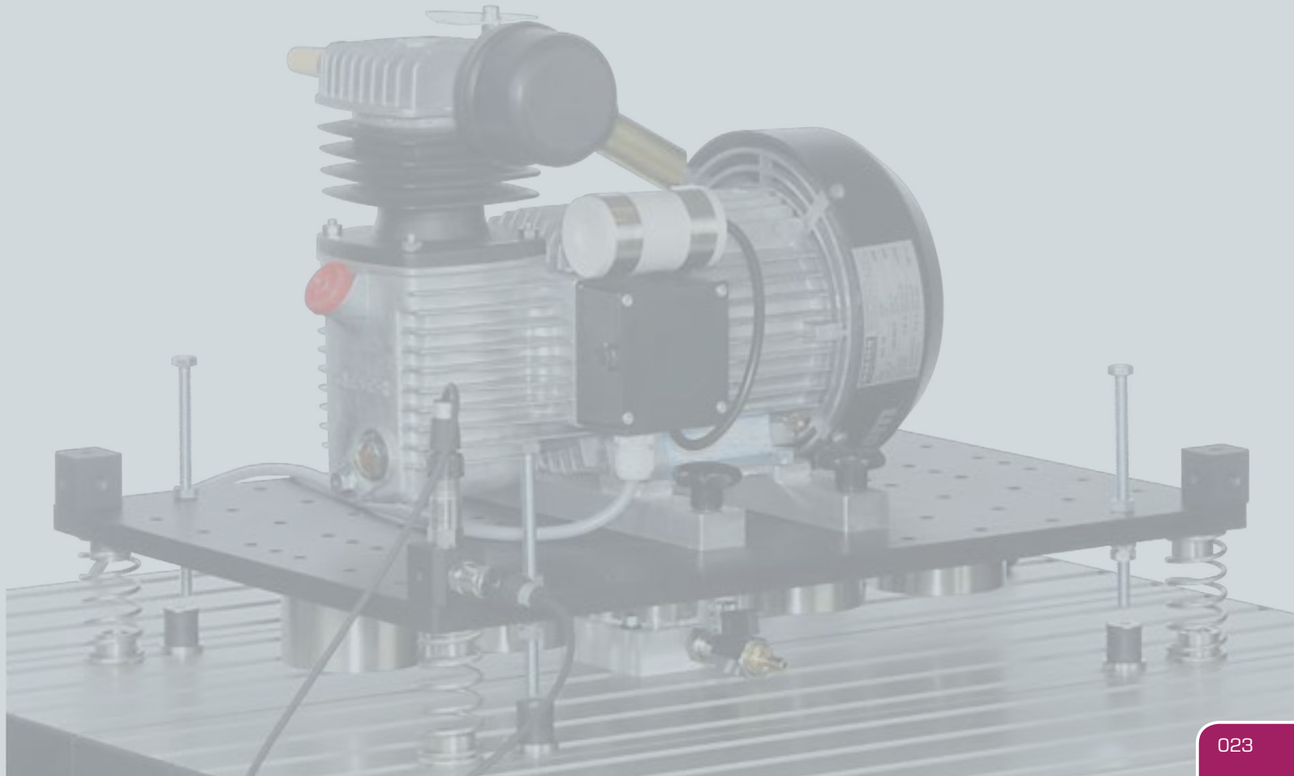
Machine foundation and isolation of vibrations

Order No.: 040.18200

TM 182.01
Piston compressor for TM 182

Used for generating vibrations for the TM 182

Order No.: 040.18201



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

Order No.:
052.50000

PT 500.10
Elastic shaft kit

Bending vibrations of elastic shaft

Order No.:
052.50010

PT 500.11
Crack detection in rotating shaft kit

Vibrational behaviour of a shaft with a radial crack

Order No.: 052.50011

PT 500.12
Roller bearing faults kit

Assessment of bearing condition by vibration analysis

Order No.: 052.50012

PT 500.13
Couplings kit

Vibration analysis of couplings

Order No.: 052.50013

PT 500.14
Belt drive kit

Vibrations in belt drives

Order No.: 052.50014

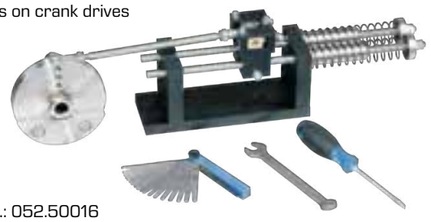
PT 500.15
Damage to gears kit

Vibration analysis of gearing damage

Order No.:
052.50015

PT 500.16
Crank mechanism kit

Vibrations on crank drives



Order No.: 052.50016

PT 500.17
Cavitation in pumps kit

Observation and measurement of cavitation

Order No.:
052.50017

PT 500.18
Vibrations in fans kit

Vibration measurements on blades

Order No.: 052.50018

PT 500.19
Electromechanical vibrations kit

Investigation of vibrational behaviour of an electric motor

Order No.: 052.50019

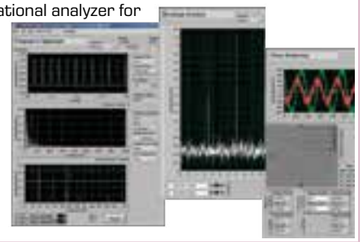
PT 500.05
Brake & load unit

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

Order No.:
052.50005

PT 500.04
Computerised vibration analyser

Computerised vibrational analyzer for representation and evaluation of experiments with the PT 500 machinery diagnosis series



Order No.:
052.50004

PT 501
Roller bearing faults

Investigation of the vibrations of roller bearings

Order No.: 052.50100

Engineering design
Engineering drawing

TZ 100
Three-dimensional display with geometric models

Set of models for fundamentals of technical drawing

Order No.: 050.10000

TZ 200.61
Drawing demonstration: drilling jig

Technical drawing course for the representation of rotationally symmetrical parts

Order No.: 050.20061

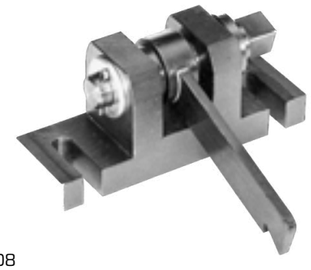
TZ 200.02
Bearing housing, casting

Two workpieces for technical drawing on the topic of cast parts

Order No.: 050.20002

TZ 200.08
Safety catch

Practice model providing an introduction to technical drawing



Order No.: 050.20008

TZ 300
Lever press assembly kit

For drawing, measurement and assembly exercises

Order No.: 050.30000

TZ 200.71
Lever shears assembly kit

Complex course for drawing and assembly exercises

Order No.: 050.20071

TZ 200.11
Bending device assembly kit

For drawing, measurement and assembly exercises

Order No.: 050.20011

Engineering design
Cutaway models

GL 300.01
Cutaway model: worm gear

Order No.: 030.30001

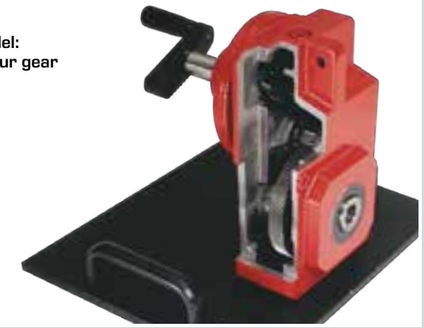
GL 300.02
Cutaway model: mitre gear

Order No.: 030.30002

GL 300.03
Cutaway model: spur gear

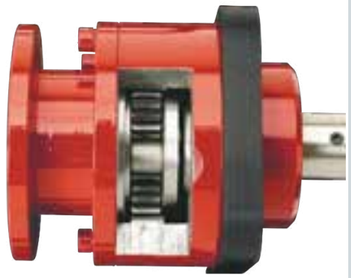
Order No.: 030.30003

GL 300.04
Cutaway model: two-stage spur gear



Order No.: 030.30004

GL 300.05
Cutaway model: planetary gear



Order No.: 030.30005

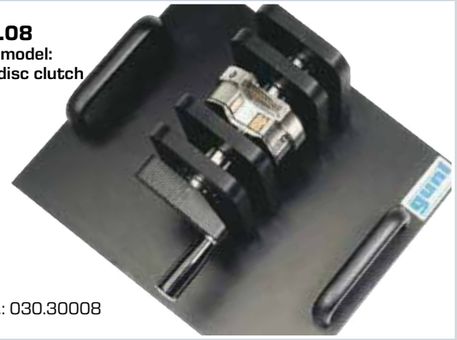
GL 300.06
Cutaway model: variable speed belt drive

Order No.: 030.30006

GL 300.07
Cutaway model: control gear

Order No.: 030.30007

GL 300.08
Cutaway model: multiple-disc clutch



Order No.: 030.30008

Engineering design
Cutaway models

GL 300.12
Cutaway model: pedestal bearing

Order No.: 030.30012

TM 320
Screw tester

Correlation between tightening torque and tension force on standardised bolts

Order No.: 040.32000

TM 310
Thread efficiency testing equipment

Thread efficiencies for different pairs of materials and thread pitches

Order No.: 040.31000

Engineering design
Machine elements fasteners

MG 901
Nuts and bolts kit

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

Order No.: 053.90100

MG 905
Thread types kit

Determining the thread type with the thread gauge

Order No.: 053.90500

MG 903
Screw-locking devices kit

Familiarisation with the relevant standard designations and terms, including graphical representation

Order No.: 053.90300

Engineering design
Machine elements bearings

MG 911
Roller bearings kit

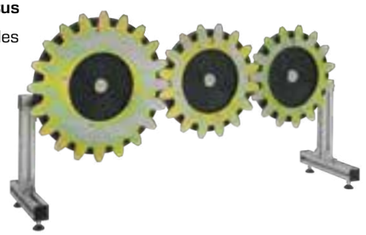
Familiarisation with the major types of roller bearings

Order No.: 053.91100

Engineering design
Machine elements transmission elements

GL 100
Gear trains apparatus

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



Order No.: 030.10000

TM 123
Spur gear lifting apparatus

Mode of operation and layout of toothed gearing mechanisms

Order No.: 040.12300

TM 124
Worm and wheel apparatus

Mode of operation and layout of a worm gear

Order No.: 040.12400

TM 125
Winch

Using force equilibrium considerations to determine load transmission and efficiency

Order No.: 040.12500

GL 110
Cam mechanism

Demonstration and measurement of the displacement curves for cam mechanisms

Order No.: 030.11000

TM 220
Belt friction apparatus

Investigating the influence of the angle of contact, coefficient of friction and belt force on belt drives and belt friction

Order No.: 040.22000

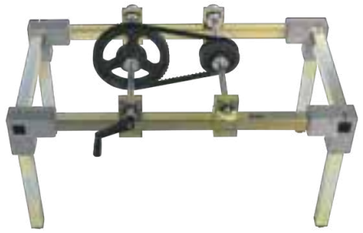
AT 200
Determination of gear efficiency

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

Order No.: 031.20000

GL 410
Assembly simple drives

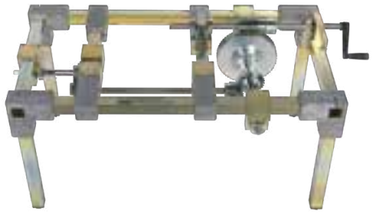
Versatile assembly exercise for simple drives using a belt, chain sprockets or a roller chain



Order No.: 030.41000

GL 420
Assembly combined drives

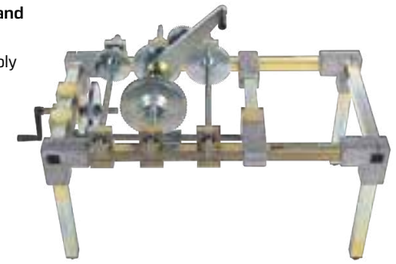
Versatile assembly exercise for combined drives



Order No.: 030.42000

GL 430
Assembly step and shift gears

Versatile assembly exercise for various step and gear units



Order No.: 030.43000

GL 200
Demonstrator for lathe gearing layout

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

Order No.: 030.20000

Engineering design
Assembly exercises

MT 170
Assembly shaft with journal bearings

Design and function of a simple journal bearing

Order No.: 051.17000

MT 171
Assembly hydro-dynamic journal bearing

Design and function of a hydrodynamic journal bearing

Order No.: 051.17100

MT 152
Assembly spur gear

Design and function of a spur gear with helical gear wheels

Order No.: 051.15200

MT 110.02
Assembly spur wheel / worm gear mechanism

Assembly of an industrial gear unit, using simple tools and jigs

Order No.: 051.11002

MT 172
Alignment of drives, shafts and gears

Mechanical drive technology; functional testing for assembly objects MT 110, MT 110.02 and MT 170

Order No.: 051.17200

MT 190
Assembly materials tester

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

Order No.: 051.19000

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

Order No.: 051.19001

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On our website you will find all you need to know, including all the latest news.

Testing of materials
Tensile, compression, bending and hardness testing

WP 300
Universal material tester, 20 kN

Training unit for basic experiments on materials testing: tensile tests, Brinell hardness tests, stress-strain diagrams

Order No.: 020.30000

WP 310
Hydraulic universal material tester, 50 kN

Training unit for experiments of an industrial nature on materials testing

Order No.: 020.31000

SE 100
Universal testing frame, 400 kN

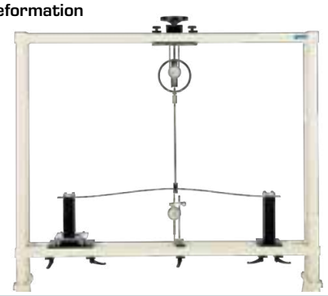
Loading experiments on components from structural steelwork and civil engineering; size allows measurements on actual components

Order No.: 022.10000

SE 110.48
Bending test, plastic deformation

Observation and determination of the transition from elastic to plastic deformation

SE 112 Mounting frame required



Bestellnr.: 022.11048

Testing of materials
Impact bending test

WP 400
Pendulum impact tester, 25 Nm

Implementation of the notched bar impact bending test

Order No.: 020.40000

WP 410
Pendulum impact tester, 300 Nm

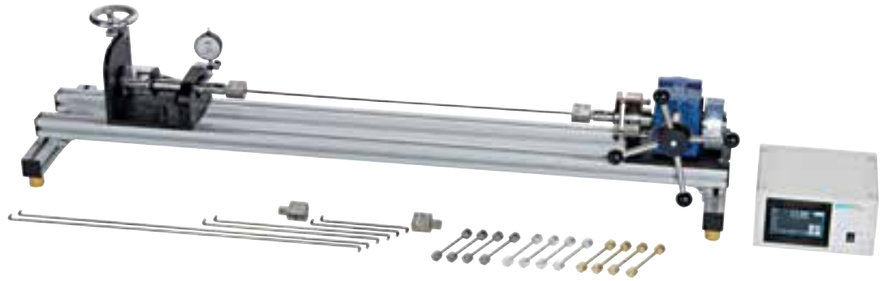
Notched bar impact bending test with increased impact energy

Order No.: 020.41000

Testing of materials
Torsional test

WP 500
Torsion tester, 30 Nm

Manual torsion testing of different materials to fracture



Order No.: 020.50000

WP 510
Torsion testing machine, 200 Nm, motor driven

Motorised torsion testing of different materials to fracture

Order No.: 020.51000

Testing of materials
Fatigue of materials

WP 140
Fatigue testing machine

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

Order No.: 020.14000

WP 600
Creep testing machine

Demonstration of typical creep phenomena in various materials

Order No.: 020.60000

Testing of materials
Tribology and corrosion

TM 260
Tribology trainer base module

Modular experimental system for sliding and rolling friction

Order No.: 040.26000

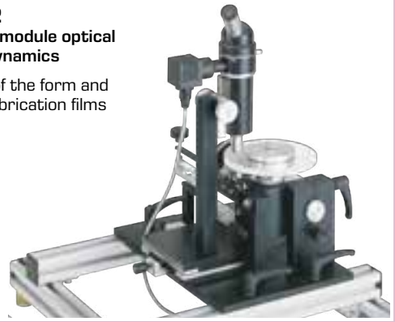
TM 260.01
Experimental module rolling/sliding disc

Slip forces in two discs rubbing together

Order No.: 040.26001

TM 260.02
Experimental module optical elastohydrodynamics

Investigation of the form and thickness of lubrication films



Order No.: 040.26002

TM 260.03
Experimental module pin on disc

Investigations into wear on pairs of friction materials with surface contact

Order No.: 040.26003

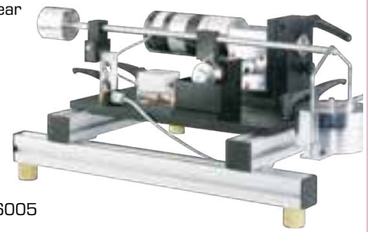
TM 260.04
Experimental module slip/stick & friction vibration

Differences between static and sliding friction, instability

Order No.: 040.26004

TM 260.05
Experimental module block on ring friction

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

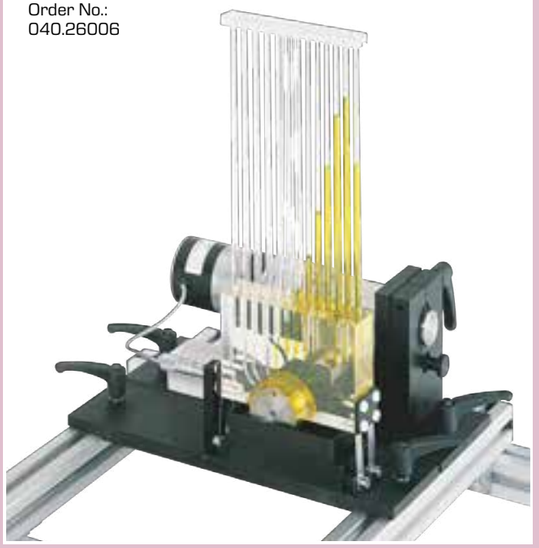


Order No.: 040.26005

TM 260.06
Radial pressure distribution in the journal bearing

Demonstration of pressure distribution in a plain bearing with hydrodynamic lubrication

Order No.: 040.26006



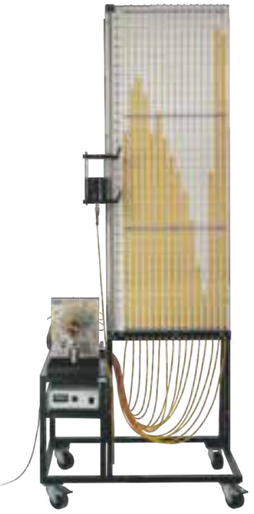
TM 232
Bearing friction

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

Order No.: 040.23200

TM 280
Pressure distribution in journal bearings

Illustrates the principle of hydrodynamic lubrication



Order No.: 040.28000

TM 282
Friction in journal bearings

Learning the fundamentals of hydrodynamic lubrication by experimentation

Order No.: 040.28200

TM 290
Hydrodynamic bearing apparatus

Investigation of friction in a hydrodynamically lubricated journal bearing

Order No.: 040.29000

CE 105
Corrosion experimental unit

Parallel investigation of different influencing factors on different metal samples

Order No.: 083.10500

Mechatronics

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Catalogues

This is where you can find extensive information, product descriptions and data sheets:

Offine
Print catalogue programme area 2 "Mechatronics"

Online
at www.gunt.de

Software for data acquisition / visualisation

Engineering drawing
Geometric models

TZ 100
Three-dimensional display with geometric models

Set of models for fundamentals of technical drawing

Order No.: 050.10000

TZ 110
Cylindrical work samples with cut-outs parallel to axis

Comprehensive collection of models with varying levels of difficulty

Order No.: 050.11000

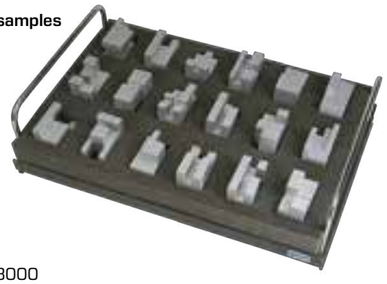
TZ 120
Cylindrical work samples with slanted cut-outs

Comprehensive collection of models with varying levels of difficulty

Order No.: 050.12000

TZ 130
Prismatic work samples with cut-outs parallel to edges

Comprehensive collection of models with varying levels of difficulty



Order No.: 050.13000

TZ 140
Prismatic work samples with slanted cut-outs

Comprehensive collection of models with varying levels of difficulty

Order No.: 050.14000

Engineering drawing
Training panels and assembly sets

TZ 200.11
Bending device assembly kit

For drawing, measurement and assembly exercises

Order No.: 050.20011

TZ 200.61
Drawing demonstration: drilling jig

Technical drawing course for the representation of rotationally symmetrical parts

Order No.: 050.20061

TZ 200.71
Lever shears assembly kit

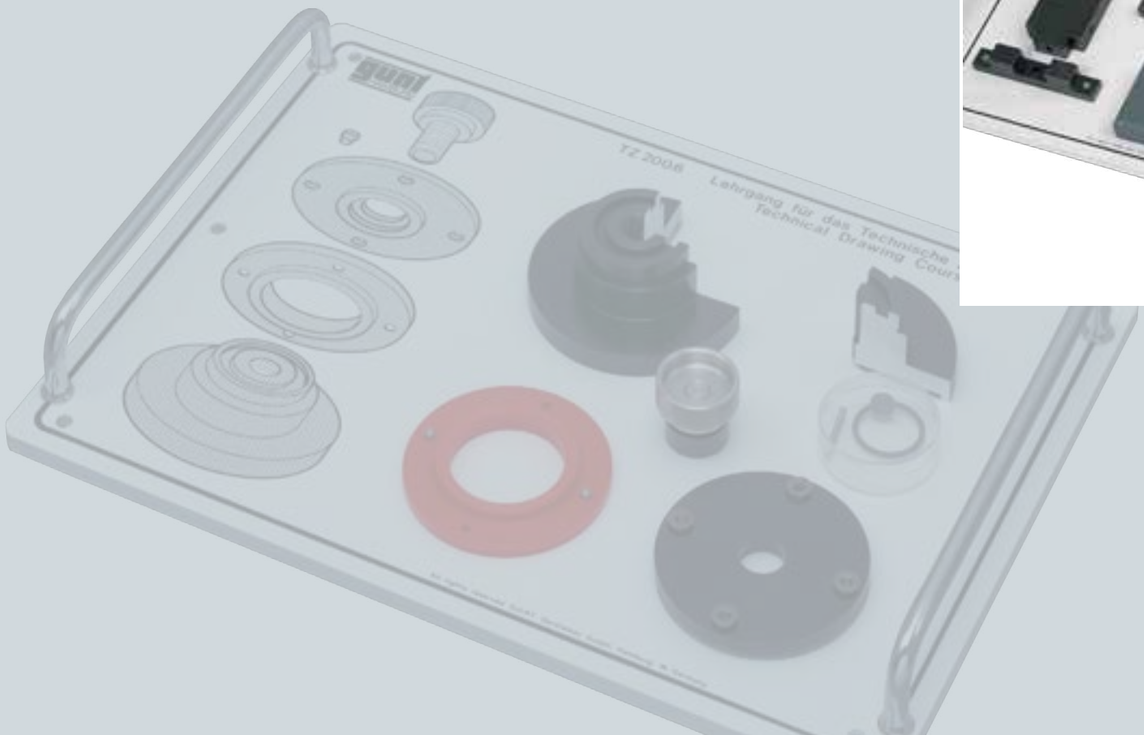
Complex course for drawing and assembly exercises

Order No.: 050.20071

TZ 300
Lever press assembly kit

For drawing, measurement and assembly exercises

Order No.: 050.30000



Engineering drawing
Practice models

TZ 200.01
Bending device

Steel bending device as the basis for extensive technical drawing course

Order No.: 050.20001

TZ 200.07
Lever shears

Functional lever shears: drawing, measurement, assembly

Order No.: 050.20007

TZ 200.04
Drilling jig for a casting

Practice model for technical drawing of jigs

Order No.: 050.20004

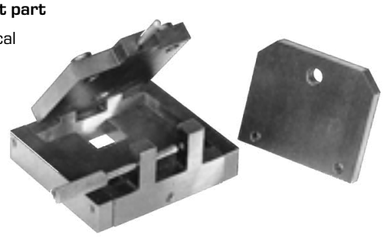
TZ 200.06
Drilling jig for an annular disc

Introduction to technical drawing: turned parts, threads

Order No.: 050.20006

TZ 200.09
Drilling jig for flat part

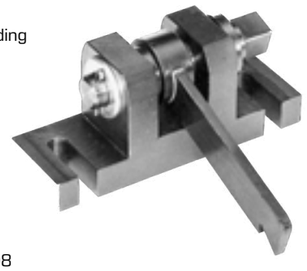
Complete technical drawing course using a drilling jig as an example



Order No.: 050.20009

TZ 200.08
Safety catch

Practice model providing an introduction to technical drawing



Order No.: 050.20008

TZ 200.02
Bearing housing, casting

Two workpieces for technical drawing on the topic of cast parts

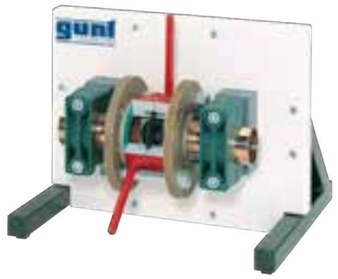
Order No.: 050.20002

Cutaway models
Components in piping systems

HM 700.01
Cutaway model: standard orifice plate

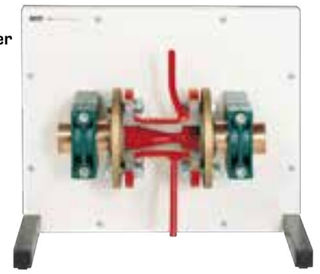
Order No.: 070.70001

HM 700.02
Cutaway model: flow nozzle



Order No.: 070.70002

HM 700.03
Cutaway model: standard Venturi meter



Order No.: 070.70003

HM 700.04
Cutaway model: straight-way valve

Order No.: 070.70004

HM 700.05
Cutaway model: corner valve

Order No.: 070.70005

HM 700.06
Cutaway model: angle seat valve

Order No.: 070.70006

HM 700.07
Cutaway model: non-return valve

Order No.: 070.70007

HM 700.08
Cutaway model: pressure reducing valve

Order No.: 070.70008

Cutaway models
Components in piping systems

HM 700.09
Cutaway model: strainer

Order No.:
070.70009

HM 700.10
Cutaway model: gate valve

Order No.:
070.70010

HM 700.11
Cutaway model: straight-way plug valve

Order No.:
070.70011

HM 700.12
Cutaway model: three-way plug valve

Order No.:
070.70012

HM 700.13
Cutaway model: ball valve

Order No.:
070.70013

HM 700.14
Cutaway model: safety valve

Order No.:
070.70014

HM 700.15
Cutaway models: various screwed pipe connections

Order No.:
070.70015

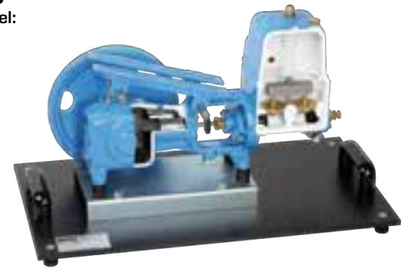
HM 700.16
Cutaway models: pressure gauges

Order No.:
070.70016

HM 700.17
Cutaway model: centrifugal pump

Order No.:
070.70017

HM 700.20
Cutaway model: piston pump



Order No.:
070.70020

HM 700.22
Cutaway model: gear pump

Order No.:
070.70022

VS 101
Cutaway model: underground hydrant

Order No.:
076.10100

VS 102
Cutaway model: resilient seated gate valve

Order No.:
076.10200

VS 103
Cutaway model: screw down valve

Order No.:
076.10300

VS 104
Cutaway model: changeover valve

Order No.:
076.10400

VS 105
Cutaway model: gas meter

Order No.:
076.10500

Cutaway models
Components in piping systems

VS 106
Cutaway model: backflow preventer

Order No.:
076.10600

VS 107
Cutaway model: non-return butterfly valve

Order No.:
076.10700

VS 108
Cutaway model: water meter

Order No.:
076.10800

VS 109
Cutaway model: strainer

Order No.:
076.10900

Cutaway models
Gear and drive elements

GL 300.01
Cutaway model: worm gear

Order No.:
030.30001

GL 300.02
Cutaway model: mitre gear

Order No.:
030.30002

GL 300.03
Cutaway model: spur gear

Order No.:
030.30003

GL 300.04
Cutaway model: two-stage spur gear

Order No.:
030.30004

GL 300.05
Cutaway model: planetary gear

Order No.:
030.30005

GL 300.06
Cutaway model: variable speed belt drive

Order No.:
030.30006

GL 300.07
Cutaway model: control gear

Order No.:
030.30007

GL 300.08
Cutaway model: multiple-disc clutch

Order No.:
030.30008

GL 300.12
Cutaway model: pedestal bearing

Order No.:
030.30012

Cutaway models
Refrigeration components

ET 499.30
Cutaway model: ceiling air cooler

Order No.: 061.49930

ET 499.01
Cutaway model: hermetic refrigerant compressor

Order No.: 061.49901

ET 499.02
Cutaway model: semi-hermetic refrigerant compressor

Order No.: 061.49902

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

Order No.: 061.49903

ET 499.12
Cutaway model: block drier

Order No.: 061.49912

ET 499.13
Cutaway model: oil separator

Order No.: 061.49913

ET 499.14
Cutaway model: liquid separator

Order No.: 061.49914

ET 499.16
Cutaway model: ball valve

Order No.: 061.49916

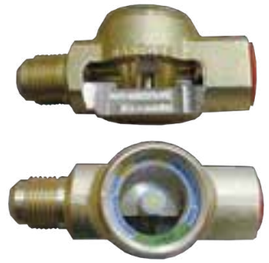
ET 499.18
Cutaway model: thermostatic expansion valve

Order No.: 061.49918

ET 499.19
Cutaway model: automatic expansion valve

Order No.: 061.49919

ET 499.21
Cutaway model: sight glass with humidity indicator



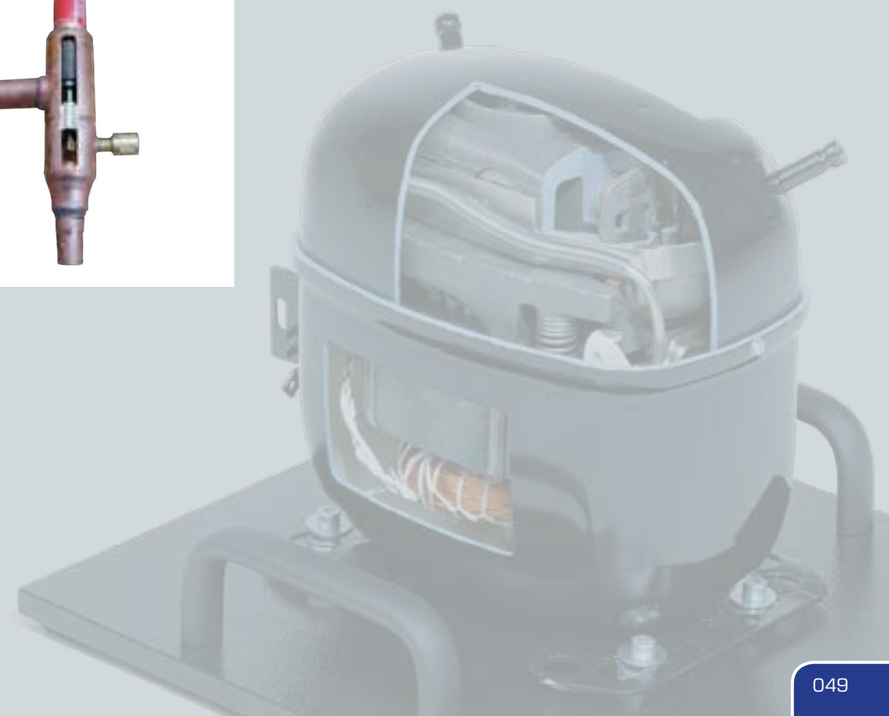
Order No.: 061.49921

ET 499.25
Cutaway model: 4/2-way reversing valve

Order No.: 061.49925

ET 499.26
Cutaway model: condensation pressure control valve

Order No.: 061.49926



Dimensional metrology

PT 101
Dimensional metrology I: training kit 1

Measurement exercises with steel ruler and vernier calliper gauge; ten stainless steel test pieces

Order No.: 052.10100

PT 102
Dimensional metrology I: training kit 2

Measurement exercises on a bearing plate with vernier calliper gauge and external micrometer

Order No.: 052.10200

PT 103
Dimensional metrology I: training kit 3

Measurement exercises on a bush with vernier calliper gauge, micrometer and calliper

Order No.: 052.10300

PT 104
Dimensional metrology I: training kit 4

Angle measurement exercises with universal goniometer; ten stainless steel test pieces

Order No.: 052.10400

PT 105
Dimensional metrology I: training kit 5

Measurement exercises on a shaft: lengths and radii

Order No.: 052.10500

PT 106
Dimensional metrology I: training kit 6

Measurement exercises on a shaft: lengths, angles, radii; ten stainless steel test pieces

Order No.: 052.10600

PT 201
Dimensional metrology II: training kit 1

Measurement exercises on a shaft with groove: key-way vernier calliper, block gauges

Order No.: 052.20100

PT 202
Dimensional metrology II: training kit 2

Testing external and inner tapers; eight stainless steel test pieces

Order No.: 052.20200

Fasteners and machine parts
Workshop exercises

MG 100
Instructional kit: assembly with dowel pins

Familiarisation with various pin types, their special features and applications

Order No.: 053.10000

MG 110
Instructional kit: assembly with keys

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

Order No.: 053.11000

MG 120
Instructional kit: assembly with taper keys

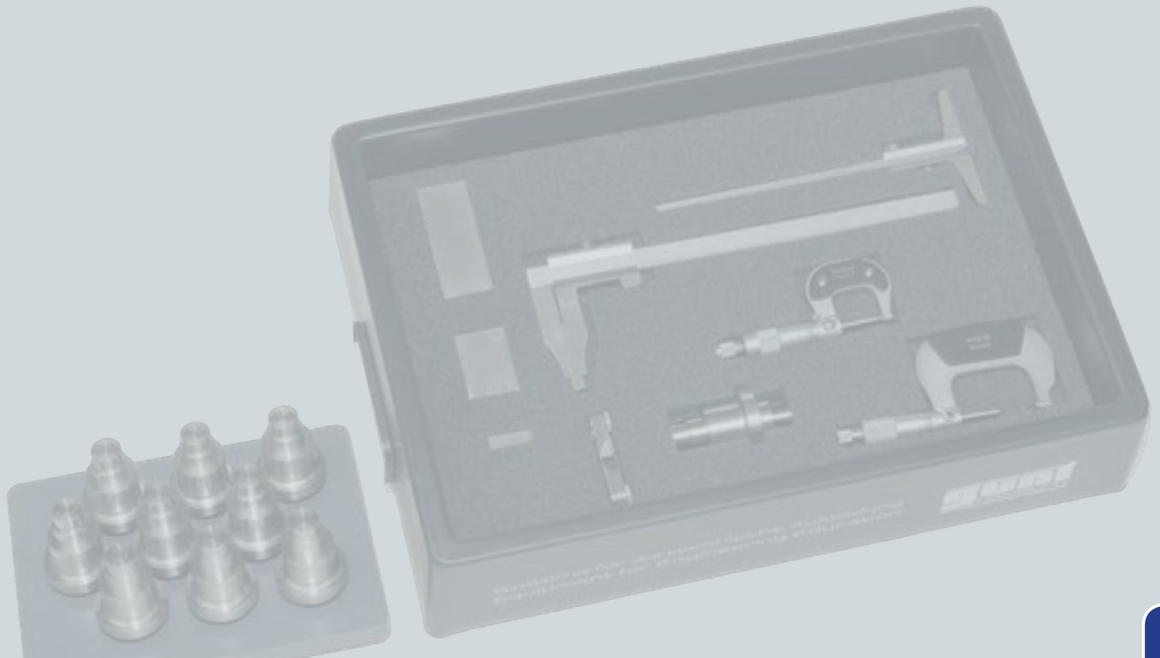
Familiarisation with various taper keys, their production, special features and areas of application

Order No.: 053.12000

MG 200
Instructional kit: threaded fasteners and lock washers

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

Order No.: 053.20000



Fasteners and machine parts
Demonstration kits

MG 901
Nuts and bolts kit

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

Order No.: 053.90100

MG 903
Screw-locking devices kit

Familiarisation with the relevant standard designations and terms, including graphical representation

Order No.: 053.90300

MG 905
Thread types kit

Determining the thread type with the thread gauge

Order No.: 053.90500

MG 911
Roller bearings kit

Familiarisation with the major types of roller bearings

Order No.: 053.91100

Fasteners and machine parts
Technological experiments

TM 123
Spur gear lifting apparatus

Mode of operation and layout of toothed gearing mechanisms

Order No.: 040.12300

GL 110
Cam mechanism

Demonstration and measurement of the displacement curves for cam mechanisms

Order No.: 030.11000

TM 124
Worm and wheel apparatus

Mode of operation and layout of a worm gear

Order No.: 040.12400

TM 320
Screw tester

Correlation between tightening torque and tension force on standardised bolts

Order No.: 040.32000

TM 232
Bearing friction

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

Order No.: 040.23200

TM 282
Friction in journal bearings

Learning the fundamentals of hydrodynamic lubrication by experimentation

Order No.: 040.28200

Manufacturing engineering
Demonstration kits

FT 901
Drilling kit

Various drilling tools: cutting geometry, incorrect cutter profiles

Order No.: 054.90100

FT 903
Countersinking kit

Collection of countersinking tools: standard designations

Order No.: 054.90300

FT 905
Reaming kit

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

Order No.: 054.90500

FT 907
Grinding kit

Teaching collection of traditional grinding tools and abrasives

Order No.: 054.90700

FT 909
Turning kit

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

Order No.: 054.90900

FT 913
Milling kit

Familiarisation with various types of milling cutters

Order No.: 054.91300

Manufacturing engineering
Technological experiments

FT 100
Cutting forces during drilling

Measurement of feed force and torque

Order No.: 054.10000

FT 102
Cutting forces during turning

Measuring the forces acting on a lathe tool; three-component force measuring device

Order No.: 054.10200

FT 200
Forming by bending

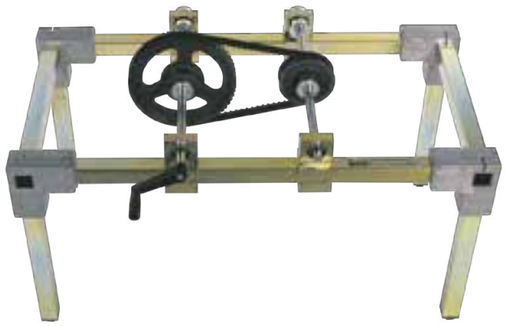
Vice experiment: permanent deformation of flat bars

Order No.: 054.20000

Assembly projects
Drive elements and gears

GL 410
Assembly simple drives

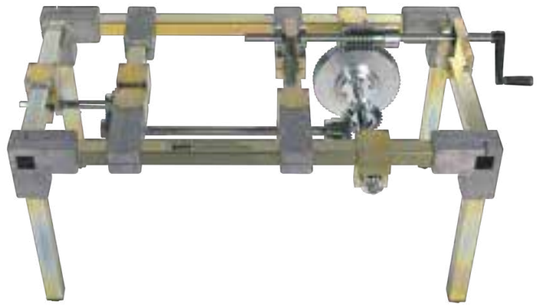
Versatile assembly exercise for simple drives using a belt, chain sprockets or a roller chain



Order No.: 030.41000

GL 420
Assembly combined drives

Versatile assembly exercise for combined drives

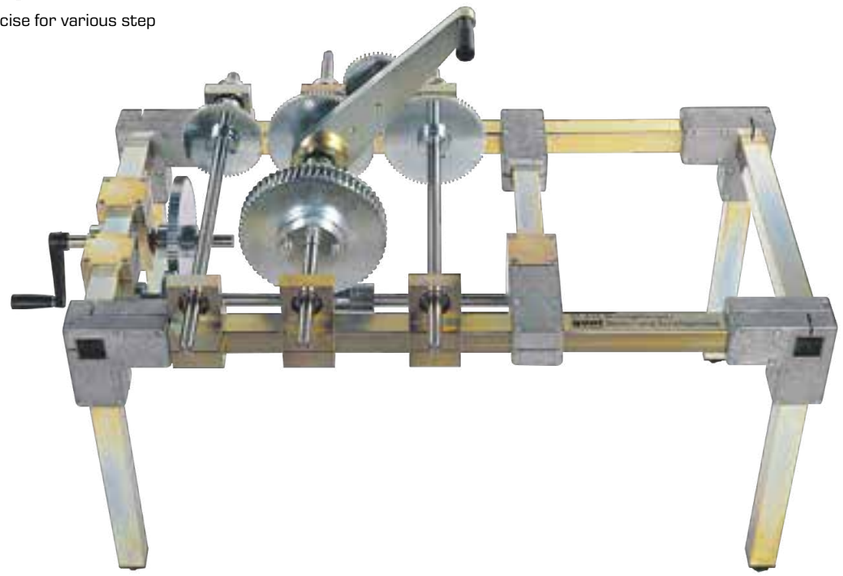


Order No.: 030.42000

GL 430
Assembly step and shift gears

Versatile assembly exercise for various step and gear units

Order No.: 030.43000



MT 170
Assembly shaft with journal bearings

Design and function of a simple journal bearing

Order No.: 051.17000

MT 171
Assembly hydro-dynamic journal bearing

Design and function of a hydrodynamic journal bearing

Order No.: 051.17100

MT 152
Assembly spur gear

Design and function of a spur gear with helical gear wheels

Order No.: 051.15200

MT 110
Assembly station: spur wheel / worm gear mechanism

Teaching station for demonstration of and introduction to assembly projects using an industrial gear as an example

Order No.: 051.11000

MT 110.02
Assembly spur wheel / worm gear mechanism

Assembly of an industrial gear unit, using simple tools and jigs

Order No.: 051.11002

MT 172
Alignment of drives, shafts and gears

Mechanical drive technology; functional testing for assembly objects MT 110, MT 110.02 and MT 170

Order No.: 051.17200

Assembly projects
Fittings

MT 154
Assembly exercise: shut-off valve

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

Order No.: 051.15400

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

Assembly, disassembly and maintenance of industrial fittings

Order No.: 051.15600

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

Assembly, disassembly and maintenance of industrial fittings

Order No.: 051.15700

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

Assembly, disassembly and maintenance of industrial fittings

Order No.: 051.15800

MT 162
Hydraulic valves and fittings test stand

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

Order No.: 051.16200

Assembly projects
Piping assembly

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

Order No.: 065.96000

HL 960.01
Assembly and alignment of pumps and drives

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

Order No.: 065.96001

Assembly projects
Compressors

MT 140
Assembly station: piston compressor

Teaching station for demonstration of and introduction to assembly projects using a compressor as an example

Order No.: 051.14000

MT 140.01
Assembly exercise piston compressor: functional test

Installation of the compressor MT 140 or MT 140.02 for operational check

Order No.: 051.14001

MT 140.02
Assembly exercise: piston compressor

Assembly of an industrial compressor, using simple tools and jigs

Order No.: 051.14002

MT 140.20
Multimedia learning software: piston compressor

Illustration by animations: functions and assembly steps

Order No.: 051.14020

Maintenance
Test stands for valves and fittings and actuators

RT 395
Maintenance of valves and fittings and actuators

Maintenance and operational check: four different fittings and actuators

Order No.: 080.39500

RT 396
Pump and valves and fittings test stand

Recording characteristic curves of industrial fittings and a centrifugal pump

Order No.: 080.39600

Maintenance
Assembly kits

MT 210
Assembly & maintenance exercise: refrigeration

Study project with high practical relevance for training in metal and electrical professions: setup of a refrigeration system from individual components

Order No.: 051.21000

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

Order No.: 051.19001

MT 190
Assembly materials tester

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

Order No.: 051.19000

Laboratory and conceptual design from A–Z

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.

Maintenance
System components: valves, pumps, pipes

MT 180
Assembly & maintenance exercise: centrifugal pump

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

Order No.: 051.18000

MT 181
Assembly & maintenance exercise: multistage centrifugal pump

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

Order No.: 051.18100

MT 182
Assembly & maintenance exercise: screw pump

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

Order No.: 051.18200

MT 183
Assembly & maintenance exercise: diaphragm pump

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

Order No.: 051.18300

MT 184
Assembly & maintenance exercise: piston pump

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

Order No.: 051.18400

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

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

Order No.: 051.18500

MT 186
Assembly & maintenance exercise: gear pump

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

Order No.: 051.18600

HL 962
Assembly stand for pumps

Base unit when constructing a complex piping system

Order No.: 065.96200

HL 962.01
Standard chemicals pump

Typical pump as used in process engineering

Order No.: 065.96201

HL 962.02
Canned motor pump

Hermetic centrifugal pump, particularly suitable for pumping liquid gases

Order No.: 065.96202

HL 962.03
Side channel pump

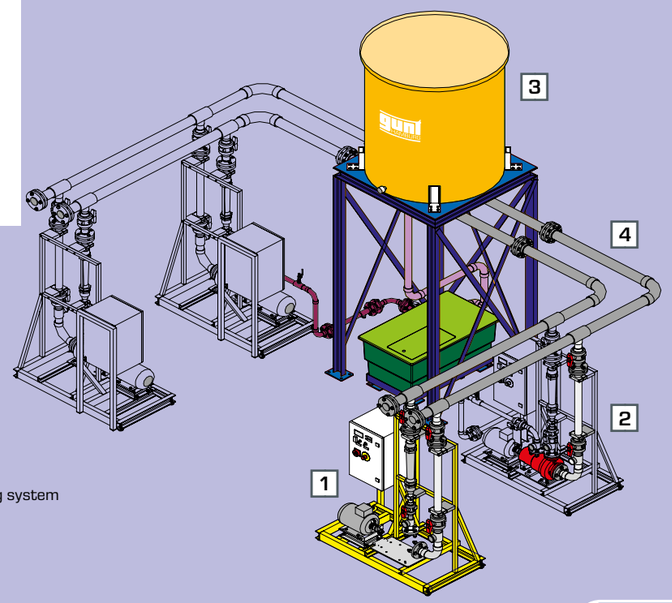
Self-priming three-stage pump

Order No.: 065.96203

HL 962.04
Standard chemicals pump with magnetic clutch

Hermetic centrifugal pump according to ISO 5199

Order No.: 065.96204



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)

Machinery diagnosis

PT 500
Machinery diagnostic system, base unit

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

Order No.:
052.50000

PT 500.10
Elastic shaft kit

Bending vibrations of elastic shaft

Order No.:
052.50010

PT 500.11
Crack detection in rotating shaft kit

Vibrational behaviour of a shaft with a radial crack

Order No.: 052.50011

PT 500.12
Roller bearing faults kit

Assessment of bearing condition by vibration analysis

Order No.: 052.50012

PT 500.13
Couplings kit

Vibration analysis of couplings

Order No.: 052.50013

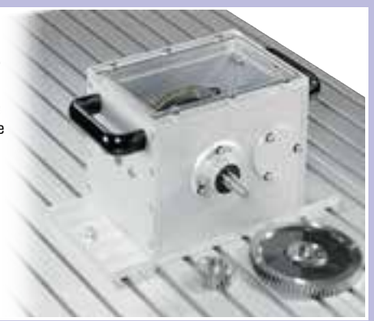
PT 500.14
Belt drive kit

Vibrations in belt drives

Order No.: 052.50014

PT 500.15
Damage to gears kit

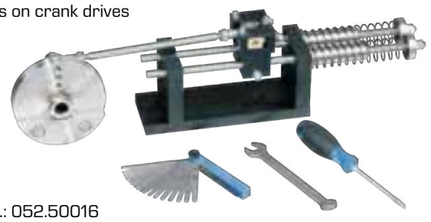
Vibration analysis of gearing damage



Order No.:
052.50015

PT 500.16
Crank mechanism kit

Vibrations on crank drives



Order No.: 052.50016

PT 500.17
Cavitation in pumps kit

Observation and measurement of cavitation

Order No.:
052.50017

PT 500.18
Vibrations in fans kit

Vibration measurements on blades

Order No.: 052.50018

PT 500.19
Electromechanical vibrations kit

Investigation of vibrational behaviour of an electric motor

Order No.: 052.50019

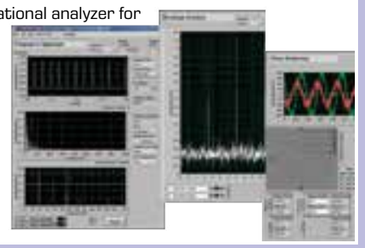
PT 500.05
Brake & load unit

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

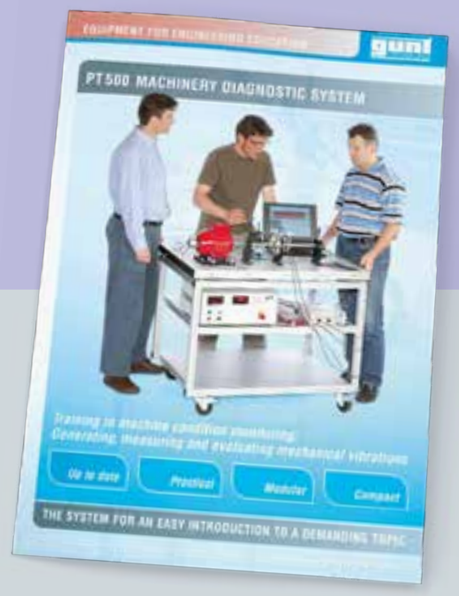
Order No.:
052.50005

PT 500.04
Computerised vibration analyser

Computerised vibrational analyzer for representation and evaluation of experiments with the PT 500 machinery diagnosis series



Order No.:
052.50004



PT 501
Roller bearing faults

Investigation of the vibrations of roller bearings

Order No.: 052.50100

Automation
Sensors / instrumentation

IA 120
Principles of industrial sensors

Familiarisation with key sensors: mode of operation and application

Order No.: 058.12000

FL 100
Strain gauge training system

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

Order No.: 021.10000

WL 202
Fundamentals of temperature measurement

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

Order No.: 060.20200

IA 110
Calibrating a pressure sensor

Test pressure generated with dead-weight piston manometer

Order No.: 058.11000

Automation
PLC and PLC applications

RT 800
PLC application: mixing process

Experiments using PLC to control discontinuous mixing processes

Order No.: 080.80000

IA 210
PLC application: materials handling process

Basic system of automation: transporting and sorting workpieces

Order No.: 058.21000

IA 130
PLC module

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

Order No.: 058.13000

Automation
Fundamentals of pneumatics and hydraulics

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

Order No.: 080.77000

RT 700
Training system: fundamentals of hydraulics

Complete training system providing an experimental introduction to the fundamentals of hydraulics

Order No.: 080.70000

RT 710
Hydraulic servo system

Hydraulic position control circuit with adjustable load conditions

Order No.: 080.71000

Automation
Controllers, controlled systems, networking

RT 350
Operation of industrial controllers

Simulation of controlled systems; digital controller with freely selectable parameters

Order No.: 080.35000

RT 360
Networking of industrial controllers

Function and structure of a process control system under Profibus DP

Order No.: 080.36000

RT 370
Setup of field bus systems

Parametrisation and communication of field bus systems

Order No.: 080.37000

RT 380
Optimization of control loops

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

Order No.: 080.38000

Automation
Process control demonstration and experimental models

RT 010
Training system: level control, HSI

Fundamentals of control engineering using the example of a level control system with integral behaviour

Order No.: 080.01000

RT 020
Training system: flow control, HSI

Fundamentals of control engineering using the example of a rapid flow control system

Order No.: 080.02000

RT 030
Training system: pressure control, HSI

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

Order No.: 080.03000

RT 040
Training system: temperature control, HSI

Fundamentals of control engineering using the example of a temperature control system with dead time

Order No.: 080.04000

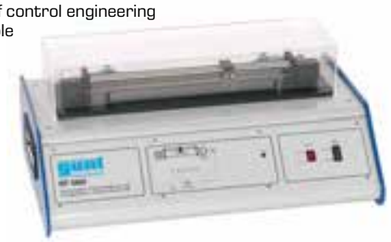
RT 050
Training system: speed control, HSI

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

Order No.: 080.05000

RT 060
Training system: position control, HSI

Fundamentals of control engineering using the example of a position control system with integral behaviour



Order No.: 080.06000

Automation
Process control demonstration and experimental models

RT 614
Level control demonstration unit

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

Order No.: 080.61400

RT 624
Flow control demonstration unit

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

Order No.: 080.62400

RT 634
Pressure control demonstration unit

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

Order No.: 080.63400

RT 644
Temperature control demonstration unit

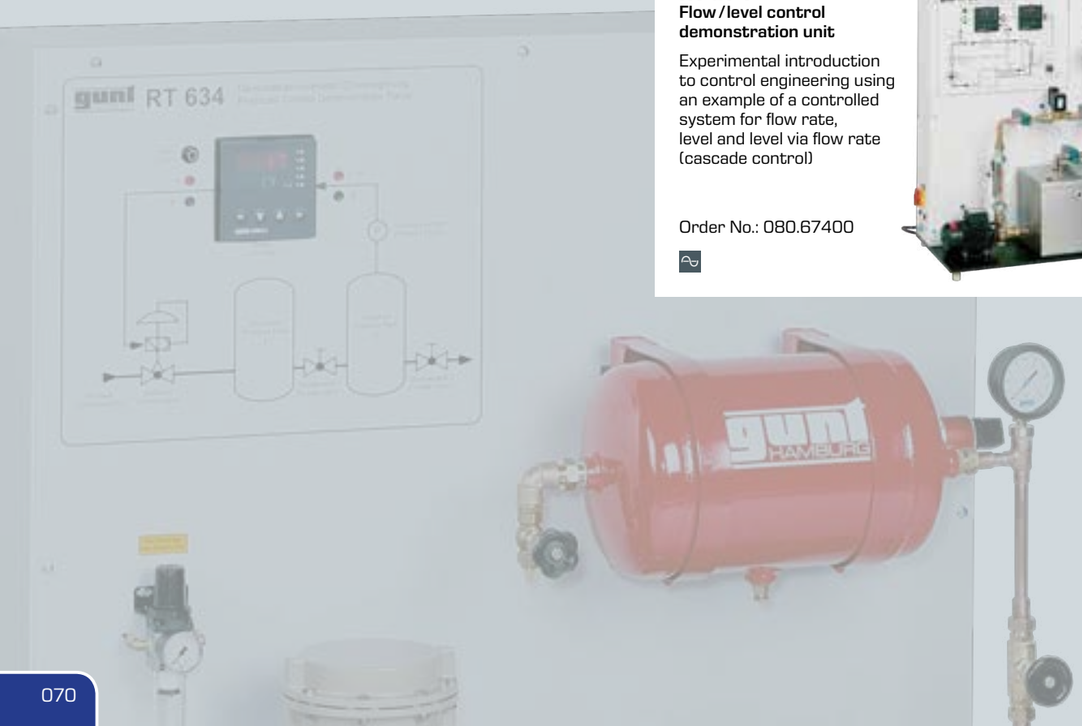
Experimental introduction to control engineering using an example of temperature controlled system

Order No.: 080.64400

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)

Order No.: 080.67400



RT 512
Level control trainer

Basic course in control engineering with industrial components using level controlled system

Order No.: 080.51200

RT 532
Pressure control trainer

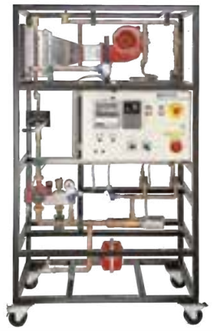
Basic course in control engineering with industrial components using first order and second order pressure controlled system

Order No.: 080.53200

RT 542
Temperature control trainer

Basic course in control engineering with industrial components using temperature controlled system with dead time

Order No.: 080.54200



RT 522
Flow control trainer

Basic course in control engineering with industrial components using flow controlled system

Order No.: 080.52200

RT 552
pH value control trainer

Basic course in control engineering with industrial components using pH controlled system with dead time

Order No.: 080.55200

Automation
Modular process automation training system

The image shows a fully assembled pressure control system after planning and execution of the piping and wiring.

RT 450
Process automation training system: base module

Basis for the modular setup of the different process automation experiments, including electrical power supply and water supply with tank and pump

Order No.: 080.45000

RT 450.01
Controlled system module: level

Together with further components this is the main element for the setup of a level control loop

Order No.: 080.45001

RT 450.02
Controlled system module: flow

Together with further components this is the main element for the setup of a flow control loop

Order No.: 080.45002

RT 450.03
Controlled system module: pressure

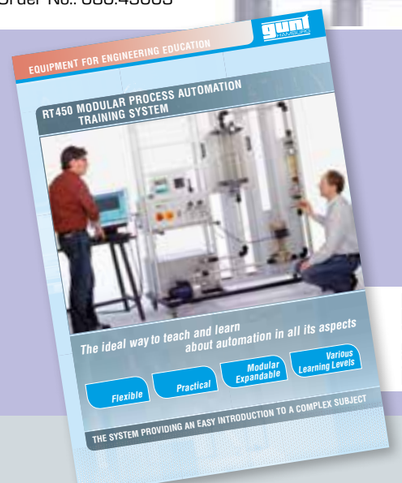
Together with further components this is the main element for the setup of a pressure control loop

Order No.: 080.45003

RT 450.04
Controlled system module: temperature

Together with further components this is the main element for the setup of a temperature control loop

Order No.: 080.45004



Automation
CNC and robotics

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

Order No.: 058.52000

Automation
Fuzzy control

RT 121
Fuzzy control: ball-on-beam

Linear, one-dimensional single-variable system with one input and one output

Order No.: 080.12100

RT 122
Fuzzy control: inverted pendulum

Non-linear, one-dimensional single-variable system with two actuators

Order No.: 080.12200

RT 123
Fuzzy control: ball-on-plate

Linear, two-dimensional multivariable system with two actuators

Order No.: 080.12300

RT 124
Fuzzy control: carrier vehicle with inverted pendulum

Non-linear, single-dimensional multivariable system with strong coupling

Order No.: 080.12400

Thermal engineering and HVAC

3

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This is where you can find extensive information, product descriptions and data sheets:

Offine
Print catalogue programme area 3
"Thermal engineering & HVAC"
Print catalogue 3b
"Refrigeration and air conditioning technology"

Online
at www.gunt.de

Software for data acquisition/visualisation

Fundamentals of thermodynamics
Primary quantities of thermodynamics

WL 201
Fundamentals of humidity measurement

Comparison of four measuring methods of humidity in a climatic chamber with adjustable humidity

Order No.: 060.20100

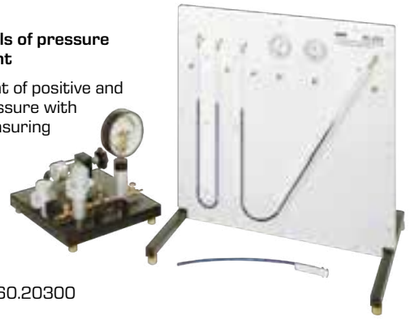
WL 202
Fundamentals of temperature measurement

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

Order No.: 060.20200

WL 203
Fundamentals of pressure measurement

Measurement of positive and negative pressure with different measuring devices



Order No.: 060.20300

WL 920
Advanced temperature measurement trainer

Comparison of steady and non-steady state temperature measurement using seven typical measuring devices

Order No.: 060.92000

WL 102
Change of state of gases

Experimental investigation of gas laws and changes of state

Order No.: 060.10200

Fundamentals of thermodynamics
Evaporation and condensation

WL 210
Evaporation process

Observation of typical forms of evaporation in a water pipe environment

Order No.: 060.21000

WL 204
Vapour pressure of water – Marcet boiler

Pressure and temperature measurement in a steam boiler

Order No.: 060.20400

WL 220
Boiling process

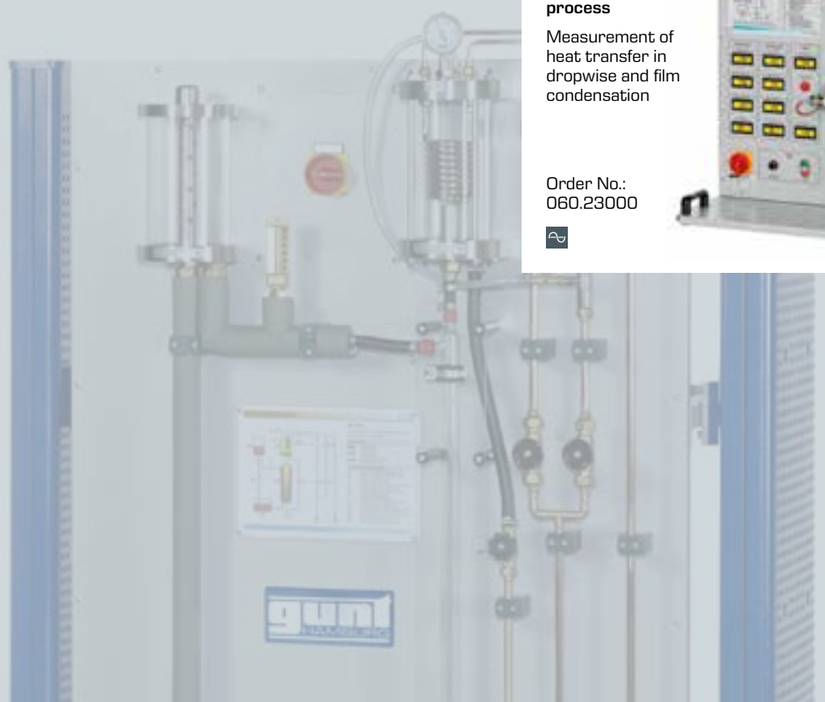
Demonstration of evaporation in a steam boiler

Order No.: 060.22000

WL 230
Condensation process

Measurement of heat transfer in dropwise and film condensation

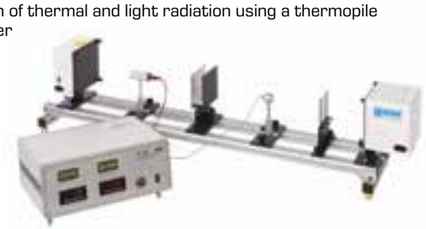
Order No.: 060.23000



Fundamentals of thermodynamics
Principles of heat transfer

WL 362
Thermal and light radiation

Investigation of thermal and light radiation using a thermopile and lux meter



Order No.:
060.36200

WL 460
Heat transfer by radiation

Effect of different surfaces on heat transfer

Order No.:
060.46000

WL 377
Convection and radiation

Heat transfer by convection and radiation in gases

Order No.: 060.37700

WL 440
Free and forced convection

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

Order No.:
060.44000

WL 430
Heat conduction and convection

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

Order No.:
060.43000

WL 372
Radial and linear heat conduction

Study of heat conduction in solids

Order No.:
060.37200

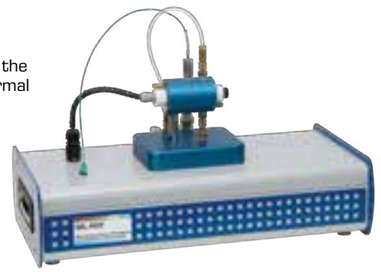
WL 420
Heat conduction in metals

Investigation of the thermal conductivity of different metals

Order No.:
060.42000

WL 422
Heat conduction in fluids

Determination of the coefficient of thermal conductivity for gaseous and liquid fluids



Order No.:
060.42200

WL 900
Heat conduction trainer

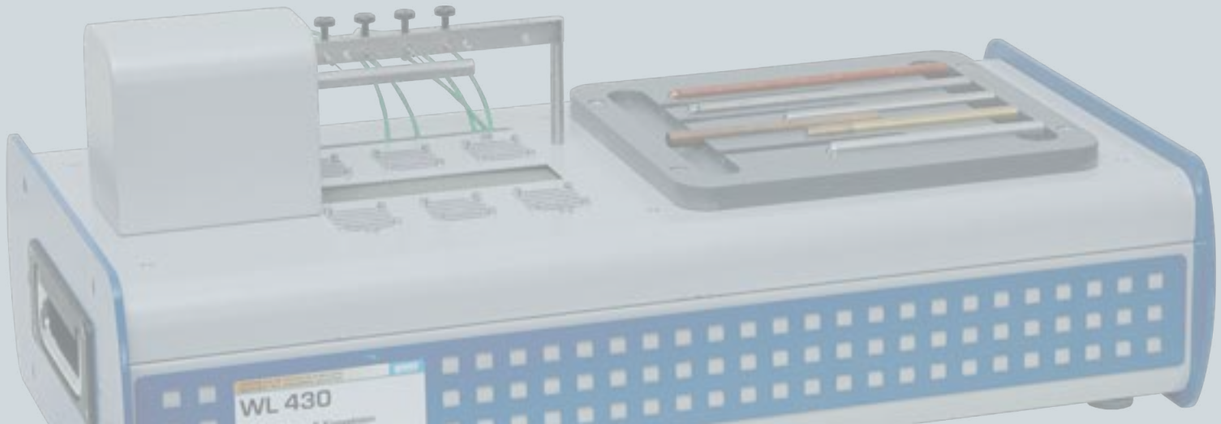
Determination of the steady and non-steady state conductivities in metallic specimens

Order No.:
060.90000

WL 376
Thermal conductivity of building materials

Investigation of the insulation properties of typical materials from the building materials sector

Order No.:
060.37600



Applied thermodynamics
Water-to-water heat exchangers

WL 302
Trainer tubular heat exchanger

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

Order No.: 060.30200

WL 110
Heat exchanger supply unit

Measuring the transfer characteristics of four different heat exchanger models

Order No.: 060.11000

WL 110.01
Tubular heat exchanger

Demonstration of the function and behaviour of a tubular heat exchanger in parallel flow and counterflow operation

Order No.: 060.11001

WL 110.02
Plate heat exchanger

Demonstration of the function and behaviour of a plate heat exchanger in parallel flow and counterflow operation

Order No.: 060.11002

WL 110.03
Shell & tube heat exchanger

Demonstration of the function and behaviour of a shell and tube heat exchanger in cross parallel flow and cross counterflow operation

Order No.: 060.11003

WL 110.04
Jacketed vessel with stirrer & coil

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

Order No.: 060.11004

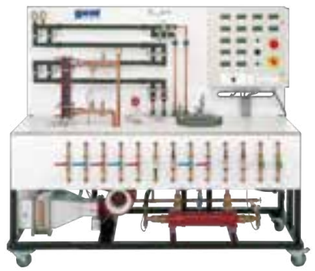
WL 308
Heat transfer in a tubular heat exchanger

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

Order No.: 060.30800

WL 315C
Trainer for various heat exchangers

Comparison of plate heat exchanger, tubular heat exchanger, shell and tube heat exchanger, finned cross-flow heat exchanger, and jacketed vessel with stirrer



Order No.: 060.315C0

Applied thermodynamics
Air heat exchangers

WL 312
Multipurpose air duct and heat transfer unit

Air duct for the investigation of convective heat transfer in air flows using a variety of heat exchangers

Order No.: 060.31200

WL 314
Heat transfer bench

Investigation of free and forced convective heat transfer in air

Order No.: 060.31400

WL 314.01
Parallel flow module

Investigation of heat transfer in the outer pipe of a tubular heat exchanger

Order No.: 060.31401

WL 314.02
Mixed flow module

Investigation of the heat transfer in a shell and tube heat exchanger in cross-flow operation

Order No.: 060.31402

WL 314.03
Tubular forced convection heat exchanger

Investigation of the heat transfer in the inner pipe of a tubular heat exchanger

Order No.: 060.31403

Applied thermodynamics
Fluidisation and heat transfer

WL 225
Heat transfer in the fluidised bed

Investigation of fluidised beds with varying particle sizes and heat transfer in the fluidised bed

Order No.:
060.22500

Applied thermodynamics
Water-to-air heat exchangers

ET 300
Water-to-air heat exchanger trainer

Air cooling finned tube cooler for hot water

Order No.: 061.30000

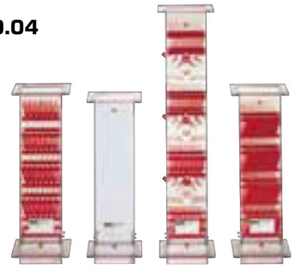
WL 320
Wet cooling tower

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

Order No.: 060.32000

WL 320.01 - WL 320.04
Cooling columns

Cooling columns with different wetting areas



Order No.:
060.32001 - 060.32004

Renewable energies
Photovoltaics

ET 250
Solar module measurements

Determining the characteristic parameters of a photovoltaic system

Order No.: 061.25000

ET 250.02
Stand-alone operation of photovoltaic modules

Expansion module for ET 250 with components for independent use of electricity from solar panels

Order No.:
061.25002

ET 250.01
Photovoltaic in grid-connected operation

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

Order No.: 061.25001

ET 252
Solar cell measurements

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

Order No.: 061.25200

ET 255
Using photovoltaics: grid-connected or stand-alone

Electrical components of a real life photovoltaic system

Order No.: 061.25500

Renewable energies
Solar thermal energy

ET 202
Principles of solar thermal energy

Determining characteristic parameters of a solar thermal system using an artificial radiation source

Order No.: 061.20200

HL 320.03
Flat plate collector

Pivotable flat plate collector for converting solar energy into heat

Order No.: 065.32003

HL 320.04
Evacuated tube collector

Conversion of solar energy into heat in the evacuated tube collector

Order No.: 065.32004

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

Order No.: 065.31300

HL 320.05
Central storage module with controller

Module with buffer storage and bivalent storage for heating systems with renewable energies

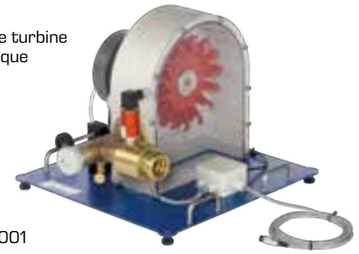
Order No.: 065.32005

Renewable energies
Hydropower

HM 450.01
Pelton turbine

Model of an impulse turbine with speed and torque measurement

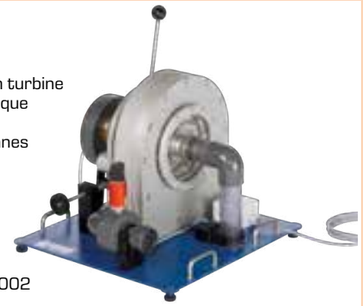
Order No.: 070.45001



HM 450.02
Francis turbine

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

Order No.: 070.45002



HM 450C
Characteristic variables of hydraulic turbomachines

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

Order No.: 070.450C0

ET 270
Wave energy converter

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

Order No.: 061.27000

Renewable energies
Shallow geothermal energy

ET 405
Heat pump for cooling and heating operation

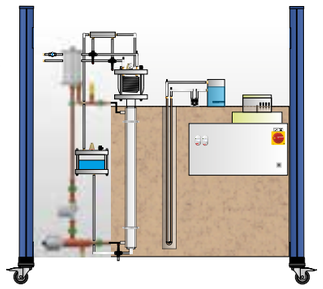
Heat pump with various heat exchangers for air and water

Order No.: 061.40500

ET 262
Geothermal probe with heat pipe principle

Transparent components offer insight into the changes of state of the working medium

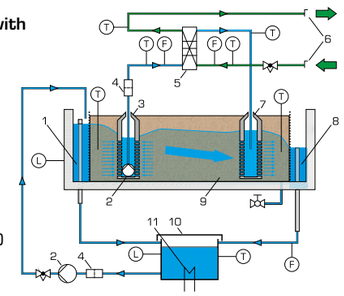
Order No.: 061.26200



ET 264
Geothermal energy with two-well system

Open circuit for use of geothermal energy

Order No.: 061.26400



HL 320.01
Heat pump

Heat pump for operation with different sources

Order No.: 065.32001

HL 320.07
Underfloor heating / geothermal energy absorber

Can be used as heat sink or heat source

Order No.: 065.32007

HL 320.08
Fan heater / air heat exchanger

Can be used as heat sink or heat source

Order No.: 065.32008

Renewable energies
Energy efficiency in building services engineering

HL 320.01
Heat pump

Heat pump for operation with different sources

Order No.: 065.32001

HL 320.02
Conventional heating

Electric auxiliary heater for the module system HL 320

Order No.: 065.32002

HL 320.03
Flat plate collector

Pivotable flat plate collector for converting solar energy into heat

Order No.: 065.32003

HL 320.04
Evacuated tube collector

Conversion of solar energy into heat in the evacuated tube collector

Order No.: 065.32004

HL 320.05
Central storage module with controller

Module with buffer storage and bivalent storage for heating systems with renewable energies

Order No.: 065.32005

HL 320.07
Underfloor heating / geothermal energy absorber

Can be used as heat sink or heat source

Order No.: 065.32007

HL 320.08
Fan heater / air heat exchanger

Can be used as heat sink or heat source

Order No.: 065.32008

Renewable energies
Wind power

ET 220
Energy conversion in a wind power plant

Conversion of kinetic wind energy into electrical energy

Order No.: 061.22000

ET 220.10
Control unit for wind power plant ET 220.01

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

Order No.: 061.22010

ET 220.01
Wind power plant

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

Order No.: 061.22001

Renewable energies
Fuel cell

ET 292
Fuel cell system

Water-cooled polymer-membrane fuel cell combined heat and power

Order No.: 061.29200

Driving and driven machines
Compressors

ET 500
Two-stage piston compressor

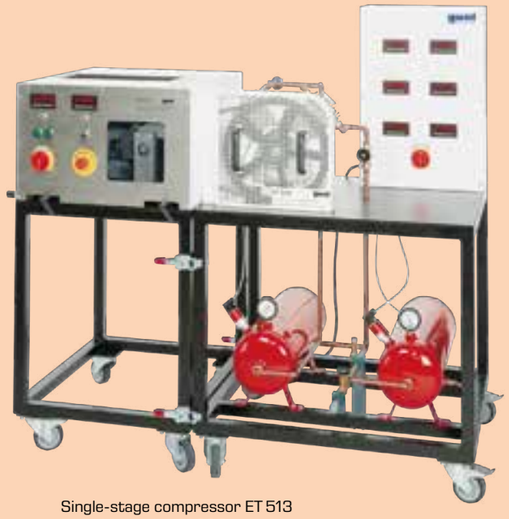
Determining the characteristic values of an industrial two-stage compressor

Order No.: 061.50000

ET 508
Simulation of a two-stage air compressor

Simulation allows easy familiarisation with a compression process with intercooling

Order No.: 061.50800



Single-stage compressor ET 513 with drive unit HM 365

ET 513
Single-stage piston compressor

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

Order No.: 061.51300

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

ET 512
Air compressor test unit

Functional test of a small industrial compressor

Order No.: 061.51200

Driving and driven machines
Steam power plants

ET 860
Safety devices on steam boilers

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

Order No.: 061.86000

ET 810
Steam power plant with steam engine

Double-acting single-cylinder steam engine with gas-fired steam boiler

Order No.: 061.81000

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

Order No.: 061.81300

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

ET 850
Steam generator

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

Order No.: 061.85000

ET 851
Axial steam turbine

Single-stage steam turbine with power output measurement; steam supply from ET 850

Order No.: 061.85100

ET 830
Steam power plant 1,5 kW

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

Order No.: 061.83000

ET 830.01/02, ET 833.01/02
Cooling towers

Wet cooling tower for steam power plant ET 830 / ET 833 for re-cooling the cooling water (115 kW or 140 kW)

Order No.:
061.83001/02,
061.83301/02

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

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

Order No.: 061.83300

ET 805
Steam power plant 20 kW 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 treatment and modern synchronisation device (PPU)

Order No.: 061.80500

Driving and driven machines
Gas turbines

ET 795
Simulation of a gas turbine

Simulation of a two-shaft system with power turbine allows easy understanding of the operating properties

Order No.: 061.79500

ET 794
Gas turbine with power turbine

Two-shaft system with radial compressor and two radial turbines using liquid gas

Order No.: 061.79400

ET 792
Gas turbine

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

Order No.: 061.79200

ET 796
Gas turbine jet engine

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

Order No.: 061.79600

Internal combustion engines
Engine test stand CT 159

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, 2,2 kW

Test stand for the mounting and investigation of the characteristics of prepared single cylinder engines

Order No.:
063.15900

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.:
070.36500

CT 150
Four-stroke petrol engine for CT 159

Air-cooled overhead valve four-stroke petrol engine

Order No.:
063.15000

CT 151
Four-stroke diesel engine for CT 159

Air-cooled four-stroke diesel engine with direct injection

Order No.:
063.15100

CT 152
Four-stroke petrol engine with variable compression for CT 159

Air-cooled four-stroke petrol engine with different compression ratios thanks to interchangeable combustion chambers

Order No.:
063.15200

CT 153
Two-stroke petrol engine for CT 159

Air-cooled two-stroke petrol engine

Order No.:
063.15300

Internal combustion engines
Engine test stand CT 110

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

Test stand for the mounting and investigation of the characteristics of prepared two-stroke and four-stroke engines

Order No.: 063.11000

CT 100.20
Four-stroke petrol engine for CT 110

Air-cooled four-stroke petrol engine with carburettor

Order No.:063.10020

CT 100.21
Two-stroke petrol engine for CT 110

Air-cooled two-stroke petrol engine with reverse scavenging

Order No.: 063.10021

CT 100.22
Four-stroke diesel engine for CT 110

Air-cooled four-stroke diesel engine with direct injection

Order No.: 063.10022

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

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

Order No.: 063.10023

Internal combustion engines
Engine test stand CT 300

CT 300
Engine test stand, 11 kW

Test stand for the mounting and investigation of the characteristics of prepared single cylinder engines with variable compression and two-cylinder industrial engines

Order No.: 063.30000

CT 300.03
Single cylinder engine with variable compression for CT 300

Operation as spark ignition petrol engine with external mixture formation or self-igniting diesel engine with direct injection

Order No.: 063.30003

CT 300.04
Two-cylinder petrol engine for CT 300

Air-cooled two-cylinder four-stroke petrol engine with external carburation

Order No.: 063.30004

CT 300.05
Two-cylinder diesel engine for CT 300

Water-cooled four-stroke diesel engine with indirect injection

Order No.: 063.30005

Internal combustion engines
Engine test stand CT 400

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

Test stand with air-cooled eddy-current brake for the mounting and investigation of the characteristics of prepared four-cylinder engines

Order No.: 063.40000

CT 400.01
Four-cylinder petrol engine

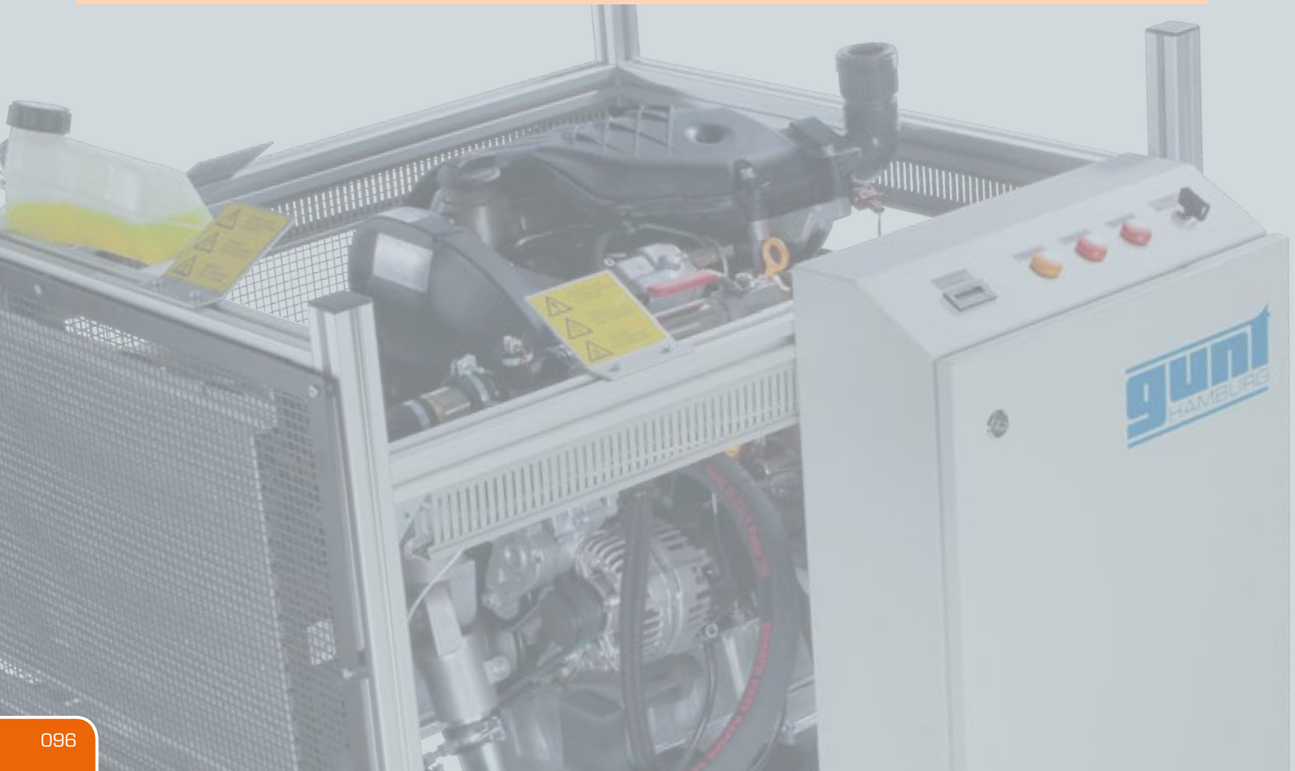
Water-cooled petrol engine with intake-manifold fuel injection, max. 55 kW

Order No.: 063.40001

CT 400.02
Four-cylinder diesel engine

Water-cooled naturally aspirated diesel engine with direct injection, max. 47 kW

Order No.: 063.40002



Refrigeration and air conditioning technology
Refrigeration – principles of cold production

ET 101
Simple compression refrigeration circuit

Cooling and heating of the heat exchangers directly tangible

Order No.: 061.10100

ET 400
Refrigeration circuit with variable load

Compression refrigeration system with water-cooled evaporator

Order No.: 061.40000

ET 411C
Compression refrigeration system

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

Order No.: 061.411C0

ET 352
Vapour jet compressor in refrigeration engineering

Investigation of cold production using thermal energy. Transparent condenser and evaporator allow the view into the inner workings.

Order No.: 061.35200

ET 120
Cooling using the Peltier effect

Demonstration of the thermo-electric effect

Order No.: 061.12000

ET 122
Vortex cooling device

Demonstration of cooling and heating with the aid of compressed air

Order No.: 061.12200

ET 480
Absorption refrigeration system

Investigation of a thermally driven refrigeration system without compressor that can be heated with either gas or electrically

Order No.: 061.48000

Refrigeration and air conditioning technology
Refrigeration – thermodynamics of the refrigeration cycle

ET 350
Changes of state in the refrigeration circuit

Energetic evaluations of the refrigeration cycle. Transparent components allow view inside.

Order No.: 061.35000

ET 412C
Refrigeration system with refrigeration and freezing chamber

Investigation and fault finding of a refrigeration system

Order No.: 061.412C0

ET 441
Refrigeration chamber and defrosting methods

Climatic investigations in cooling and freezing chambers

Order No.: 061.44100

ET 351C
Thermodynamics of the refrigeration circuit

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

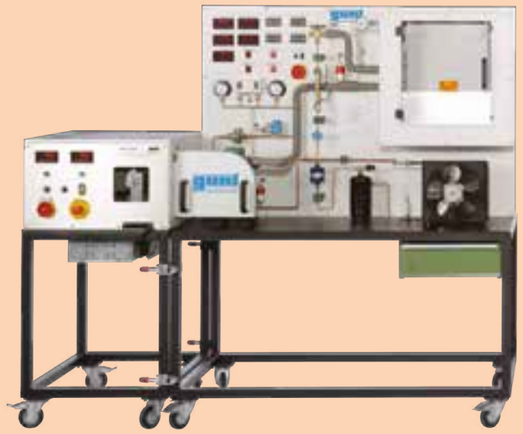
Order No.: 061.351C0

ET 430
Refrigeration system with two-stage compression

Low temperature refrigeration system; compression with injection intercooler

Order No.: 061.43000

Refrigeration and air conditioning technology
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

Order No.: 061.16500

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

ET 432
Behaviour of a piston compressor

Investigations in an open two-cylinder piston compressor from refrigeration engineering

Order No.: 061.43200

ET 428
Energy efficiency in refrigeration systems

Investigation of a refrigeration system in multi-compressor operation

Order No.: 061.42800

Refrigeration and air conditioning technology
Components of refrigeration: heat exchangers

ET 431
Heat exchangers in the refrigeration circuit

Investigation of properties of different heat exchangers and their use in refrigeration

Order No.:
061.43100

Refrigeration and air conditioning technology
Components of refrigeration: primary and secondary controllers

ET 426
Capacity control in refrigeration systems

Comparison of different methods of capacity control

Order No.: 061.42600

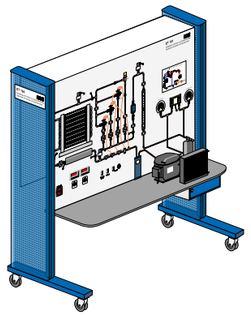
ET 180
Pressure switches in refrigeration

Demonstration and operation of pressure switches used in refrigeration

Order No.: 061.18000

ET 181
Adjustment and operation of expansion valves

Comparison of different expansion valves: recording the control response



Order No.: 061.18100

ET 182
Secondary controllers in refrigeration systems

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

Order No.: 061.18200

Refrigeration and air conditioning technology
Components of refrigeration: piping

ET 460
Oil return in refrigeration systems

Investigation of transport of lubricants soluble in refrigerant

Order No.:
061.46000

Refrigeration and air conditioning technology
Refrigeration – assembly, fault finding, maintenance

MT 210
Assembly & maintenance exercise: refrigeration

Study project with high practical relevance for training in metal and electrical professions: setup of a refrigeration system from individual components

Order No.: 051.21000

ET 192
Replacement of refrigeration components

Service and repair exercises: replacement of compressor, pressure switch, filter/drier, solenoid valve and expansion valve

Order No.: 061.19200

ET 422
Capacity control and faults in refrigeration systems

Investigation of different methods of capacity control

Order No.: 061.42200

Refrigeration and air conditioning technology
Components of refrigeration: equipment studies and cutaway models

ET 499.30
Cutaway model: ceiling air cooler

Order No.: 061.49930

ET 499.01
Cutaway model: hermetic refrigerant compressor

Order No.: 061.49901

ET 499.02
Cutaway model: semi-hermetic refrigerant compressor

Order No.: 061.49902

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

Order No.: 061.49903

ET 499.12
Cutaway model: block drier

Order No.: 061.49912

ET 499.13
Cutaway model: oil separator

Order No.: 061.49913

ET 499.14
Cutaway model: liquid separator

Order No.: 061.49914

ET 499.16
Cutaway model: ball valve

Order No.: 061.49916

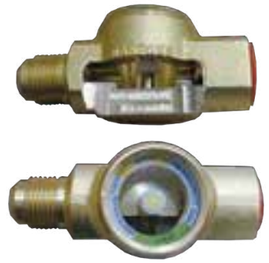
ET 499.18
Cutaway model: thermostatic expansion valve

Order No.: 061.49918

ET 499.19
Cutaway model: automatic expansion valve

Order No.: 061.49919

ET 499.21
Cutaway model: sight glass with humidity indicator



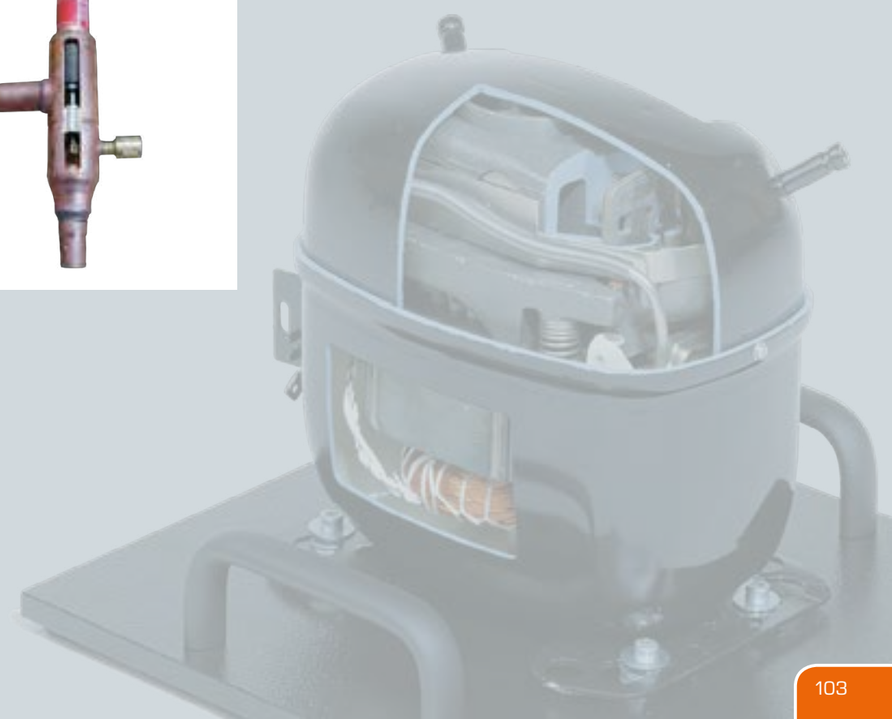
Order No.: 061.49921

ET 499.25
Cutaway model: 4/2-way reversing valve

Order No.: 061.49925

ET 499.26
Cutaway model: condensation pressure control valve

Order No.: 061.49926

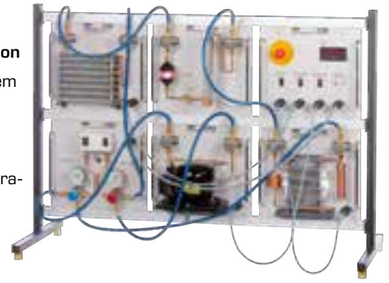


Refrigeration and air conditioning technology
Refrigeration – modular training systems

ET 900
Introduction to refrigeration

Training system with interchangeable modules for setting up simple refrigeration circuits

Order No.: 061.90000



ET 910
Refrigeration training system, base unit

Setup of various refrigeration circuits using modular component kits

Order No.: 061.91000

ET 910.10
Refrigeration components for basic experiments

Accessories to set up simple refrigeration circuits

Order No.: 061.91010

ET 910.11
Refrigeration components for advanced experiments

Accessories to set up complex refrigeration circuits

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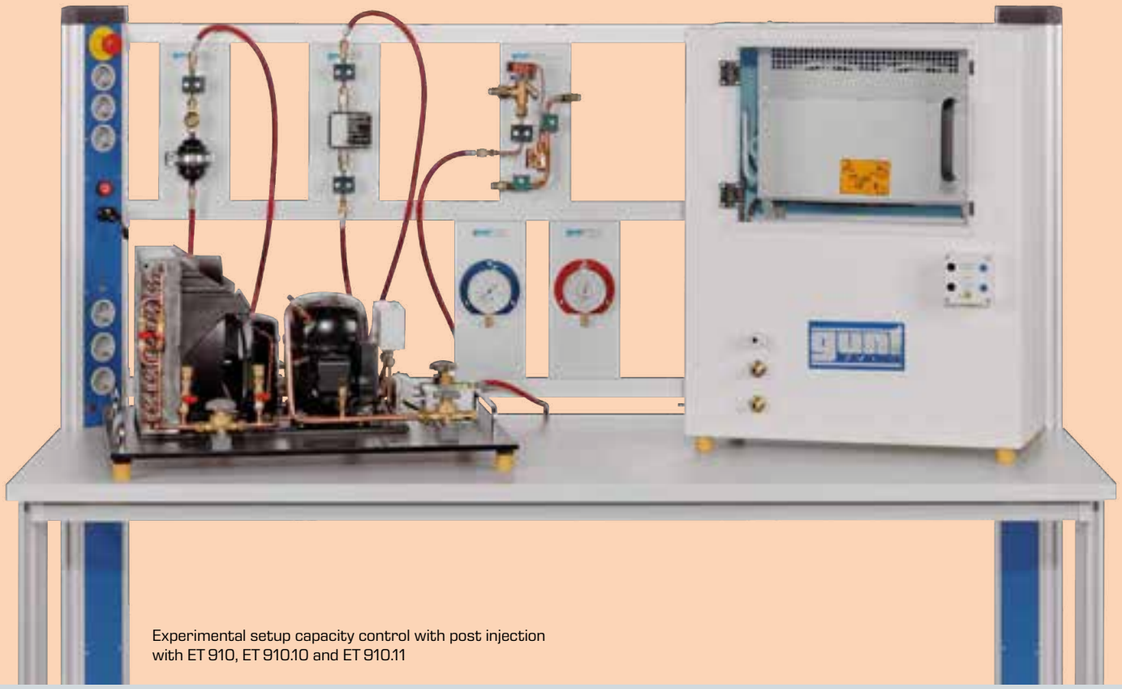

Experimental setup capacity control with post injection with ET 910, ET 910.10 and ET 910.11

ET 915.01
Refrigerator model

Simple model of a domestic refrigerator for connection to the ET 915

Order No.: 061.91501

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

Modern learning environment through hardware/software integration (HSI)

Order No.: 061.91500

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

Series and parallel connection of evaporators; connection to ET 915

Order No.: 061.91502

HSI training system refrigeration with ET 915 and ET 915.02

Refrigeration and air conditioning technology
Refrigeration – heat pumps and ice store

ET 102
Heat pump trainer

Utilisation of ambient heat for water heating

Order No.:
061.10200

ET 405
Heat pump for cooling and heating operation

Heat pump with various heat exchangers for air and water

Order No.:
061.40500

ET 420
Ice stores in refrigeration

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

Order No.: 061.42000

Refrigeration and air conditioning technology
Air conditioning – states of the air

WL 201
Fundamentals of humidity measurement

Comparison of four measuring methods of humidity in a climatic chamber with adjustable humidity

Order No.:
060.20100

WL 320
Wet cooling tower

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

Order No.:
060.32000

Refrigeration and air conditioning technology
Principles of air conditioning technology

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

Modern learning environment through hardware/software integration (HSI)

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ET 915.06
Model of a simple air conditioning system

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

Order No.:
061.91506

ET 915.07
Air conditioning model

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

Order No.:
061.91507

ET 605
Air conditioning system model

Climatic chamber with latent and sensitive heat source as cooling load. Recirculating and outer air operation possible.

Order No.: 061.60500

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

Refrigeration and air conditioning technology
Practical air conditioning systems

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Air conditioning system with chamber

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

Order No.: 061.61100

ET 600
Conditioning of room air

Air conditioning system consisting of industrial components including direct evaporator and vapour humidifier

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ET 630
Split system air conditioner

Modern air conditioning unit with heat pump function: cooling or heating

Order No.: 061.63000

ET 450
Vehicle air conditioning

Investigation of a typical vehicle air conditioning system using components typical in automotive engineering

Order No.: 061.45000

ET 620
Air conditioning and ventilation system

Manual or automatic operation through PLC climate controller

Order No.: 061.62000

Refrigeration and air conditioning technology
Air conditioning – ventilation technology

HM 280
Experiments with a radial fan

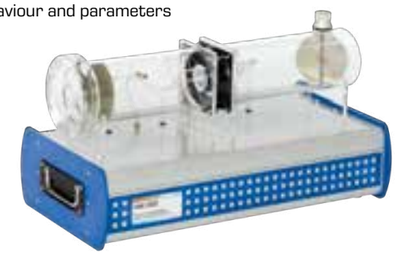
Operating behaviour and characteristic variables of a radial fan; two interchangeable rotors

Order No.: 070.28000

HM 282
Experiments with an axial fan

Operating behaviour and parameters of an axial fan

Order No.: 070.28200



HM 210
Characteristic variables of a radial fan

Determining the flow rate through iris diaphragm or venturi nozzle

Order No.: 070.21000

HL 720
Ventilation system

Components and functions of a ventilation system; measuring the pressure curve within the ventilation system

Order No.: 065.72000

HL 710
Air duct systems

Planning and setup of simple and complex air duct systems

Order No.: 065.71000

Refrigeration and air conditioning technology
Electrical engineering – refrigeration controls

ET 144
Electrical installation in refrigeration systems

Setup and wiring of typical electrical circuits for refrigeration circuits

Order No.:
061.14400

ET 171
Electrical connection of refrigerant compressors

Use of a real refrigerant compressor

Order No.: 061.17100

Refrigeration and air conditioning technology
Electrical engineering – control of refrigeration systems

ET 340
Building automation in heating and air conditioning systems

Operation and programming of a DDC (Direct Digital Control) for heating and air conditioning systems

Order No.: 061.34000

ET 930
Evaporator control with electronic expansion valve

Practical programming of a modern refrigeration controller

Order No.: 061.93000

Refrigeration and air conditioning technology
Electrical engineering – fault finding

ET 172
Electrical faults in refrigerant compressors

Investigation of important electrical components from refrigeration

Order No.: 061.17200

ET 170
Electrical faults in simple air conditioning systems

Design and operation of electrical components in a simulated air conditioning system

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ET 174
Electrical faults in full air conditioning systems

Design and operation of electrical components in a complex simulated air conditioning system

Order No.: 061.17400

Heating and ventilation in buildings
Fundamental experiments on heating – training panels

HL 101
Thermal expansion training panel

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

Order No.:
065.10100

HL 104
Temperature measurement training panel

Investigation of four different temperature measuring techniques

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HL 102
Installation technology: losses in different pipes

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

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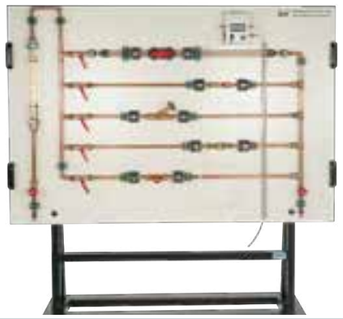
065.10200

HL 113
Installation technology: losses in valves and fittings

Investigation of the pressure loss of standard valves and fittings



Order No.:
065.11300

HL 103
Installation technology: losses in pipe bends

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

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065.10300

HL 111
Installation technology: losses in straight pipes

Determining the pressure loss in an open pipe section

Order No.:
065.11100

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

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HL 105
Three-way mixing valve training panel

Effect of the mixing ratio on flow temperature and circulation temperature

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HL 106
Four-way mixing valve training panel

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Circulating pumps training panel

Series and parallel operation of two pumps

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HL 110
Expansion vessel training panel

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

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065.11000

HL 109
Safety devices training panel

Function of safety valves against excess pressure and excess temperature

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065.10900

HL 112
Radiator training panel

Radiators in a heating system

Order No.:
065.11200

HL 108
Domestic heating circuit training panel

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

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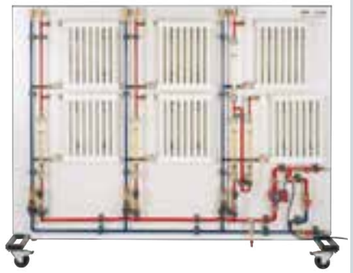
HL 305
Hydronic balancing of radiators

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



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Heating and ventilation in buildings
Heating systems in buildings

HL 620
Domestic heating system control training panel

Operation of a modern heating controller

Order No.: 065.62000

HL 630
Efficiency in heating technology

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

Order No.: 065.63000

ET 202
Principles of solar thermal energy

Determining characteristic parameters of a solar thermal system using an artificial radiation source

Order No.: 061.20200

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

Order No.: 065.31300

HL 350
Oil burner demonstrator

Boiler with viewing windows to observe the flame

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HL 351
Domestic heating boiler

Investigation and function of an oil burner in a domestic heating circuit

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HL 352
Domestic water heating system

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HL 360
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Trainer on heating oil storage in tanks

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HL 353
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Together with the HL 353.01 and HL 353.02 trainers, setup of a complete demonstration system for building heating systems

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HL 353.02
Heat distribution and control in heating systems

Two independent heating circuits: single subcircuit system, dual subcircuit system

Order No.: 065.35302

HL 353.01
Comparison of different heating types

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

Order No.: 065.35301

HL 300
Central heating system

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

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HL 392C
Safety & control in heating systems

Function and operating behaviour of safety valve, safety pressure limiter, temperature controller, flow monitor and much more

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Heating systems in buildings

HL 510
Domestic gas supply training panel

Leak testing on gas supply systems

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HL 500
Instantaneous gas heater

Fault finding and adjustment of gas-fired heaters

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Demo unit, gas burner

Electronic simulation of the operation of a forced air gas burner

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HL 358
Forced air gas burner training panel

Fault finding and adjustment of forced air gas burners using safe simulation with compressed air

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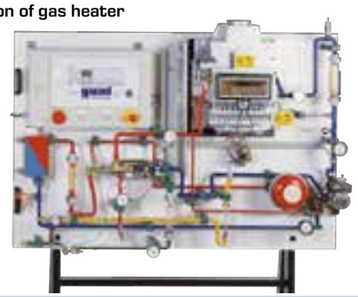
HL 530
Training panel function of gas heater

Function of a typical combi-boiler; separate circuits for heating rooms and domestic water heating

Order No.: 065.53000



Heating and ventilation in buildings
Ventilation systems

HL 710
Air duct systems

Planning and setup of simple and complex air duct systems

Order No.: 065.71000

HL 720
Ventilation system

Components and functions of a ventilation system; measuring the pressure curve within the ventilation system

Order No.: 065.72000

HL 722
Control unit for ventilation system

Temperature control unit for ventilation system HL 720

Order No.: 065.72200

Sanitary systems

ST 210
Sanitation fittings training panel

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

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ST 250
Cavitation

Investigation of cavitation process in a venturi nozzle

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ST 310
Drinking water installation demonstrator

Drinking water installation in domestic setting with all common components

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ST 320
Pipe cleaning training panel

Pipe flushing according to DIN 1988 standards. Contaminants can be introduced.

Order No.: 066.32000

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

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Protection of drinking water training panel

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

Fluid mechanics

4

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Catalogues

This is where you can find extensive information, product descriptions and data sheets:

Offine
Print catalogue programme area 4
"Fluid mechanics"

Online
at www.gunt.de

Software for
data acquisition/visualisation

Fundamentals of fluid mechanics
Physics and properties of fluids

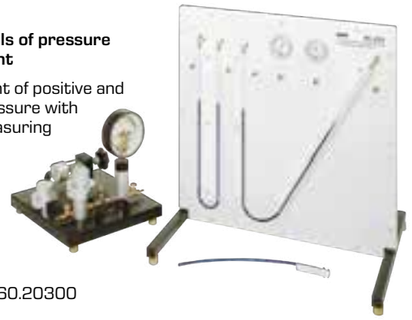
WL 202
Fundamentals of temperature measurement

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

Order No.: 060.20200

WL 203
Fundamentals of pressure measurement

Measurement of positive and negative pressure with different measuring devices



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HM 150.02
Calibration of pressure gauges

Pressure generation via weight-loaded piston

Order No.: 070.15002

WL 102
Change of state of gases

Experimental investigation of gas laws and changes of state

Order No.: 060.10200

WL 204
Vapour pressure of water – Marcet boiler

Pressure and temperature measurement in a steam boiler

Order No.: 060.20400

Fundamentals of fluid mechanics
Fundamentals of hydrostatics

HM 115
Hydrostatics trainer

A well equipped hydrostatics bench allowing numerous experiments on the topic of hydrostatics of liquid and gases

Order No.: 070.11500

HM 150.05
Hydrostatic pressure in liquids

Investigation of fluid pressure on vessel walls

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HM 150.06
Stability of floating bodies

Determining metacentre and buoyancy using a rectangular hull cross-section

Order No.: 070.15006

HM 150.39
Floating bodies for HM 150.06

Comparison of two different hull shapes: hard chine and round hull

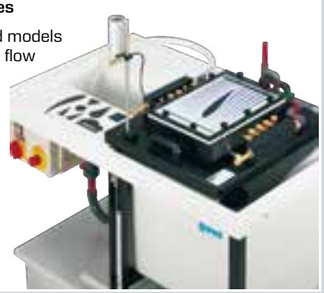
Order No.: 070.15039

Fundamentals of fluid mechanics
Flow around bodies

HM 150.10
Visualisation of streamlines

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

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



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HM 135
Determination of the settling velocity

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

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Fundamentals of fluid mechanics
Fundamentals of hydrodynamics

HM 150.18
Osborne reynolds experiment

Visualisation of laminar and turbulent flow

Recommended for water supply:
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Order No.: 070.15018

HM 150.07
Bernoulli's principle

Static pressure and total pressure distribution along the venturi nozzle

Recommended for water supply:
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HM 150.08
Measurement of jet forces

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

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TM 605
Coriolis force

Demonstration of the coriolis force in rotating reference systems

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HM 150.09
Horizontal flow from a tank

Recording the trajectory of the water jet at different outlet velocities

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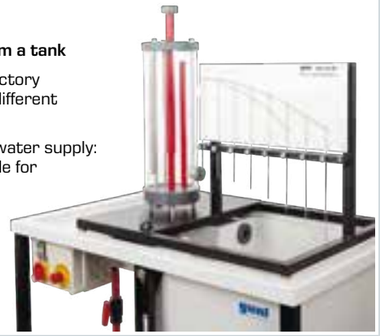

HM 150.12
Vertical flow from a tank

Determination of pressure losses and contraction coefficient for different outlet contours

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

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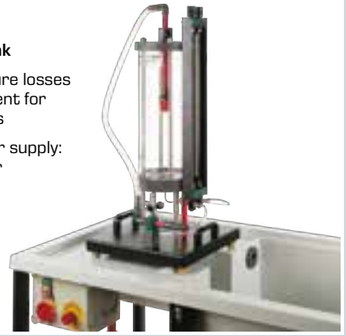

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Vortex formation

Free and forced vortex and recognition of surface profiles

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HM 150
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Volumetric flow measurement for large and small flow rates

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Fundamentals of fluid mechanics
Flow in pipes

HM 150.01
Pipe friction for laminar/turbulent flow

Determining the critical Reynolds number

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HM 150.29
Energy losses in piping elements

Pressure losses in various pipe fittings and in the ball valve

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

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HM 150.11
Losses in a pipe system

Influence of flow velocity on pressure loss

Recommended for water supply:
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Order No.: 070.15011

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

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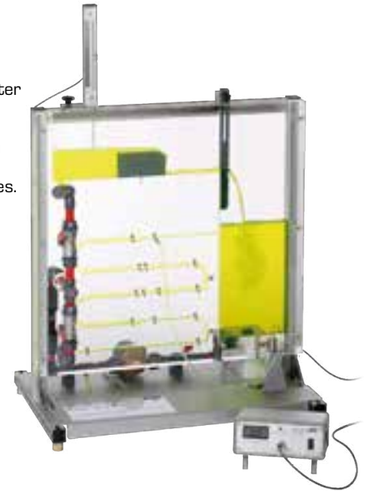
Fundamentals of fluid mechanics
Compact fluid mechanics: fluidtutor

HM 241
Fundamentals of water flow

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



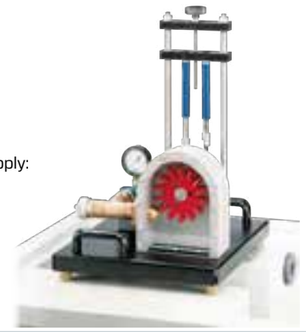
Order No.:
070.24100

Fundamentals of fluid mechanics
Turbomachines

HM 150.19
Operating principle of a Pelton turbine

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

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



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070.15019

HM 150.20
Operating principle of a Francis turbine

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

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HM 150.04
Centrifugal pump

Determining the characteristics of a typical centrifugal pump

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HM 150.16
Series and parallel configuration of pumps

Determining the characteristic curves and hydraulic power output and comparison of series and parallel operating modes

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Fundamentals of fluid mechanics
Open-channel flow

HM 150.03
Plate weirs for HM 150

Discharge measurement in open channels using two measuring weirs

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HM 150.21
Visualisation of streamlines in an open channel

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

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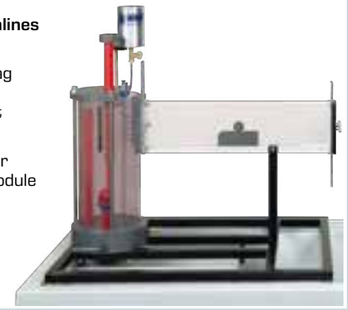

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070.15021

HM 164
Open channel and closed channel flow

Flow processes on different control structures in open and closed channel flows

Order No.:
070.16400

HM 160
Experimental flume 86 x 300 mm

Experimental section for performing flow experiments in open flumes with lengths of 2,5 m or 5 m available, closed water circuit and inclination adjustment

Order No.: 070.16000

Steady flow
Fundamentals of steady flow

HM 240
Principles of air flow

Determining the fan characteristic curve

Order No.: 070.24000

HM 240.03
Electronic total pressure sensor

Measurement of the velocity distribution in the intake tube on HM 240

Order No.: 070.24003

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

Order No.: 070.24004

HM 240.06
Heat transfer at a cylinder in transverse flow

Investigation of heat transfer from a heated rod to an air flow

Order No.: 070.24006

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

Order No.: 070.24005

HM 241
Fundamentals of water flow

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

Order No.: 070.24100

HM 220
Air flow experimental plant

Determining pressure loss and velocity profiles; different measuring objects

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HM 220.01
Venturi tube

Examination of the continuity equation and Bernoulli's principle; representation of the pressure curve

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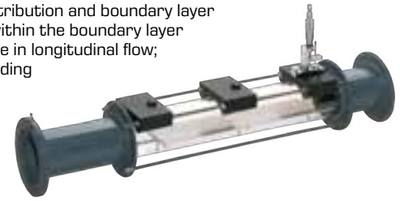
HM 220.02
Measurement of boundary layers

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



Order No.: 070.22002

HM 225
Aerodynamics trainer

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

Order No.: 070.22500

HM 225.03
Bernoulli's principle

Demonstration of the continuity equation and Bernoulli's equation

Order No.: 070.22503

HM 225.05
Flow in a pipe bend

Investigation of the flow through a pipe bend

Order No.: 070.22505

HM 225.07
Free jet

Investigation of flow from nozzles

Order No.: 070.22507

Steady flow
Steady flow of compressible fluids

HM 230
Flow of compressible fluids

Subsonic and transonic flow through different measuring objects

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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

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HM 260
Characteristics of nozzles

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

Order No.: 070.26000

HM 261
Nozzle pressure distribution

Measuring the pressure curves in a convergent nozzle and in Laval nozzles and to study the flow of compressible fluids

Order No.: 070.26100

Steady flow
Flow in pipe systems

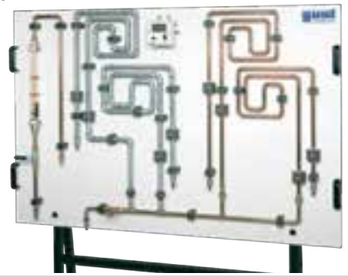
HL 102
Installation technology: losses in different pipes

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

Order No.: 065.10200

HL 103
Installation technology: losses in pipe bends

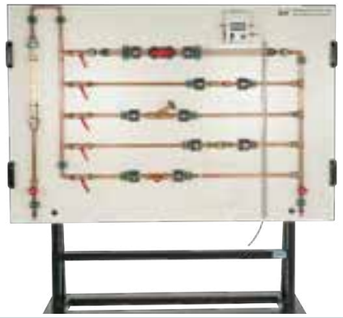
Investigation of the pressure loss at pipe elements with different changes in pipe direction and materials



Order No.: 065.10300

HL 113
Installation technology: losses in valves and fittings

Investigation of the pressure loss of standard valves and fittings



Order No.: 065.11300

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

Order No.: 065.21000

HL 111
Installation technology: losses in straight pipes

Determining the pressure loss in an open pipe section

Order No.: 065.11100

HM 120
Losses in pipe elements

Investigation of flow and pressure losses in different pipe sections

Order No.: 070.12000

HM 112
Fluid mechanics trainer

Interchangeable measuring objects and different pipe sections

Order No.: 070.11200

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

Order No.: 070.11100

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.

Order No.: 070.12400

HM 122
Pressure losses in pipes

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

Order No.: 070.12200

Steady flow
Flow in valves

RT 390
Test stand for control valves

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

Order No.:
080.39000

RT 396
Pump and valves and fittings test stand

Recording characteristic curves of industrial fittings and a centrifugal pump

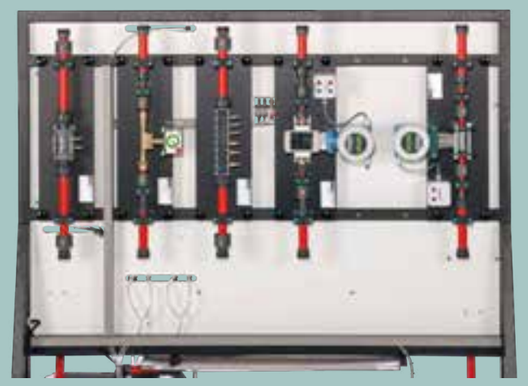
Order No.:
080.39600

Steady flow
Methods of flow rate measurement

HM 500
Flow meter trainer

Comparison and calibration of different flow meters

Order No.: 070.50000



Many flow meters are available as accessories.

Steady flow
Cavitation

HM 380
Cavitation in pumps

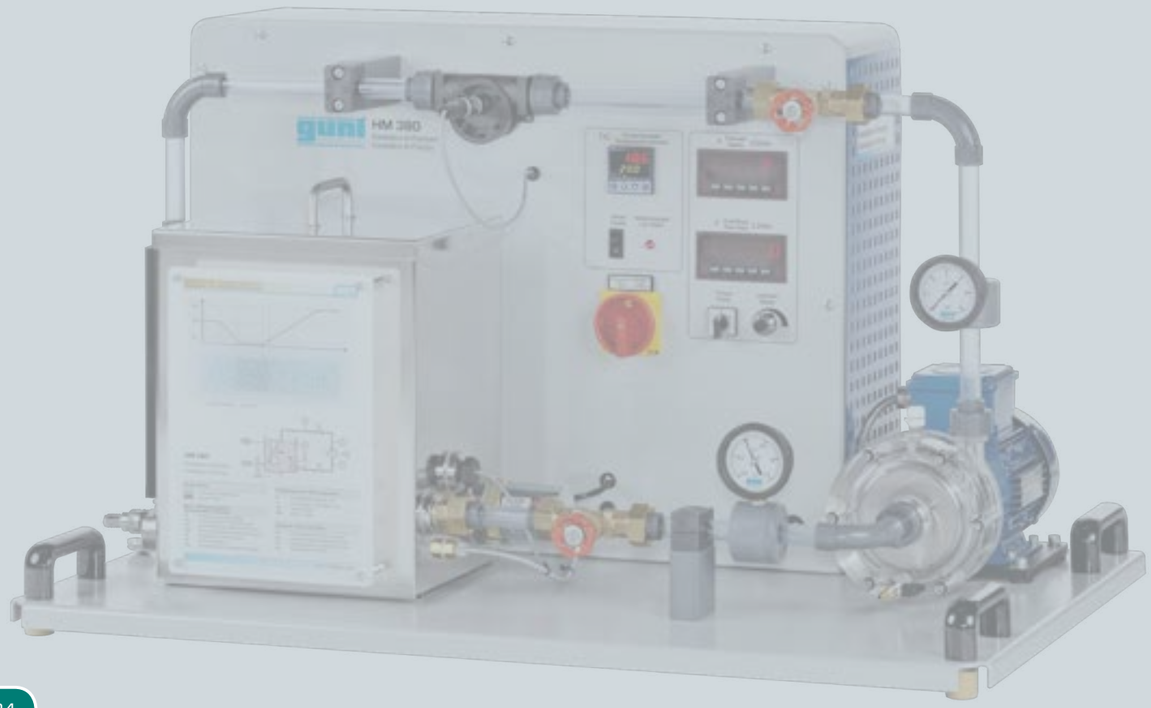
Visualisation of cavitation effects in a transparent pump; how speed, inlet pressure, flow rate and temperature affect cavitation

Order No.: 070.38000

ST 250
Cavitation

Investigation of cavitation process in a venturi nozzle

Order No.: 066.25000



Examples of transient flow

HM 156
Water hammer and surge chamber

Investigation and visualisation of water hammer in pipes and demonstration of how a surge chamber works

Order No.: 070.15600

HM 155
Water hammer in pipes

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

Order No.: 070.15500

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

Order No.: 070.15015

HM 143
Transient drainage processes in storage reservoirs

Demonstration of the function of a rainwater retention basin and a dam

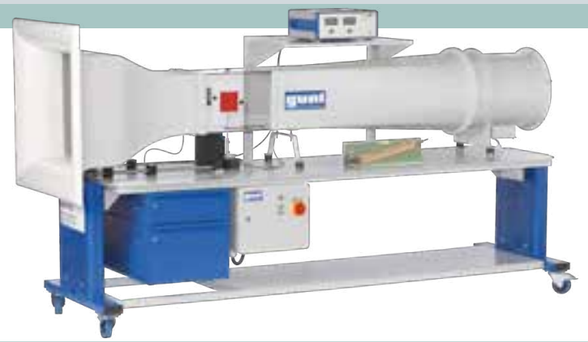
Order No.: 070.14300

Flow around bodies

HM 170
Open wind tunnel

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

Order No.: 070.17000



Drag bodies
HM 170.01 – HM 170.11

HM 170.22
Pressure distribution on an aerofoil NACA 0015

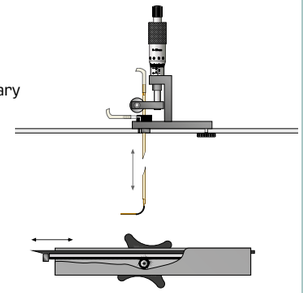
Effective lift force and flow separation for different angles of attack

Order No.: 070.17022

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

Order No.: 070.17024



HM 170.28
Wake measurement

Investigation of the pressure distribution behind a cylinder immersed in a flow; determination of the drag force

Order No.: 070.17028

HM 152
Potential flow

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

Order No.: 070.15200

HM 153
Visualisation of different flows

Visualisation of flow around bodies and flow phenomena in open channels and pipes

Order No.: 070.15300

HM 225
Aerodynamics trainer

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

Order No.: 070.22500

HM 225.02
Boundary layers

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

Order No.: 070.22502

HM 225.04
Drag forces

Determining drag forces on models immersed in a flow

Order No.: 070.22504

HM 225.06
Coanda effect

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

Order No.: 070.22506

HM 225.08
Visualisation of streamlines

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

Order No.: 070.22508

Flow around bodies

HM 226
Wind tunnel for visualisation of streamlines

Illuminated experimental section, various models, fog generator included

Order No.:
070.22600

HM 133
Visualisation of flow fields

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

Order No.: 070.13300

CE 220
Fluidised bed formation

Investigation of fluidised bed formation of solids in air and water

Order No.: 083.22000

HM 136
Flow through packed columns

Comparison of different modes of operation; water or water and air, parallel flow or counterflow mode

Order No.:
070.13600

HM 132
Vertical visualisation of flow fields

Electrolytically generated hydrogen bubbles as contrast medium

Order No.:
070.13200

Hydraulic fluid energy machines
Wind turbines

ET 220
Energy conversion in a wind power plant

Conversion of kinetic wind energy into electrical energy

Order No.:
061.22000

ET 220.01
Wind power plant

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

Order No.:
061.22001

ET 220.10
Control unit for wind power plant ET 220.01

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

Order No.:
061.22010

Hydraulic fluid energy machines
Water turbines

HM 287
Experiments with an axial turbine

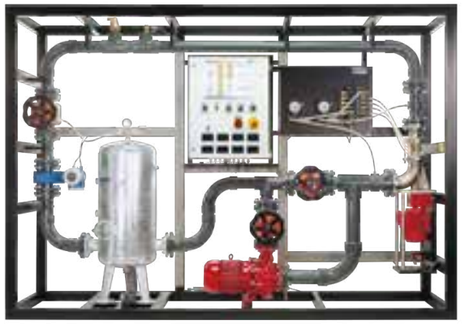
Record characteristics of an axial reaction turbine

Order No.:
070.28700

HM 405
Axial-flow turbomachines

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

Order No.: 070.40500



Hydraulic fluid energy machines
Water turbines

HM 288
Experiments with a reaction turbine

Record characteristics of a turbine based on the reaction force

Order No.: 070.28800

HM 289
Experiments with a Pelton turbine

Record characteristics of a free jet turbine

Order No.: 070.28900

HM 291
Experiments with an action turbine

Record characteristics of an axial impulse turbine

Order No.: 070.29100

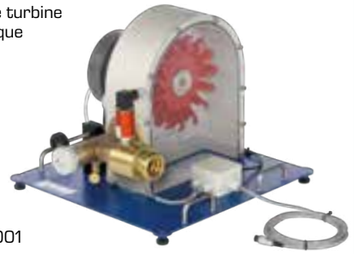
HM 290
Base unit for turbines

Water supply for HM 288, HM 289 and HM 291

Order No.: 070.29000

HM 450.01
Pelton turbine

Model of an impulse turbine with speed and torque measurement



Order No.: 070.45001

HM 450.02
Francis turbine

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

Order No.: 070.45002

HM 450C
Characteristic variables of hydraulic turbomachines

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

Order No.: 070.450C0

Hydraulic fluid energy machines
Driven machines

HM 299
Comparison of positive displacement machines and turbomachines

Interchangeable driven machines:
three pumps,
two compressors

Order No.: 070.29900

Hydraulic fluid energy machines
Positive-displacement pumps

HM 285
Experiments with a piston pump

Record characteristics of a reciprocating positive-displacement pump

Order No.:
070.28500

HM 286
Experiments with a gear pump

Record characteristics of a rotary positive-displacement pump

Order No.:
070.28600

Hydraulic fluid energy machines
Centrifugal pumps

HM 283
Experiments with a centrifugal pump

Determination of the characteristics of a centrifugal pump

Order No.: 070.28300

HM 284
Series and parallel configuration of pumps

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

Order No.: 070.28400

HM 300
Hydraulic circuit with centrifugal pump

Measurement of pressure conditions in valves and fittings and a pump

Order No.: 070.30000

HM 332
Pump characteristics for parallel and series configuration

Investigation of the behaviour of two identical centrifugal pumps in operation

Order No.: 070.33200

Hydraulic fluid energy machines
Fans

HM 280
Experiments with a radial fan

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

Order No.: 070.28000

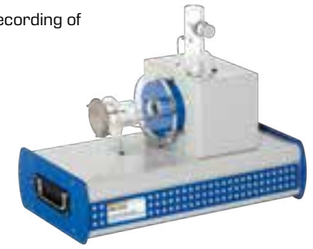
HM 210
Characteristic variables of a radial fan

Determining the flow rate through iris diaphragm or venturi nozzle

Order No.: 070.21000

HM 292
Experiments with a radial compressor

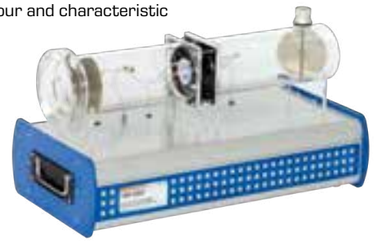
Two-stage compressor: recording of the compressor curve for both stages



Order No.: 070.29200

HM 282
Experiments with an axial fan

Operating behaviour and characteristic variables of an axial fan

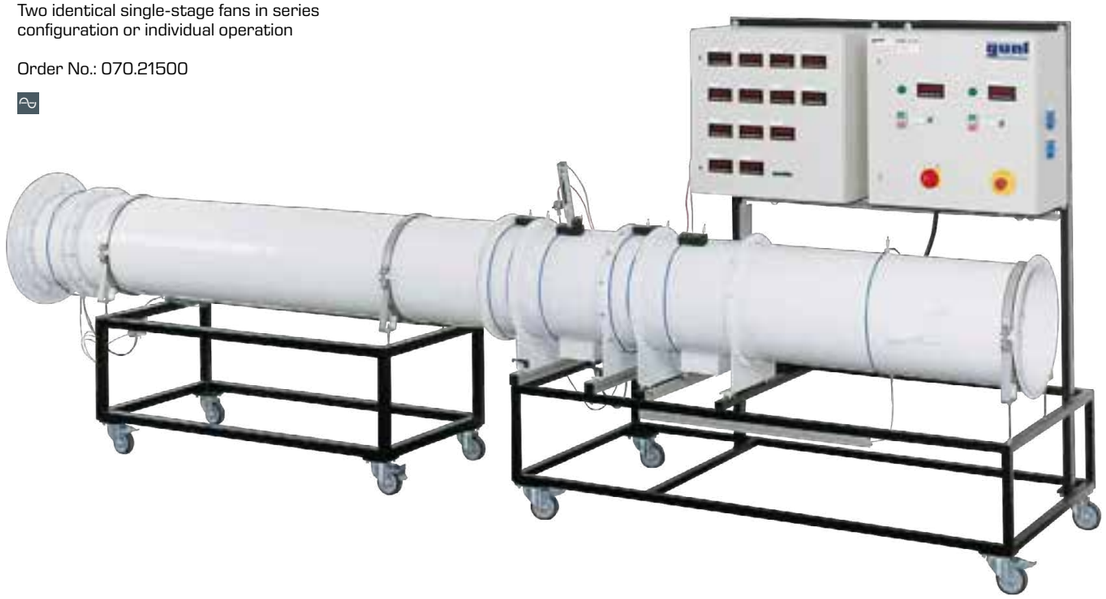


Order No.: 070.28200

HM 215
Two-stage axial fan

Two identical single-stage fans in series configuration or individual operation

Order No.: 070.21500

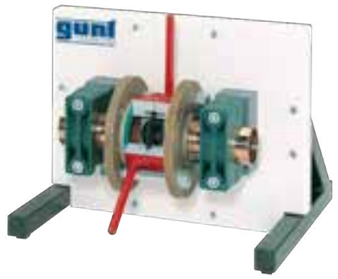


Components in piping systems and plant design
Cutaway models

HM 700.01
Cutaway model: standard orifice plate

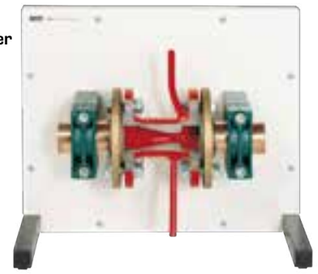
Order No.:
070.70001

HM 700.02
Cutaway model: flow nozzle



Order No.:
070.70002

HM 700.03
Cutaway model: standard Venturi meter



Order No.:
070.70003

HM 700.04
Cutaway model: straight-way valve

Order No.:
070.70004

HM 700.05
Cutaway model: corner valve

Order No.:
070.70005

HM 700.06
Cutaway model: angle seat valve

Order No.:
070.70006

HM 700.07
Cutaway model: non-return valve

Order No.:
070.70007

HM 700.08
Cutaway model: pressure reducing valve

Order No.:
070.70008

HM 700.09
Cutaway model: strainer

Order No.:
070.70009

HM 700.10
Cutaway model: gate valve

Order No.:
070.70010

HM 700.11
Cutaway model: straight-way plug valve

Order No.:
070.70011

HM 700.12
Cutaway model: three-way plug valve

Order No.:
070.70012

HM 700.13
Cutaway model: ball valve

Order No.:
070.70013

HM 700.14
Cutaway model: safety valve

Order No.:
070.70014

HM 700.15
Cutaway models: various screwed pipe connections

Order No.:
070.70015

HM 700.16
Cutaway models: pressure gauges

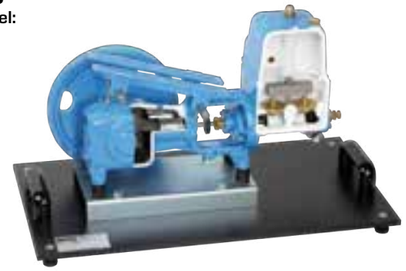
Order No.:
070.70016

Components in piping systems and plant design
Cutaway models

HM 700.17
Cutaway model: centrifugal pump

Order No.:
070.70017

HM 700.20
Cutaway model: piston pump



Order No.:
070.70020

HM 700.22
Cutaway model: gear pump

Order No.:
070.70022

VS 101
Cutaway model: underground hydrant

Order No.:
076.10100

VS 102
Cutaway model: resilient seated gate valve

Order No.:
076.10200

VS 103
Cutaway model: screw down valve

Order No.:
076.10300

VS 104
Cutaway model: changeover valve

Order No.:
076.10400

VS 105
Cutaway model: gas meter

Order No.:
076.10500

VS 106
Cutaway model: backflow preventer

Order No.:
076.10600

VS 107
Cutaway model: non-return butterfly valve

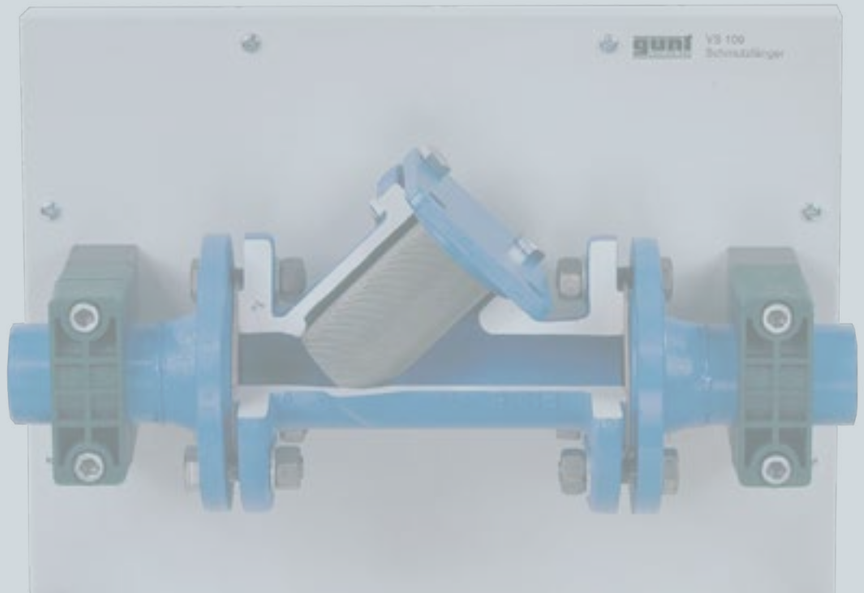
Order No.:
076.10700

VS 108
Cutaway model: water meter

Order No.:
076.10800

VS 109
Cutaway model: strainer

Order No.:
076.10900



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

Order No.: 051.15400

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

Assembly, disassembly and maintenance of industrial fittings

Order No.: 051.15600

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

Assembly, disassembly and maintenance of industrial fittings

Order No.: 051.15700

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

Assembly, disassembly and maintenance of industrial fittings

Order No.: 051.15800

MT 162
Hydraulic valves and fittings test stand

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

Order No.: 051.16200

Components in piping systems and plant design
Assembly & maintenance exercises pumps

MT 180
Assembly & maintenance exercise: centrifugal pump

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

Order No.: 051.18000

MT 181
Assembly & maintenance exercise: multistage centrifugal pump

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

Order No.: 051.18100

MT 182
Assembly & maintenance exercise: screw pump

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

Order No.: 051.18200

MT 183
Assembly & maintenance exercise: diaphragm pump

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

Order No.: 051.18300

MT 184
Assembly & maintenance exercise: piston pump

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

Order No.: 051.18400

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

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

Order No.: 051.18500

MT 186
Assembly & maintenance exercise: gear pump

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

Order No.: 051.18600

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

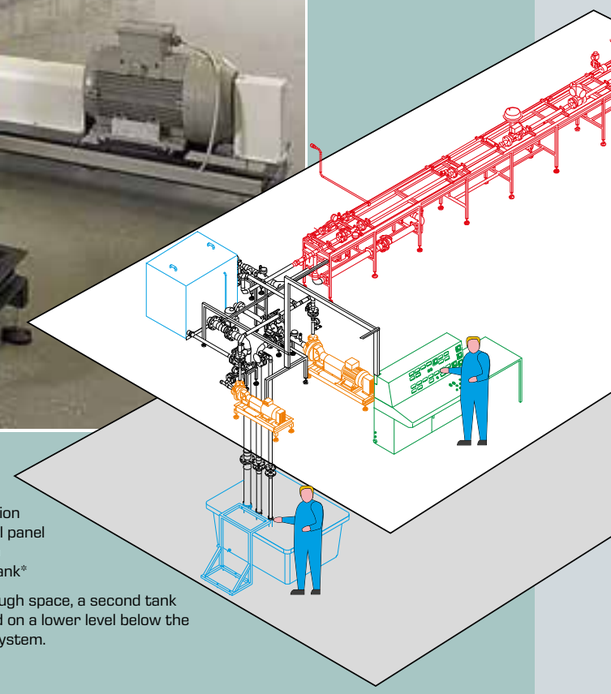
Order No.:065.96000

HL 960.01
Assembly and alignment of pumps and drives

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

Order No.: 065.96001

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.

Order No.: 070.12400

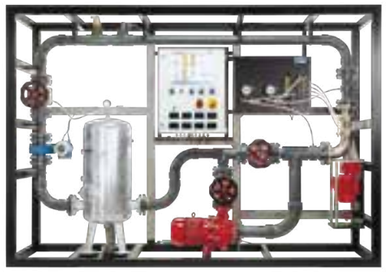
HM 362
Comparison of pumps

Investigate operating behaviour of centrifugal pumps, piston pump and side channel pump

Order No.:
070.36200

HM 405
Axial-flow turbomachines

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



Order No.:
070.40500

Fluidic experimental plants

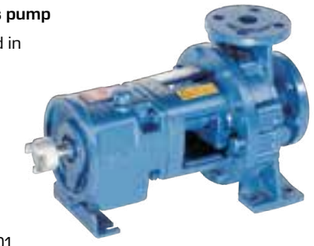
HL 962
Assembly stand for pumps

Base unit when constructing a complex piping system

Order No.: 065.96200

HL 962.01
Standard chemicals pump

Typical pump as used in process engineering



Order No.: 065.96201

HL 962.02
Canned motor pump

Hermetic centrifugal pump, particularly suitable for pumping liquid gases

Order No.: 065.96202

HL 962.03
Side channel pump

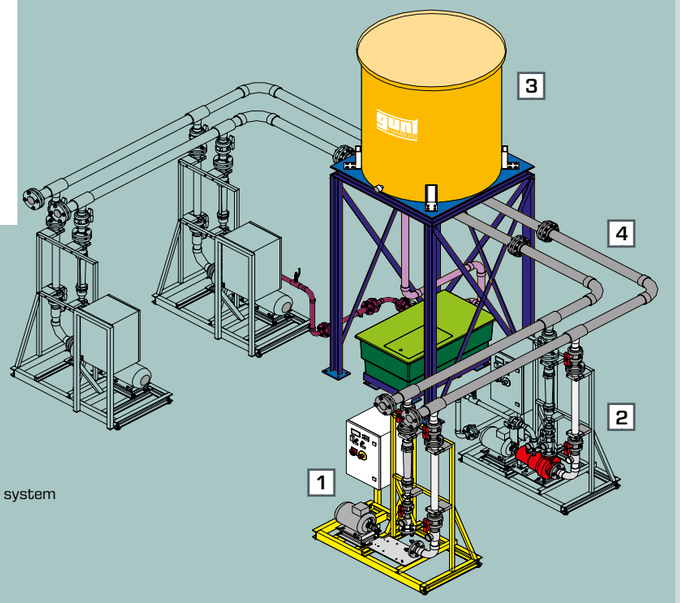
Self-priming three-stage pump

Order No.: 065.96203

HL 962.04
Standard chemicals pump with magnetic clutch

Hermetic centrifugal pump according to ISO 5199

Order No.: 065.96204



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

Two identical single-stage fans in series configuration or individual operation

Order No.: 070.21500

HL 710
Air duct systems

Planning and setup of simple and complex air duct systems

Order No.: 065.71000

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.

Order No.: 066.51000

Fluid machinery

4a

Fundamentals

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Driving machines

Gas turbines	161
Air turbines	162
Water turbines	163
Internal combustion engines	166

Driven machines

Centrifugal pumps	164
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Equipment series

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GUNT-FEMLine: turbines	185
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Catalogues

This is where you can find extensive information, product descriptions and data sheets:

Offine
Print catalogue programme area 4a
"Fluid machinery"

Online
at www.gunt.de

Software for
data acquisition/visualisation

Fundamentals
Fluid mechanics

HM 115
Hydrostatics trainer

A well equipped hydrostatics bench allowing numerous experiments on the topic of hydrostatics of liquid and gases

Order No.: 070.11500

HM 112
Fluid mechanics trainer

Interchangeable measuring objects and different pipe sections

Order No.:
070.11200

HM 230
Flow of compressible fluids

Subsonic and transonic flow through different measuring objects

Order No.: 070.23000

HM 122
Pressure losses in pipes

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

Order No.: 070.12200

HM 380
Cavitation in pumps

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

Order No.: 070.38000

ST 250
Cavitation

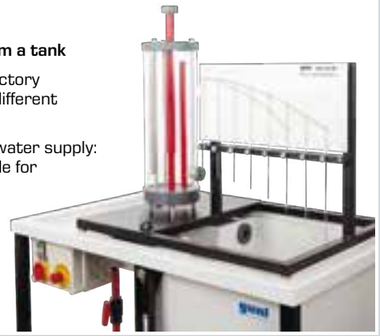
Investigation of cavitation process in a venturi nozzle

Order No.: 066.25000

HM 150.09
Horizontal flow from a tank

Recording the trajectory of the water jet at different outlet velocities

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



Order No.:
070.15009

HM 150
Base module for experiments in fluid mechanics

Volumetric flow measurement for large and small flow rates

Order No.: 070.15000

HM 152
Potential flow

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

Order No.: 070.15200

HM 133
Visualisation of flow fields

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

Order No.: 070.13300

HM 260
Characteristics of nozzles

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

Order No.: 070.26000

HM 261
Nozzle pressure distribution

Measuring the pressure curves in a convergent nozzle and in Laval nozzles and to study the flow of compressible fluids

Order No.: 070.26100

HM 226
Wind tunnel for visualisation of streamlines

Illuminated experimental section, various models, fog generator included

Order No.:
070.22600

HM 241
Fundamentals of water flow

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

Order No.: 070.24100

Fundamentals
Thermodynamics

WL 102
Change of state of gases

Experimental investigation of gas laws and changes of state

Order No.:
060.10200

ET 351C
Thermodynamics of the refrigeration circuit

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

Order No.:
061.351C0

WL 204
Vapour pressure of water – Marcet boiler

Pressure and temperature measurement in a steam boiler

Order No.:
060.20400

WL 440
Free and forced convection

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

Order No.:
060.44000

WL 372
Radial and linear heat conduction

Study of heat conduction in solids

Order No.:
060.37200

WL 210
Evaporation process

Observation of typical forms of evaporation in a water pipe environment

Order No.:
060.21000

WL 220
Boiling process

Demonstration of evaporation in a steam boiler

Order No.:
060.22000

WL 230
Condensation process

Measurement of heat transfer in dropwise and film condensation

Order No.:
060.23000

WL 110
Heat exchanger supply unit

Measuring the transfer characteristics of four different heat exchanger models

Order No.:
060.11000

WL 110.01
Tubular heat exchanger

Demonstration of the function and behaviour of a tubular heat exchanger in parallel flow and counterflow operation

Order No.:
060.11001

WL 110.02
Plate heat exchanger

Demonstration of the function and behaviour of a plate heat exchanger in parallel flow and counterflow operation

Order No.:
060.11002

WL 110.03
Shell & tube heat exchanger

Demonstration of the function and behaviour of a shell and tube heat exchanger in cross parallel flow and cross counterflow operation

Order No.:
060.11003

WL 110.04
Jacketed vessel with stirrer & coil

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

Order No.:
060.11004

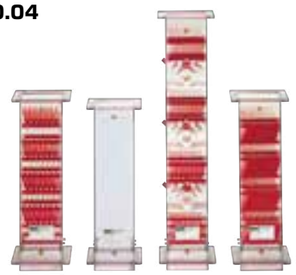
WL 320
Wet cooling tower

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

Order No.: 060.32000

WL 320.01 - WL 320.04
Cooling columns

Cooling columns with different wetting areas



Order No.:
060.32001 - 060.32004

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

Order No.: 080.05000

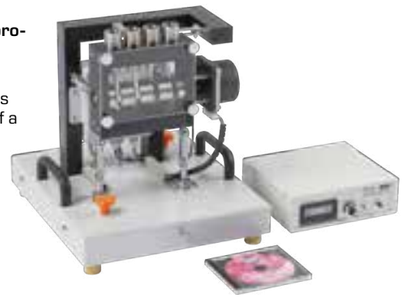
TM 632
Centrifugal governor

Characteristic curves of different centrifugal force governors

Order No.: 040.63200

TM 180
Forces at reciprocating engines

Investigation of free mass forces and moments of a reciprocating engine



Order No.: 040.18000

TM 620
Bending elasticity in rotors

Investigation of bending vibrations and resonance of a rotating shaft

Order No.: 040.62000

Driving machines
Gas turbines

HM 270
Impulse turbine

Investigation of a compressed air driven axial impulse turbine

Order No.: 070.27000

HM 272
Reaction turbine

Investigation of a compressed air driven radial reaction turbine

Order No.: 070.27200

ET 792
Gas turbine

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

Order No.: 061.79200

ET 851
Axial steam turbine

Single-stage steam turbine with power output measurement; steam supply from ET 850

Order No.: 061.85100

Driving machines
Air turbines

ET 220
Energy conversion in a wind power plant

Conversion of kinetic wind energy into electrical energy

Order No.: 061.22000

ET 220.01
Wind power plant

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

Order No.:
061.22001

ET 220.10
Control unit for wind power plant ET 220.01

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

Order No.:
061.22010

ET 270
Wave energy converter

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

Order No.: 061.27000

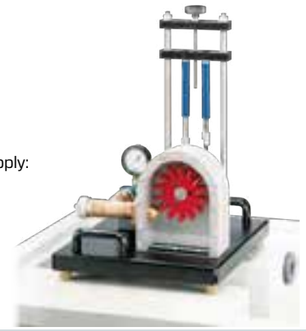
Driving machines
Water turbines

HM 150.19
Operating principle of a Pelton turbine

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

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

Order No.:
070.15019

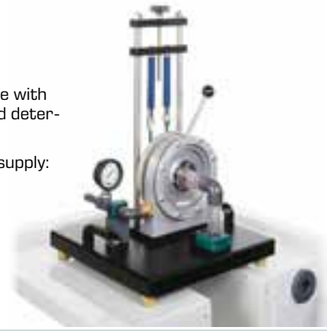


HM 150.20
Operating principle of a Francis turbine

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

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

Order No.:
070.15020



HM 287
Experiments with an axial turbine

Record characteristics of an axial reaction turbine

Order No.:
070.28700

HM 288
Experiments with a reaction turbine

Record characteristics of a turbine based on the reaction force

Order No.: 070.28800

HM 289
Experiments with a Pelton turbine

Record characteristics of a free jet turbine

Order No.: 070.28900

HM 291
Experiments with an action turbine

Record characteristics of an axial impulse turbine

Order No.: 070.29100

HM 290
Base unit for turbines

Water supply for HM 288, HM 289 and HM 291

Order No.: 070.29000

Driving machines
Water turbines

HM 365.31
Pelton and Francis turbine

Comparison of impulse and reaction turbines

Order No.: 070.36531

HM 365.32
Turbine supply unit

Water supply for HM 365.31

Order No.: 070.36532

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

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

HM 430C
Francis turbine trainer

Characteristics of a powerful Francis turbine with adjustable guide vanes

Order No.: 070.430C0

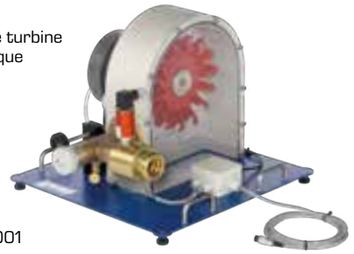
HM 421
Kaplan turbine trainer

Four-bladed Kaplan turbine with guide vane adjustment for varying power

Order No.: 070.42100

HM 450.01
Pelton turbine

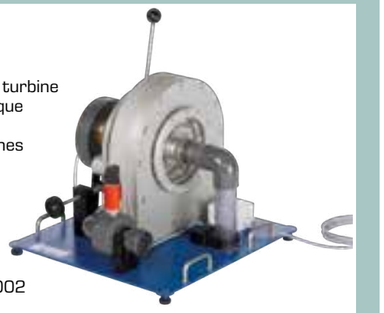
Model of an impulse turbine with speed and torque measurement



Order No.: 070.45001

HM 450.02
Francis turbine

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



Order No.: 070.45002

HM 450C
Characteristic variables of hydraulic turbomachines

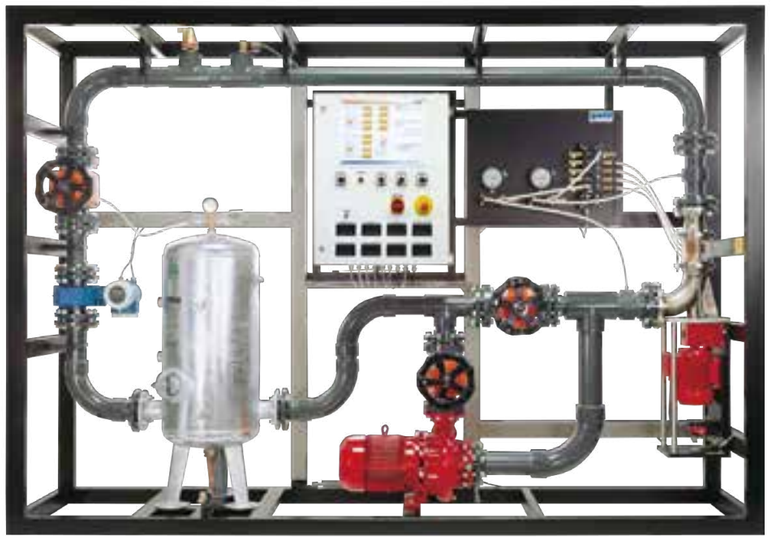
Determination of output and efficiency of turbines and pumps; demonstration of a pumped storage plant

Order No.: 070.450C0

HM 405
Axial-flow turbomachines

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

Order No.: 070.40500



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, 2,2 kW

Test stand for the mounting and investigation of the characteristics of prepared single cylinder engines

Order No.:
063.15900

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.:
070.36500

CT 150
Four-stroke petrol engine for CT 159

Air-cooled overhead valve four-stroke petrol engine

Order No.:
063.15000

CT 151
Four-stroke diesel engine for CT 159

Air-cooled four-stroke diesel engine with direct injection

Order No.:
063.15100

CT 152
Four-stroke petrol engine with variable compression for CT 159

Air-cooled four-stroke petrol engine with different compression ratios thanks to interchangeable combustion chambers

Order No.:
063.15200

CT 153
Two-stroke petrol engine for CT 159

Air-cooled two-stroke petrol engine

Order No.:
063.15300

Driven machines
Centrifugal pumps

HM 150.04
Centrifugal pump

Determining the characteristics of a typical centrifugal pump

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

Order No.:
070.15004

HM 450C
Characteristic variables of hydraulic turbomachines

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

Order No.: 070.450C0

HM 150.16
Series and parallel configuration of pumps

Determining the characteristic curves and hydraulic power output and comparison of series and parallel operating modes

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

Order No.: 070.15016

HM 283
Experiments with a centrifugal pump

Determination of the characteristics of a centrifugal pump

Order No.: 070.28300

HM 284
Series and parallel configuration of pumps

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

Order No.: 070.28400

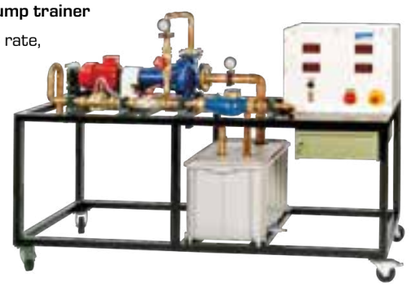
HM 300
Hydraulic circuit with centrifugal pump

Measurement of pressure conditions in valves and fittings and a pump

Order No.: 070.30000

HM 305
Centrifugal pump trainer

Pressure, flow rate, speed, torque and power consumption available as measured values



Order No.:
070.30500

Driven machines
Centrifugal pumps

HM 365.11
Centrifugal pump, standard design

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

Order No.: 070.36511

HM 365.12
Centrifugal pump, self-priming

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

Order No.: 070.36512

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

HM 365.13
Centrifugal pump, multistage

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

Order No.: 070.36513

HM 365.15
Side channel pump

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

Order No.: 070.36515

HM 365.14
Centrifugal pumps, series and parallel connected

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

Order No.: 070.36514

HM 365.10
Supply unit for water pumps

Water supply for HM 365.11 to HM 365.19

Order No.: 070.36510

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

HM 332
Pump characteristics for parallel and series configuration

Investigation of the behaviour of two identical centrifugal pumps in operation

Order No.: 070.33200

HM 362
Comparison of pumps

Investigation operating behaviour of centrifugal pumps, piston pump and side channel pump

Order No.: 070.36200

Driven machines
Axial pumps

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

HM 365.45
Axial-flow pump

Operating behaviour of an axial propeller pump

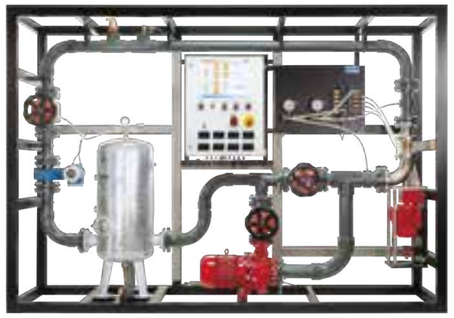
Order No.: 070.36545

Trainer for an axial pump with axial pump HM 365.45 and drive unit HM 365

HM 405
Axial-flow turbomachines

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

Order No.: 070.40500



Driven machines
Positive-displacement pumps

HM 285
Experiments with a piston pump

Record characteristics of a reciprocating positive-displacement pump

Order No.: 070.28500

HM 286
Experiments with a gear pump

Record characteristics of a rotary positive-displacement pump

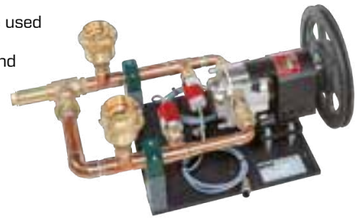
Order No.: 070.28600

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

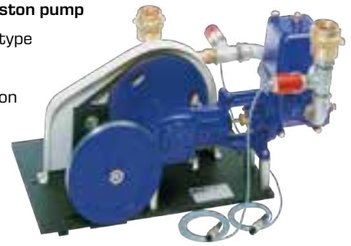
Lobe pumps are used for delivering highly viscous and highly abrasive media



Order No.: 070.36516

HM 365.17
Reciprocating piston pump

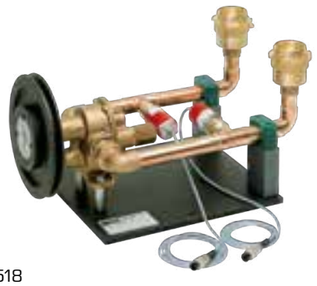
The most simple type of reciprocating piston pump consists of a piston that moves in a cylinder with one inlet and one outlet valve



Order No.: 070.36517

HM 365.18
Gear pump

A gear pump is characterised by a steady flow rate



Order No.: 070.36518

HM 365.19
Vane pump

Vane pumps can be used both for liquid and gaseous media

Order No.: 070.36519

HM 365.10
Supply unit for water pumps

Water supply for HM 365.11 to HM 365.19

Order No.: 070.36510

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

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

Order No.: 070.36521

HM 365.22
External gear pump

The pumping medium is transported between the gears and the housing

Order No.: 070.36522

HM 365.23
Vane pump

Vane pumps can be used both for liquid and gaseous media

Order No.: 070.36523

HM 365.24
Internal gear pump

An internal gear drives an external toothed ring

Order No.: 070.36524

HM 365.20
Supply unit for oil pumps

Oil supply for HM 365.21 to HM 365.24

Order No.: 070.36520

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

Driven machines
Fans and compressors

HM 280
Experiments with a radial fan

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

Order No.: 070.28000

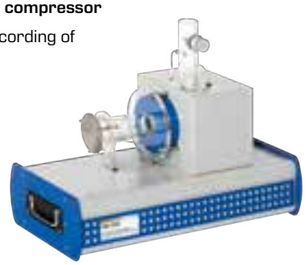
HM 210
Characteristic variables of a radial fan

Determining the flow rate through iris diaphragm or venturi nozzle

Order No.: 070.21000

HM 292
Experiments with a radial compressor

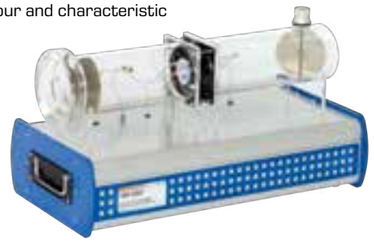
Two-stage compressor: recording of the compressor curve for both stages



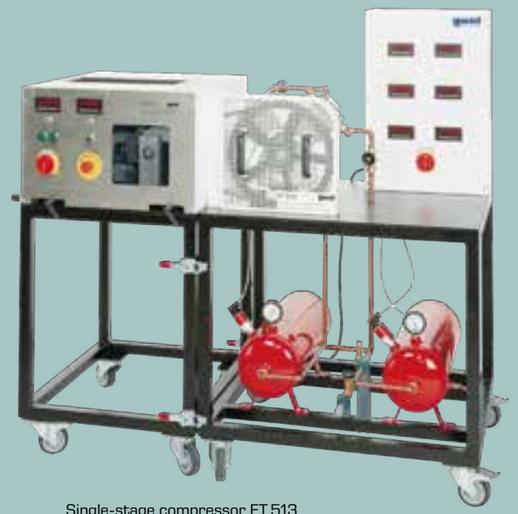
Order No.: 070.29200

HM 282
Experiments with an axial fan

Operating behaviour and characteristic variables of an axial fan



Order No.: 070.28200



Single-stage compressor ET 513 with drive unit HM 365

ET 513
Single-stage piston compressor

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

Order No.: 061.51300

HM 365
Universal drive and brake unit

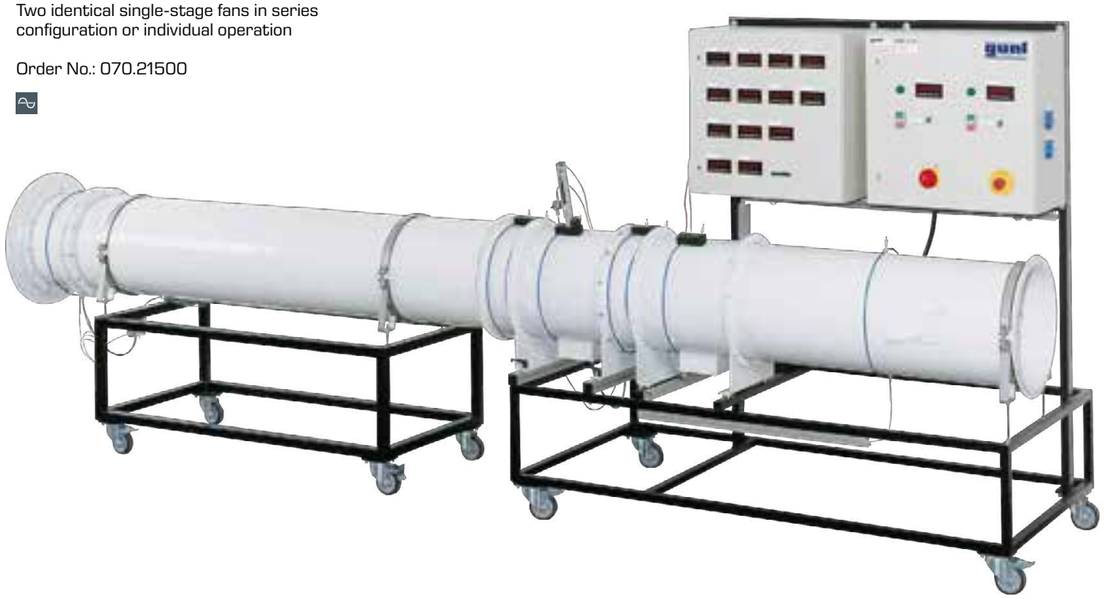
Core component for experiments on various driving and driven machines

Order No.: 070.36500

HM 215
Two-stage axial fan

Two identical single-stage fans in series configuration or individual operation

Order No.: 070.21500



HM 299
Comparison of positive displacement machines and turbomachines

Interchangeable driven machines: three pumps, two compressors

Order No.: 070.29900

Power stations and applied cycles

ET 810
Steam power plant with steam engine

Double-acting single-cylinder steam engine with gas-fired steam boiler

Order No.: 061.81000

ET 850
Steam generator

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

Order No.: 061.85000

ET 851
Axial steam turbine

Single-stage steam turbine with power output measurement; steam supply from ET 850

Order No.: 061.85100

ET 830
Steam power plant 1,5 kW

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

Order No.:
061.83000

ET 830.01 / 02
Cooling towers

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

Order No.:
061.83001 / 02

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

Order No.: 061.81300

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

ET 794
Gas turbine with power turbine

Two-shaft system with radial compressor and two radial turbines using liquid gas

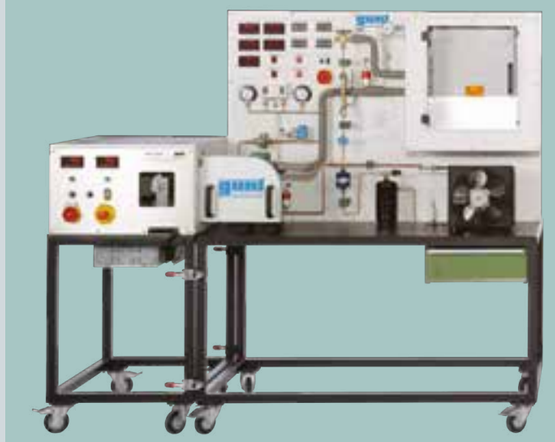
Order No.: 061.79400

ET 796
Gas turbine jet engine

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

Order No.: 061.79600

Power stations and applied cycles



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

Order No.: 061.16500

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

ET 352
Vapour jet compressor in refrigeration engineering

Investigation of cold production using thermal energy. Transparent condenser and evaporator allow the view into the inner workings.

Order No.: 061.35200

ET 430
Refrigeration system with two-stage compression

Low temperature refrigeration system; compression with injection intercooler

Order No.: 061.43000

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- **safety instructions for operating the equipment**
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- **introduction to the software (if available)**
- **explanation of the various experiments and details about the operating manual**

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Equipment series
GUNT-Labline

HM 288
Experiments with a reaction turbine

Record characteristics of a turbine based on the reaction force

Order No.: 070.28800

HM 289
Experiments with a Pelton turbine

Record characteristics of a free jet turbine

Order No.: 070.28900

HM 291
Experiments with an action turbine

Record characteristics of an axial impulse turbine

Order No.: 070.29100

HM 290
Base unit for turbines

Water supply for HM 288, HM 289 and HM 291

Order No.: 070.29000

HM 287
Experiments with an axial turbine

Record characteristics of an axial reaction turbine

Order No.: 070.28700

HM 283
Experiments with a centrifugal pump

Determination of the characteristics of a centrifugal pump

Order No.: 070.28300

HM 284
Series and parallel configuration of pumps

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

Order No.: 070.28400

HM 285
Experiments with a piston pump

Record characteristics of a reciprocating positive-displacement pump

Order No.: 070.28500

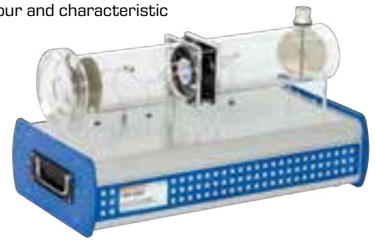
HM 280
Experiments with a radial fan

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

Order No.: 070.28000

HM 282
Experiments with an axial fan

Operating behaviour and characteristic variables of an axial fan



Order No.: 070.28200

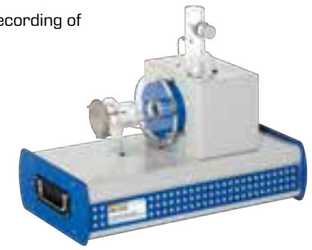
HM 286
Experiments with a gear pump

Record characteristics of a rotary positive-displacement pump

Order No.: 070.28600

HM 292
Experiments with a radial compressor

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



Order No.: 070.29200

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

Order No.: 070.36511

HM 365.12
Centrifugal pump, self-priming

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

Order No.: 070.36512

HM 365.13
Centrifugal pump, multistage

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

Order No.: 070.36513

HM 365.15
Side channel pump

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

Order No.: 070.36515

HM 365.14
Centrifugal pumps, series and parallel connected

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

Order No.: 070.36514

HM 365.45
Axial-flow pump

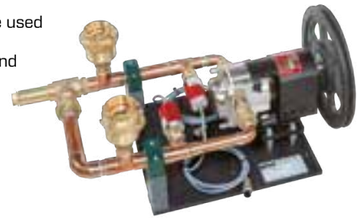
Operating behaviour of an axial propeller pump

Order No.: 070.36545

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

HM 365.16
Lobe pump

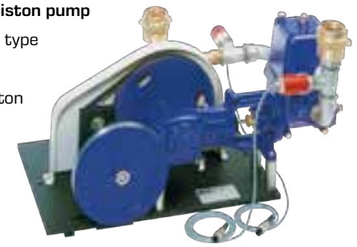
Lobe pumps are used for delivering highly viscous and highly abrasive media



Order No.: 070.36516

HM 365.17
Reciprocating piston pump

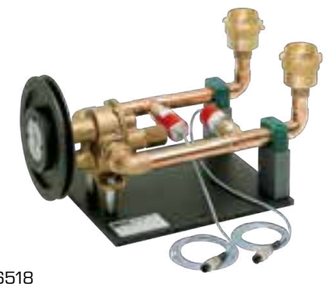
The most simple type of reciprocating piston pump consists of a piston that moves in a cylinder with one inlet and one outlet valve



Order No.: 070.36517

HM 365.18
Gear pump

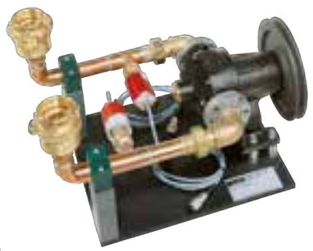
A gear pump is characterised by a steady flow rate



Order No.: 070.36518

HM 365.19
Vane pump

Vane pumps can be used both for liquid and gaseous media



Order No.: 070.36519

HM 365.10
Supply unit for water pumps

Water supply for HM 365.11 to HM 365.19

Order No.: 070.36510

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

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

Order No.: 070.36521

HM 365.22
External gear pump

The pumping medium is transported between the gears and the housing

Order No.: 070.36522

HM 365.23
Vane pump

Vane pumps can be used both for liquid and gaseous media

Order No.: 070.36523

HM 365.24
Internal gear pump

An internal gear drives an external toothed ring

Order No.: 070.36524

HM 365.20
Supply unit for oil pumps

Oil supply for HM 365.21 to HM 365.24

Order No.: 070.36520

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

Equipment series
GUNT-FEMLine: turbines

HM 365.31
Pelton and Francis turbine

Comparison of impulse and reaction turbines

Order No.: 070.36531

HM 365.32
Turbine supply unit

Water supply for HM 365.31

Order No.: 070.36532

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

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, 2,2 kW

Test stand for the mounting and investigation of the characteristics of prepared single cylinder engines

Order No.:
063.15900

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.:
070.36500

CT 150
Four-stroke petrol engine for CT 159

Air-cooled overhead valve four-stroke petrol engine

Order No.:
063.15000

CT 151
Four-stroke diesel engine for CT 159

Air-cooled four-stroke diesel engine with direct injection

Order No.:
063.15100

CT 152
Four-stroke petrol engine with variable compression for CT 159

Air-cooled four-stroke petrol engine with different compression ratios thanks to interchangeable combustion chambers

Order No.:
063.15200

CT 153
Two-stroke petrol engine for CT 159

Air-cooled two-stroke petrol engine

Order No.:
063.15300

Equipment series
GUNT-FEMLine: plants

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

Order No.:
061.81300

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.:
070.36500

Equipment series
GUNT-FEMLine: plants

Single-stage compressor ET 513 with drive unit HM 365

ET 513
Single-stage piston compressor

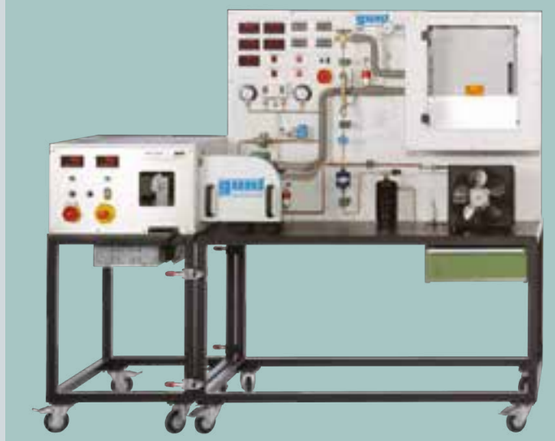
Investigations on an air compressor including the determination of the mechanical power consumption

Order No.: 061.51300

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500



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

Order No.: 061.16500

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

First-rate handbooks

GUNT's policy is simple: high quality hardware and clearly developed accompanying instructional material ensure successful teaching and learning about an experimental unit.

The core of the accompanying material are detailed reference experiments that we have carried out. The description of the experiment contains the actual experimental setup right through to the interpretation of the results and findings. A group of experienced engineers develops and maintains the instructional material.

Nevertheless, we are here to help should any questions remain unanswered, either by phone or – if necessary – on site.

Hydraulics for civil engineers

4b

Fundamentals of fluid mechanics

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Hydraulic engineering

Open-channel flow	196
Sediment transport	198
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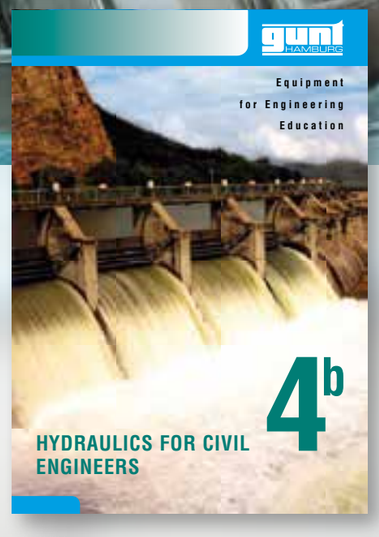
Catalogues

This is where you can find extensive information, product descriptions and data sheets:

Offine
Print catalogue programme area 4b
"Hydraulics for civil engineers"

Online
at www.gunt.de

Software for
data acquisition/visualisation



Fundamentals of fluid mechanics
Hydrostatics

HM 115
Hydrostatics trainer

A well equipped hydrostatics bench allowing numerous experiments on the topic of hydrostatics of liquid and gases

Order No.: 070.11500

HM 150.06
Stability of floating bodies

Determining metacentre and buoyancy using a rectangular hull cross-section

Order No.: 070.15006

HM 150.39
Floating bodies for HM 150.06

Comparison of two different hull shapes: hard chine and round hull

Order No.: 070.15039

Fundamentals of fluid mechanics
Discharge

HM 150.09
Horizontal flow from a tank

Recording the trajectory of the water jet at different outlet velocities

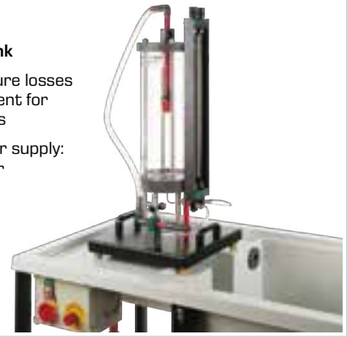
Recommended for water supply: HM 150 Base module for experiments in fluid mechanics

Order No.: 070.15009

HM 150.12
Vertical flow from a tank

Determination of pressure losses and contraction coefficient for different outlet contours

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



Order No.: 070.15012

Fundamentals of fluid mechanics
Hydrodynamics

HM 150.18
Osborne Reynolds experiment

Visualisation of laminar and turbulent flow

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

Order No.: 070.15018

HM 150.07
Bernoulli's principle

Static pressure and total pressure distribution along the venturi nozzle

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

Order No.: 070.15007

HM 150.08
Measurement of jet forces

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

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

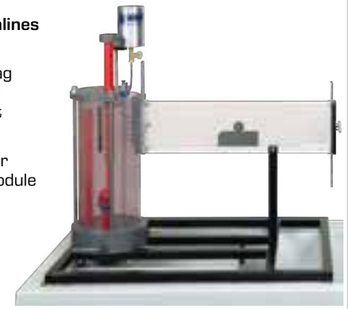
Order No.: 070.15008

HM 150.21
Visualisation of streamlines in an open channel

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

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

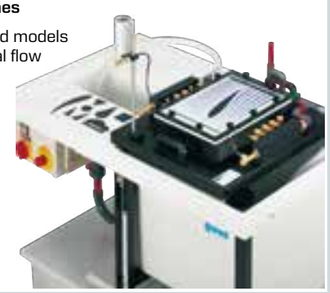
Order No.: 070.15021



HM 150.10
Visualisation of streamlines

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

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



Order No.: 070.15010

HM 150
Base module for experiments in fluid mechanics

Volumetric flow measurement for large and small flow rates

Order No.: 070.15000

Fundamentals of fluid mechanics
Pipe flow

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

Order No.: 070.15001

HM 150.11
Losses in a pipe system

Influence of flow velocity on pressure loss

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

Order No.: 070.15011

HM 164
Open channel and closed channel flow

Flow processes on different control structures in open and closed channel flows

Order No.: 070.16400

HM 111
Pipe networks

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

Order No.: 070.11100

Fundamentals of fluid mechanics
Transient flow

HM 156
Water hammer and surge chamber

Investigation and visualisation of water hammer in pipes and demonstration of how a surge chamber works

Order No.:
070.15600

HM 143
Transient drainage processes in storage reservoirs

Demonstration of the function of a rainwater retention basin and a dam

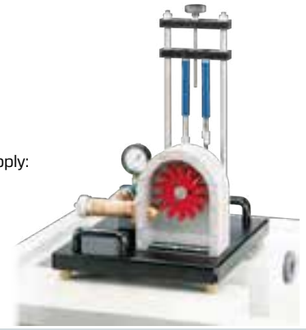
Order No.:
070.14300

Fundamentals of fluid mechanics
Turbomachines

HM 150.19
Operating principle of a Pelton turbine

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

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



Order No.:
070.15019

HM 150.20
Operating principle of a Francis turbine

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

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

Order No.:
070.15020

HM 150.04
Centrifugal pump

Determining the characteristics of a typical centrifugal pump

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

Order No.:
070.15004

HM 150.16
Series and parallel configuration of pumps

Determining the characteristic curves and hydraulic power output and comparison of series and parallel operating modes

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

Order No.:
070.15016

Hydraulic engineering
Open-channel flow

HM 160
Experimental flume 86 x 300 mm

Experimental section for performing flow experiments in open flumes with lengths of 2,5 m or 5 m available, closed water circuit and inclination adjustment

Order No.: 070.16000

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)

Order No.: 070.16200 / 070.16300

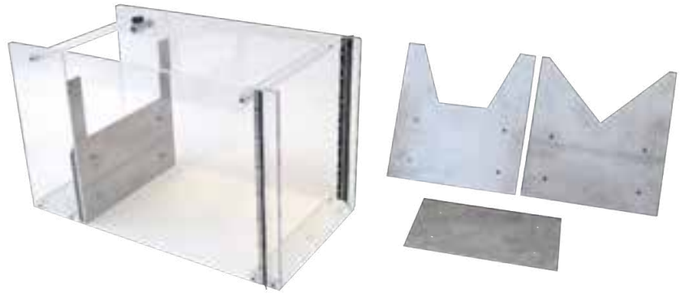
HM 161
Experimental flume 600 x 800 mm

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

Order No.: 070.16100

HM 162.30
Discharge measurement: plate weirs

Order No.: 070.16230



HM 162.32
Control structure: ogee-crested weir with two weir outlets

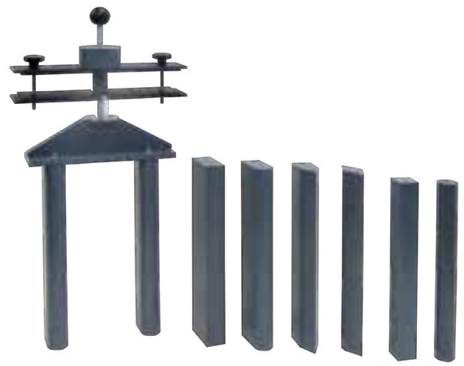
Order No.: 070.16232

HM 162.41
Wave generator

Order No.: 070.16241

HM 162.46
Change in cross-section: piers

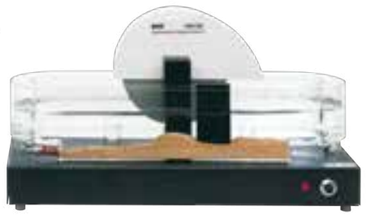
Order No.: 070.16246



Hydraulic engineering
Sediment transport

HM 166
Fundamentals of sediment transport

Investigation of the movement of sediment in flows



Order No.:
070.16600

HM 140
Open-channel sediment transport

Comprehensive investigation of sediment motion

Order No.:
070.14000

HM 142
Separation in sedimentation tanks

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

Order No.:
070.14200

HM 168
Sediment transport in river courses

Investigation of sediment migration with and without structures

Order No.: 070.16800

Hydraulic engineering
Seepage flow

HM 152
Potential flow

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

Order No.:
070.15200

HM 167
Ground water flow

Three-dimensional investigations and demonstration of flood and drainage

Order No.:
070.16700

CE 116
Cake and depth filtration

Investigation of the basic principles of filtration: Darcy's equation

Order No.:
083.11600

HM 165
Studies in hydrology

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

Order No.:
070.16500

HM 145
Advanced hydrological investigations

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

Order No.:
070.14500

HM 141
Hydrographs after precipitation

Correlations between precipitation and percolation; storage capacity and drainage methods

Order No.:
070.14100

HM 169
Visualisation of seepage flows

Graphical determination of flow fields and investigation of water pressure on structures

Order No.:
070.16900

Process engineering

5

Fundamentals of process engineering

Theory:
- thermodynamics 202
- heat and mass transfer 203
- fluid mechanics 205
- fundamentals of control engineering 207
- measuring methods 208

Practice:
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Mechanical process engineering

Separation methods:
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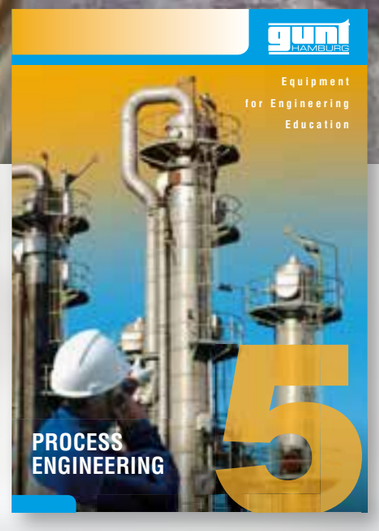
Catalogues

This is where you can find extensive information, product descriptions and data sheets:

Offine
Print catalogue programme area 5
"Process engineering"

Online
at www.gunt.de

Software for data acquisition / visualisation



Fundamentals of process engineering
Theory: thermodynamics

WL 204
Vapour pressure of water – Marcet boiler

Pressure and temperature measurement in a steam boiler

Order No.: 060.20400

WL 102
Change of state of gases

Experimental investigation of gas laws and changes of state

Order No.: 060.10200

WL 210
Evaporation process

Observation of typical forms of evaporation in a water pipe environment

Order No.: 060.21000

WL 220
Boiling process

Demonstration of evaporation in a steam boiler

Order No.: 060.22000

WL 230
Condensation process

Measurement of heat transfer in dropwise and film condensation

Order No.: 060.23000

ET 805.50
Determination of the vapour content

Determining the quality of a two-phase liquid-vapour mixture

Order No.: 061.80550

ET 850
Steam generator

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

Order No.: 061.85000

ET 350
Changes of state in the refrigeration circuit

Energetic evaluations of the refrigeration cycle. Transparent components allow view inside.

Order No.: 061.35000

Fundamentals of process engineering
Theory: heat and mass transfer

CE 110
Diffusion in liquids and gases

Use of Fick's Law

Order No.: 083.11000

WL 440
Free and forced convection

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

Order No.: 060.44000

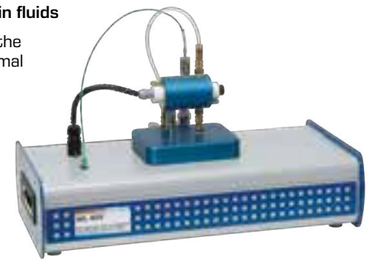
WL 372
Radial and linear heat conduction

Study of heat conduction in solids

Order No.: 060.37200

WL 422
Heat conduction in fluids

Determination of the coefficient of thermal conductivity for gaseous and liquid fluids



Order No.: 060.44000

WL 377
Convection and radiation

Heat transfer by convection and radiation in gases

Order No.: 060.37700

WL 225
Heat transfer in the fluidised bed

Investigation of fluidised beds with varying particle sizes and heat transfer in the fluidised bed

Order No.: 060.22500

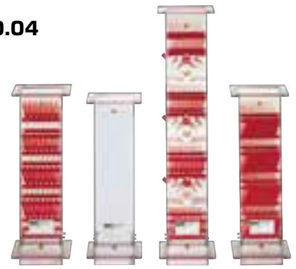
WL 320
Wet cooling tower

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

Order No.: 060.32000

WL 320.01 - WL 320.04
Cooling columns

Cooling columns with different wetting areas



Order No.: 060.32001 - 060.32004

Fundamentals of process engineering
Theory: heat and mass transfer

WL 110
Heat exchanger supply unit

Measuring the transfer characteristics of four different heat exchanger models

Order No.: 060.11000

WL 110.01
Tubular heat exchanger

Demonstration of the function and behaviour of a tubular heat exchanger in parallel flow and counterflow operation

Order No.: 060.11001

WL 110.02
Plate heat exchanger

Demonstration of the function and behaviour of a plate heat exchanger in parallel flow and counterflow operation

Order No.:
060.11002

WL 110.03
Shell & tube heat exchanger

Demonstration of the function and behaviour of a shell and tube heat exchanger in cross parallel flow and cross counterflow operation

Order No.:
060.11003

WL 110.04
Jacketed vessel with stirrer & coil

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

Order No.: 060.11004

Fundamentals of process engineering
Theory: fluid mechanics

HM 115
Hydrostatics trainer

A well equipped hydrostatics bench allowing numerous experiments on the topic of hydrostatics of liquid and gases

Order No.: 070.11500

HM 135
Determination of the settling velocity

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

Order No.:
070.13500

HM 155
Water hammer in pipes

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

Order No.:
070.15500

HM 136
Flow through packed columns

Comparison of different modes of operation; water and/or air, parallel flow or counterflow mode

Order No.:
070.13600

Fundamentals of process engineering
Theory: fluid mechanics

HM 150.18
Osborne Reynolds experiment

Visualisation of laminar and turbulent flow

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

Order No.:
070.15018

HM 150.07
Bernoulli's principle

Static pressure and total pressure distribution along the venturi nozzle

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

Order No.: 070.15007

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

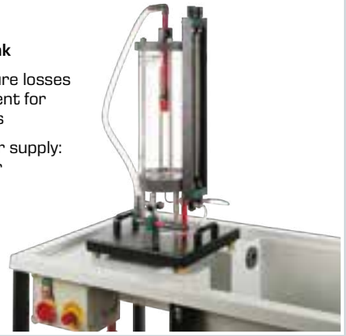
Order No.: 070.15001

HM 150.12
Vertical flow from a tank

Determination of pressure losses and contraction coefficient for different outlet contours

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

Order No.: 070.15012



HM 150.11
Losses in a pipe system

Influence of flow velocity on pressure loss

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

Order No.: 070.15011

Fundamentals of process engineering
Theory: fundamentals of control engineering

RT 010
Training system: level control, HSI

Fundamentals of control engineering using the example of a level control system with integral behaviour

Order No.: 080.01000

RT 020
Training system: flow control, HSI

Fundamentals of control engineering using the example of a rapid flow control system

Order No.: 080.02000

RT 030
Training system: pressure control, HSI

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

Order No.:
080.03000

RT 040
Training system: temperature control, HSI

Fundamentals of control engineering using the example of a temperature control system with dead time

Order No.:
080.04000

RT 800
PLC application: mixing process

Experiments using PLC to control discontinuous mixing processes

Order No.: 080.80000

RT 050
Training system: speed control, HSI

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

Order No.:
080.05000

IA 130
PLC module

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

Order No.: 058.13000

Fundamentals of process engineering
Theory: measuring methods

IA 110
Calibrating a pressure sensor

Test-pressure generated with dead-weight piston manometer

Order No.:
058.11000

WL 201
Fundamentals of humidity measurement

Comparison of four measuring methods of humidity in a climatic chamber with adjustable humidity

Order No.:
060.20100

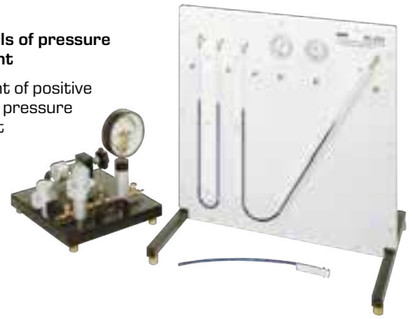
WL 202
Fundamentals of temperature measurement

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

Order No.:
060.20200

WL 203
Fundamentals of pressure measurement

Measurement of positive and negative pressure with different measuring devices

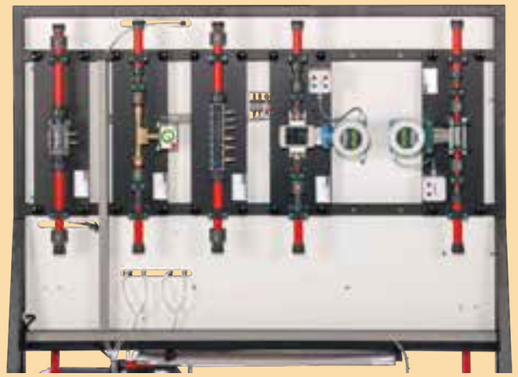


Order No.:
060.20300

HM 500
Flow meter trainer

Comparison and calibration of different flow meters

Order No.: 070.50000



Many flow meters are available as accessories.

Fundamentals of process engineering
Practice: tanks and materials

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

Order No.:
021.13000

FL 140
Stress and strain analysis on a thick-walled cylinder

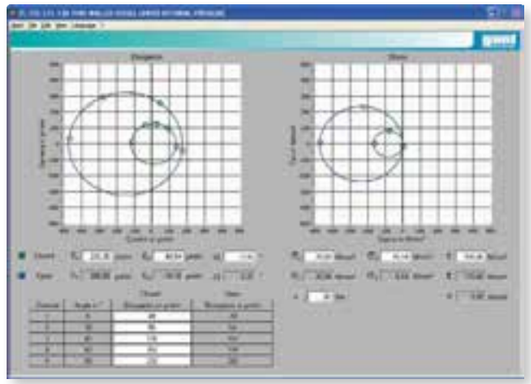
Triaxial stress state in the cylinder wall; cylinder with strain gauge application on surface and in wall

Order No.:
021.14000

FL 152
Multi-channel measurement amplifier

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

Order No.: 021.15100



Analysis using the software in FL 152

CE 105
Corrosion experimental unit

Parallel investigation of different influencing factors on different metal samples

Order No.: 083.10500

Fundamentals of process engineering
Practice: pumps and compressors

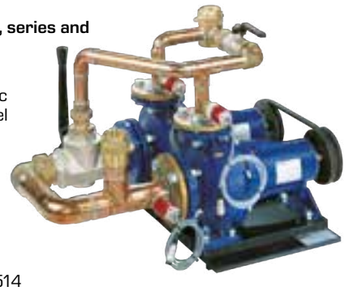
HM 365.11
Centrifugal pump, standard design

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

Order No.: 070.36511

HM 365.14
Centrifugal pumps, series and parallel connected

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



Order No.: 070.36514

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

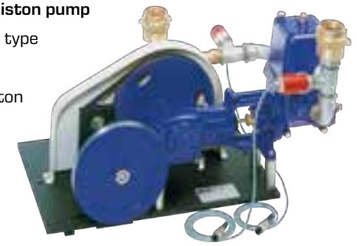
HM 365.15
Side channel pump

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

Order No.: 070.36515

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



Order No.: 070.36517

HM 365.10
Supply unit for water pumps

Water supply for HM 365.11 to HM 365.19

Order No.: 070.36510

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

MT 180
Assembly & maintenance exercise: centrifugal pump

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

Order No.: 051.18000

MT 181
Assembly & maintenance exercise: multistage centrifugal pump

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

Order No.: 051.18100

MT 182
Assembly & maintenance exercise: screw pump

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

Order No.: 051.18200

MT 183
Assembly & maintenance exercise: diaphragm pump

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

Order No.: 051.18300

MT 184
Assembly & maintenance exercise: piston pump

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

Order No.: 051.18400

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

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

Order No.: 051.18500

MT 186
Assembly & maintenance exercise: gear pump

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

Order No.: 051.18600

Fundamentals of process engineering
Practice: pumps and compressors

HL 960.01
Assembly and alignment of pumps and drives

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

Order No.:
065.96001

CE 272
Rotary vane vacuum pump

Generation of negative pressure over time

Order No.:
083.27200

ET 500
Two-stage piston compressor

Determining the characteristic values of an industrial two-stage compressor

Order No.:
061.50000

CE 271
Multi-head diaphragm pump

Determining the characteristics of a metering pump with three heads

Order No.:
083.27100

MT 140.02
Assembly exercise: piston compressor

Assembly of an industrial compressor, using simple tools and jigs

Order No.: 051.14002

MT 140.01
Assembly exercise piston compressor: functional test

Installation of the compressor MT 140 or MT 140.02 for operational check

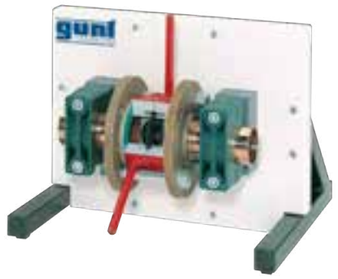
Order No.: 051.14001

Fundamentals of process engineering
Practice: piping elements and valves and fittings

HM 700.01
Cutaway model: standard orifice plate

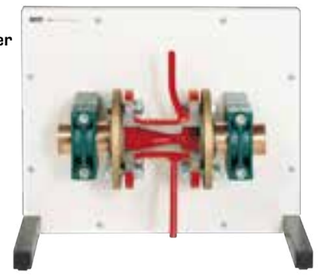
Order No.:
070.70001

HM 700.02
Cutaway model: flow nozzle



Order No.:
070.70002

HM 700.03
Cutaway model: standard Venturi meter



Order No.:
070.70003

HM 700.04
Cutaway model: straight-way valve

Order No.:
070.70004

HM 700.05
Cutaway model: corner valve

Order No.:
070.70005

HM 700.06
Cutaway model: angle seat valve

Order No.:
070.70006

HM 700.07
Cutaway model: non-return valve

Order No.:
070.70007

HM 700.08
Cutaway model: pressure reducing valve

Order No.:
070.70008

Fundamentals of process engineering
Practice: piping elements and valves and fittings

HM 700.09
Cutaway model: strainer

Order No.:
070.70009

HM 700.10
Cutaway model: gate valve

Order No.:
070.70010

HM 700.11
Cutaway model: straight-way plug valve

Order No.:
070.70011

HM 700.12
Cutaway model: three-way plug valve

Order No.:
070.70012

HM 700.13
Cutaway model: ball valve

Order No.:
070.70013

HM 700.14
Cutaway model: safety valve

Order No.:
070.70014

HM 700.15
Cutaway models: various screwed pipe connections

Order No.:
070.70015

VS 102
Cutaway model: resilient seated gate valve

Order No.:
076.10200

VS 103
Cutaway model: screw down valve

Order No.:
076.10300

VS 104
Cutaway model: changeover valve

Order No.:
076.10400

VS 106
Cutaway model: backflow preventer

Order No.:
076.10600

VS 107
Cutaway model: non-return butterfly valve

Order No.:
076.10700

VS 109
Cutaway model: strainer

Order No.:
076.10900

Fundamentals of process engineering
Practice: piping elements and valves and fittings

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

Assembly, disassembly and maintenance of industrial fittings

Order No.: 051.15600

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

Assembly, disassembly and maintenance of industrial fittings

Order No.: 051.15700

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

Assembly, disassembly and maintenance of industrial fittings

Order No.: 051.15800

MT 162
Hydraulic valves and fittings test stand

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

Order No.: 051.16200

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

Order No.: 065.96000

HL 960.01
Assembly and alignment of pumps and drives

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

Order No.: 065.96001

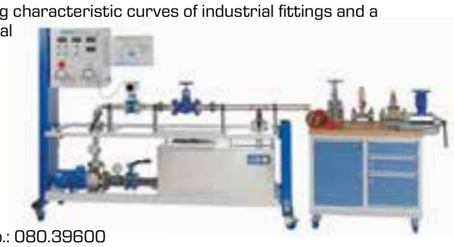
RT 395
Maintenance of valves and fittings and actuators

Maintenance and operational check: four different fittings and actuators

Order No.: 080.39500

RT 396
Pump and valves and fittings test stand

Recording characteristic curves of industrial fittings and a centrifugal pump



Order No.: 080.39600

HL 962
Assembly stand for pumps

Base unit when constructing a complex piping system

Order No.: 065.96200

HL 962.01
Standard chemicals pump

Typical pump as used in process engineering

Order No.: 065.96201

HL 962.02
Canned motor pump

Hermetic centrifugal pump, particularly suitable for pumping liquid gases

Order No.: 065.96202

HL 962.03
Side channel pump

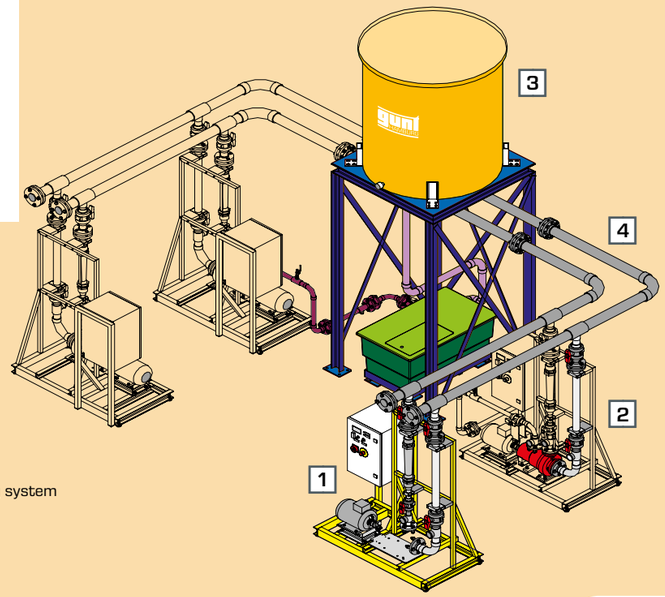
Self-priming three-stage pump

Order No.: 065.96203

HL 962.04
Standard chemicals pump with magnetic clutch

Hermetic centrifugal pump according to ISO 5199

Order No.: 065.96204



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)

Fundamentals of process engineering
Practice: heat exchangers and steam generators

ET 860
Safety devices on steam boilers

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

Order No.:
061.86000

WL 315C
Trainer for various heat exchangers

Comparison of plate heat exchanger, tubular heat exchanger, shell and tube heat exchanger, finned cross-flow heat exchanger, and jacketed vessel with stirrer

Order No.:
060.315C0

Fundamentals of process engineering
Practice: applications of control engineering

RT 586
Control of water quality

Control of pH value, redox potential, oxygen concentration and electrical conductivity

Order No.: 080.58600

RT 681
Multivariable control: vacuum degassing

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

Order No.:
080.68100

RT 682
Multivariable control: stirred tank

Heated stirrer tank with heat recovery as model: coupled level and temperature control

Order No.:
080.68200

RT 512
Level control trainer

Basic course in control engineering with industrial components using level controlled system

Order No.: 080.51200

RT 522
Flow control trainer

Basic course in control engineering with industrial components using flow controlled system

Order No.: 080.52200

RT 532
Pressure control trainer

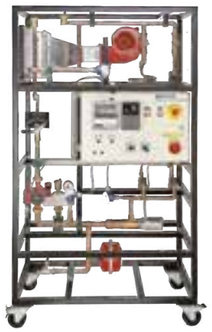
Basic course in control engineering with industrial components using first order and second order pressure controlled system

Order No.: 080.53200

RT 542
Temperature control trainer

Basic course in control engineering with industrial components using temperature controlled system with dead time

Order No.: 080.54200



RT 552
pH value control trainer

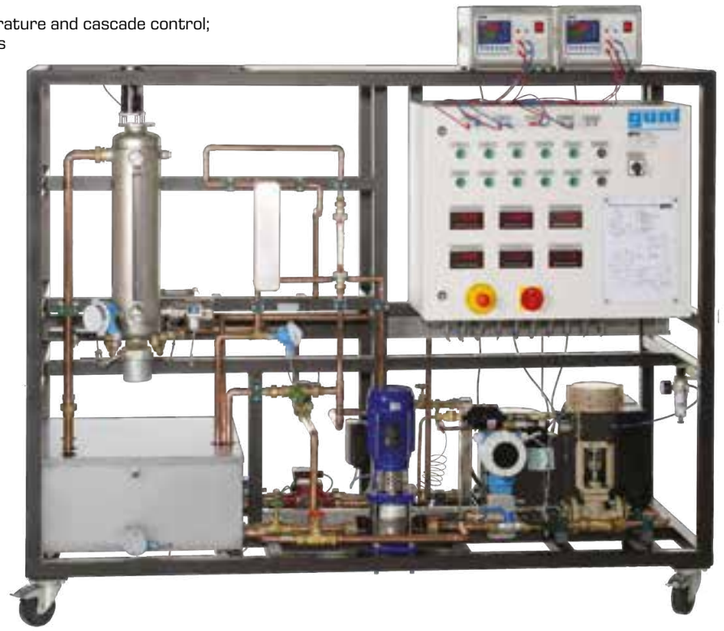
Basic course in control engineering with industrial components using pH controlled system with dead time

Order No.: 080.55200

Fundamentals of process engineering
Practice: applications of control engineering

RT 580
Fault finding in control systems

Control of level, flow rate, temperature and cascade control;
PLC for monitoring safety devices



Order No.: 080.58000

RT 310
Calibration station

Calibration of control loop components using precision measuring technique

Order No.: 080.31000

Mechanical process engineering
Separation methods: classifying and sorting

CE 275
Gas flow classification

Zigzag sifter to separate solid compounds

Order No.: 083.27500

CE 280
Magnetic separation

Sorting with a drum-type magnetic separator

Order No.:
083.28000

Mechanical process engineering
Separation methods: separation in a gravity field

CE 115
Fundamentals of sedimentation

Separation of suspensions

Order No.:
083.11500

HM 142
Separation in sedimentation tanks

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

Order No.:
070.14200

CE 587
Dissolved air flotation

Removal of solids from raw water using dissolved air flotation

Order No.: 083.58700

Mechanical process engineering
Separation methods: filtration

CE 116
Cake and depth filtration

Investigation of the basic principles of filtration: Darcy's equation

Order No.:
083.11600

CE 117
Flow through particle layers

Investigation of the properties of fixed and fluidised beds subjected to liquid flow

Order No.:
083.11700

CE 287
Plate and frame filter press

Discontinuous cake filtration for separating solids out of suspensions

Order No.:
083.28700

CE 283
Drum cell filter

Continuous cake filtration for separating solids out of suspensions

Order No.:
083.28300

CE 284
Nutsche vacuum filter

Discontinuous cake filtration by negative pressure

Order No.:
083.28400

CE 286
Nutsche pressure filter

Discontinuous cake filtration by positive pressure

Order No.:
083.28600

CE 285
Suspension production unit

Supply unit for experimental filtration units CE 283, CE 284, CE 286

Order No.:
083.28500

CE 579
Depth filtration

Removal of solids by depth filtration (sand filter)

Order No.:
083.57900

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

CE 282
Disc centrifuge

Continuous separation of emulsions

Order No.: 083.28200

CE 225
Hydrocyclone

Separation of solids from liquids by using a centrifugal force

Order No.:
083.22500

CE 235
Gas cyclone

Solid separation from gases using a cyclone

Order No.: 083.23500

Mechanical process engineering
Comminution

CE 245
Ball mill

Observation of the grinding process with regards to the comminution of solids

Order No.: 083.24500

Mechanical process engineering
Mixing and agglomeration

CE 320
Stirring

Visualization of flow fields in mixing with the use of different stirrer types

Order No.: 083.32000

CE 255
Rolling agglomeration

Dish granulator with adjustable rotation speed and angle of inclination

Order No.: 083.25500

Mechanical process engineering
Storage and flow of bulk solids

CE 210
Flow of bulk solids from silos

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

Order No.: 083.21000

CE 200
Flow properties of bulk solids

Using a ring shear apparatus to plot the shear force curves of bulk solids; basic principle of silo design

Order No.: 083.20000

Mechanical process engineering
Fluidised beds and pneumatic transport

CE 220
Fluidised bed formation

Investigation of fluidised bed formation of solids in air and water

Order No.:
083.22000

CE 250
Pneumatic transport

Upward, pneumatic pressure transport of solids in a vertical transparent pipe section

Order No.:
083.25000

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

Order No.: 083.31000

CE 310.01
Continuous stirred tank reactor

Tank for continuous or batch operation with agitator, heater coil and overflow

Order No.: 083.31001

CE 310.02
Tubular reactor

Tube coil as a reaction tube in a water bath for continuous reaction operation

Order No.: 083.31002

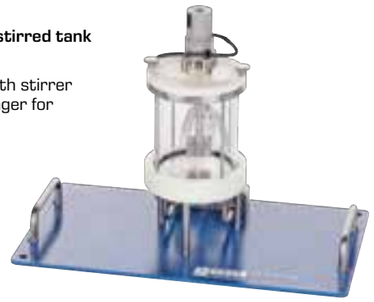
CE 310.03
Stirred tanks in series

Series connection of three stirred tank reactors

Order No.: 083.31003

CE 310.04
Discontinuous stirred tank reactor

Dewar vessel with stirrer and heat exchanger for isothermal or adiabatic saponification reaction



Order No.: 083.31004

CE 310.05
Plug-flow reactor

Continuously operated tubular reactor; fixed bed with glass spheres

Order No.: 083.31005

CE 310.06
Laminar flow reactor

Continuously operated tubular reactor

Order No.: 083.31006

CE 100
Tubular reactor

Demonstration of the influence of temperature and material contact time on the saponification reaction

Order No.: 083.10000

Chemical process engineering
Catalytic and photochemical activation

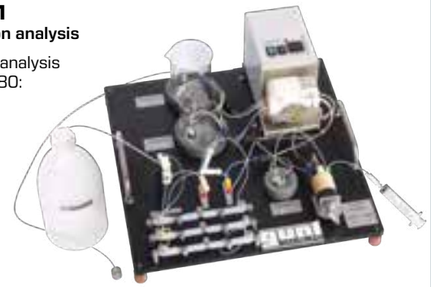
CE 380
Fixed bed catalysis

Investigation of catalytic reactions

Order No.: 083.38000

CE 380.01
Flow injection analysis

Professional analysis unit for CE 380: detection of glucose



Order No.: 083.38001

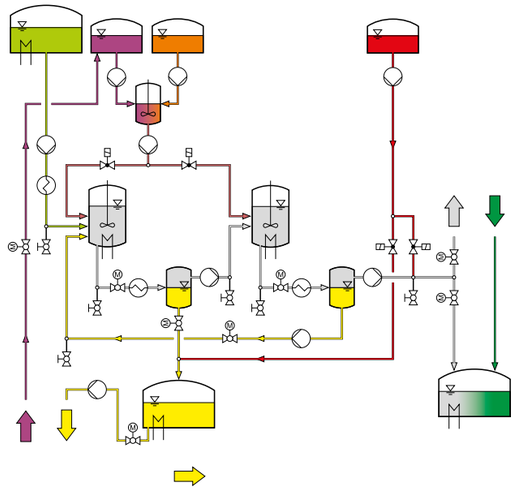
CE 584
Advanced oxidation

Oxidation of organic substances with hydrogen peroxide and UV light

Order No.: 083.58400

CE 650
Biodiesel plant

Chemical transesterification of vegetable oils



Order No.: 083.65000

Thermal process engineering
Drying and evaporation

CE 715
Rising film evaporation

Concentration of temperature-sensitive solutions

Order No.:
083.71500

CE 130
Convection drying

Drying curves for granular solids

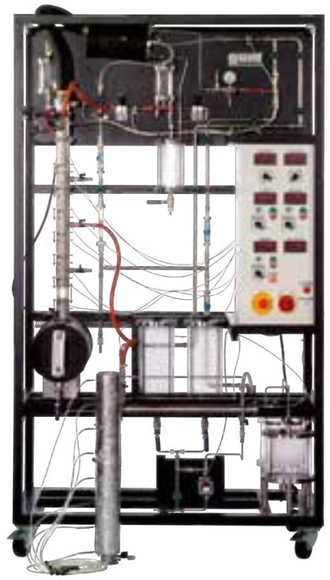
Order No.: 083.13000

Thermal process engineering
Distillation / rectification

CE 600
Continuous rectification

Continuous and discontinuous rectification with packed and sieve tray column

Order No.:
083.60000



CE 602
Discontinuous rectification

Comparison of packed and sieve plate columns in rectification

Order No.:
083.60200

CE 610
Comparison of rectification columns

PLC controlled continuous rectification with packed and sieve tray column

Order No.:
083.61000

Thermal process engineering
Absorption and adsorption

CE 400
Gas absorption

Separating a CO_2/air mixture by absorption in a solvent using counterflow

Order No.:
083.40000

CE 405
Falling film absorption

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

Order No.:
083.40500

CE 540
Adsorptive air drying

Basic principle of adsorption and desorption

Order No.: 083.54000

CE 583
Adsorption

Adsorption of dissolved substances on activated carbon

Order No.: 083.58300

Thermal process engineering
Crystallisation and membrane separation processes

CE 520
Cooling crystallisation

Investigation of crystal growth in a fluidised bed

Order No.: 083.52000

CE 530
Reverse osmosis

Membrane separation process for recovering the solvent from a salt solution

Order No.: 083.53000

Thermal process engineering
Extraction

CE 620
Liquid-liquid extraction

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

Order No.:
083.62000

CE 630
Solid-liquid extraction

Continuous or discontinuous extraction of the soluble components of a solid mixture using a revolving extractor

Order No.:
083.62000

Biological process engineering
Aerobic processes

CE 701
Biofilm process

Biological, aerobic water treatment by the biofilm process: trickling filter

Order No.: 083.70100

CE 730
Airlift reactor

Aerobic submerged reactor

Order No.: 083.73000

CE 705
Activated sludge process

Laboratory scale wastewater treatment plant for aerobic biodegradation of organic substances

Order No.: 083.70500

Biological process engineering
Anaerobic processes

CE 702
Anaerobic water treatment

Anaerobic degradation of organic substances in stirring tank and UASB reactor for biogas production (UASB: Upflow Anaerobic Sludge Blanket)

Order No.: 083.70200

CE 640
Biotechnical production of ethanol

Discontinuous conversion of starch-containing bio-resources into ethanol

Order No.: 083.64000

CE 642
Biogas plant

Two-stage continuous degradation of organic substances.
First stage: hydrolysis and acidification, second stage: anaerobic degradation

Order No.: 083.64200

Water treatment
Mechanical processes

CE 587
Dissolved air flotation

Removal of solids from raw water using dissolved air flotation

Order No.: 083.58700

HM 142
Separation in sedimentation tanks

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

Order No.: 070.14200

CE 579
Depth filtration

Removal of solids by depth filtration (sand filter)

Order No.: 083.57900

Water treatment
Biological processes

CE 701
Biofilm process

Biological, aerobic water treatment by the biofilm process: trickling filter

Order No.: 083.70100

CE 705
Activated sludge process

Laboratory scale wastewater treatment plant for aerobic biodegradation of organic substances

Order No.: 083.70500

CE 702
Anaerobic water treatment

Anaerobic degradation of organic substances in stirring tank and UASB reactor for biogas production (UASB: Upflow Anaerobic Sludge Blanket)

Order No.: 083.70200

Water treatment
Physical / chemical processes

CE 583
Adsorption

Adsorption of dissolved substances on activated carbon

Order No.: 083.58300

CE 300
Ion exchange

Softening and desalination of water by ion exchange

Order No.: 083.30000

CE 584
Advanced oxidation

Oxidation of organic substances with hydrogen peroxide and UV light

Order No.: 083.58400

CE 530
Reverse osmosis

Membrane separation process for recovering the solvent from a salt solution

Order No.: 083.53000

CE 586
Precipitation and flocculation

Removal of dissolved substances by precipitation, flocculation and sedimentation of the flocs in the lamella separator

Order No.: 083.58600

Water treatment
Combined processes

CE 581
Water treatment plant 1

Three basic procedures of water treatment: depth filtration, adsorption and ion exchange

Order No.:
083.58100

CE 582
Water treatment plant 2

Two basic procedures of water treatment: depth filtration and ion exchange

Order No.:
083.58200

Process control engineering

5c

Fundamentals of control engineering

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Components and calibration

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Coupled multivariable systems	247

Catalogues

This is where you can find extensive information, product descriptions and data sheets:

Offine
Print catalogue programme area 5c
“Process control engineering”

Online
at www.gunt.de

Software for
data acquisition / visualisation

Fundamentals of control engineering
Training systems

RT 010
Training system: level control, HSI

Fundamentals of control engineering using the example of a level control system with integral behaviour

Order No.: 080.01000

RT 020
Training system: flow control, HSI

Fundamentals of control engineering using the example of a rapid flow control system

Order No.: 080.02000

RT 030
Training system: pressure control, HSI

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

Order No.: 080.03000

RT 040
Training system: temperature control, HSI

Fundamentals of control engineering using the example of a temperature control system with dead time

Order No.: 080.04000

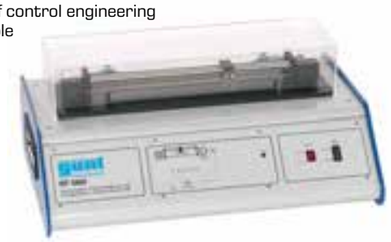
RT 050
Training system: speed control, HSI

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

Order No.: 080.05000

RT 060
Training system: position control, HSI

Fundamentals of control engineering using the example of a position control system with integral behaviour



Order No.: 080.06000

RT 200
Room temperature control

Simple temperature control loop with parametrisable industrial controller, actuator and controlled system

Order No.: 080.20000

Components and calibration
Sensors / metrology

IA 110
Calibrating a pressure sensor

Test pressure generated with dead-weight piston manometer

Order No.: 058.11000

HM 500
Flow meter trainer

Comparison and calibration of different flow meters

Order No.: 070.50000

Components and calibration
Actuators

RT 395
Maintenance of valves and fittings and actuators

Maintenance and operational check: four different fittings and actuators

Order No.: 080.39500

RT 390
Test stand for control valves

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

Order No.: 080.39000

RT 396
Pump and valves and fittings test stand

Recording characteristic curves of industrial fittings and a centrifugal pump

Order No.: 080.39600

Components and calibration
Controllers, controlled systems, networking

RT 350
Operation of industrial controllers

Simulation of controlled systems; digital controller with freely selectable parameters

Order No.: 080.35000

RT 360
Networking of industrial controllers

Function and structure of a process control system under Profibus DP

Order No.: 080.36000

RT 370
Setup of field bus systems

Parametrisation and communication of field bus systems

Order No.: 080.37000

RT 380
Optimization of control loops

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

Order No.: 080.38000

Components and calibration
Modular calibration systems

RT 310
Calibration station

Calibration of control loop components using precision measuring technique

Order No.: 080.31000

RT 304
Calibration trainer

Investigation of the transmission behaviour of actuators and transducers

Order No.: 080.30400

Simple process engineering control systems
Control engineering trainers

RT 614
Level control demonstration unit

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

Order No.: 080.61400

RT 624
Flow control demonstration unit

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

Order No.: 080.62400

RT 634
Pressure control demonstration unit

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

Order No.: 080.63400

RT 644
Temperature control demonstration unit

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

Order No.: 080.64400

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)

Order No.: 080.67400

Simple process engineering control systems
Control engineering trainers

RT 512
Level control trainer

Basic course in control engineering with industrial components using level controlled system

Order No.: 080.51200

RT 532
Pressure control trainer

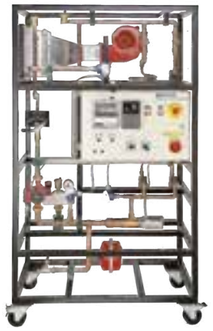
Basic course in control engineering with industrial components using first order and second order pressure controlled system

Order No.: 080.53200

RT 542
Temperature control trainer

Basic course in control engineering with industrial components using temperature controlled system with dead time

Order No.: 080.54200



RT 522
Flow control trainer

Basic course in control engineering with industrial components using flow controlled system

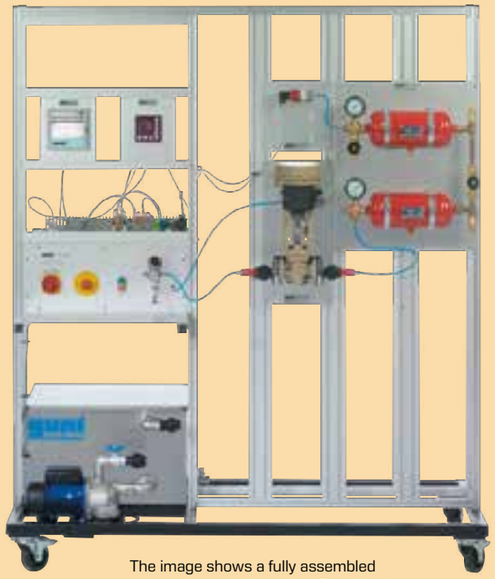
Order No.: 080.52200

RT 552
pH value control trainer

Basic course in control engineering with industrial components using pH controlled system with dead time

Order No.: 080.55200

Simple process engineering control systems
Modular process automation training system



The image shows a fully assembled pressure control system after planning and execution of the piping and wiring.

RT 450
Process automation training system: base module

Basis for the modular setup of the different process automation experiments, including electrical power supply and water supply with tank and pump

Order No.: 080.45000

RT 450.01
Controlled system module: level

Together with further components this is the main element for the setup of a level control loop

Order No.: 080.45001

RT 450.02
Controlled system module: flow

Together with further components this is the main element for the setup of a flow control loop

Order No.: 080.45002

RT 450.03
Controlled system module: pressure

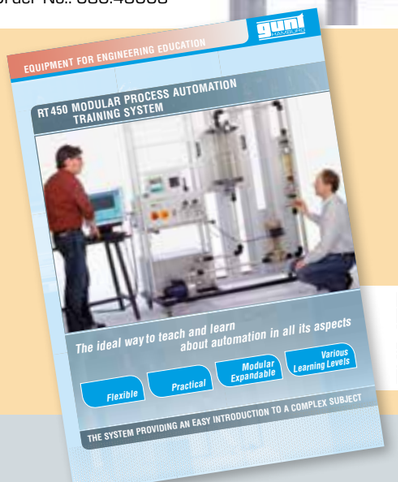
Together with further components this is the main element for the setup of a pressure control loop

Order No.: 080.45003

RT 450.04
Controlled system module: temperature

Together with further components this is the main element for the setup of a temperature control loop

Order No.: 080.45004



Complex process engineering control systems
PLC applications

RT 800
PLC application: mixing process

Experiments using PLC to control discontinuous mixing processes

Order No.: 080.80000

IA 130
PLC module

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

Order No.: 058.13000

Complex process engineering control systems
Combined multivariable systems

RT 586
Control of water quality

Control of pH-value, redox potential, oxygen concentration and electrical conductivity

Order No.: 080.58600

RT 578
Control of four variables from process engineering

Practical control of level, flow rate, pressure and temperature

Order No.: 080.57800

RT 580
Fault finding in control systems

Control of level, flow rate, temperature and cascade control; PLC for monitoring safety devices

Order No.: 080.58000

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

Order No.: 080.59000

Complex process engineering control systems
Coupled multivariable systems

RT 681
Multivariable control: vacuum degassing

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

Order No.: 080.68100

RT 682
Multivariable control: stirred tank

Heated stirrer tank with heat recovery as model: coupled level and temperature control

Order No.: 080.68200

Energy & environment

6

Energy

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Catalogues

This is where you can find extensive information, product descriptions and data sheets:

Offine
Print catalogue programme area 6
"Energy & environment"

Online
at www.gunt.de

Software for
data acquisition / visualisation

Energy

Solar energy: photovoltaics

ET 250
Solar module measurements

Determining the characteristic parameters of a photovoltaic system

Order No.: 061.25000

ET 250.02
Stand-alone operation of photovoltaic modules

Expansion module for ET 250 with components for independent use of electricity from solar panels

Order No.: 061.25002

ET 250.01
Photovoltaic in grid-connected operation

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

Order No.: 061.25001

ET 252
Solar cell measurements

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

Order No.: 061.25200

ET 255
Using photovoltaics: grid-connected or stand-alone

Electrical components of a real life photovoltaic system

Order No.: 061.25500

Energy

Solar energy: solar thermal energy

ET 202
Principles of solar thermal energy

Determining characteristic parameters of a solar thermal system using an artificial radiation source

Order No.: 061.20200

WL 377
Convection and radiation

Heat transfer by convection and radiation in gases

Order No.: 060.37700

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

Order No.: 065.31300

HL 320.03
Flat plate collector

Pivotable flat plate collector for converting solar energy into heat

Order No.: 065.32003

HL 320.04
Evacuated tube collector

Conversion of solar energy into heat in the evacuated tube collector

Order No.: 065.32005

HL 320.05
Central storage module with controller

Module with buffer storage and bivalent storage for heating systems with renewable energies

Energy

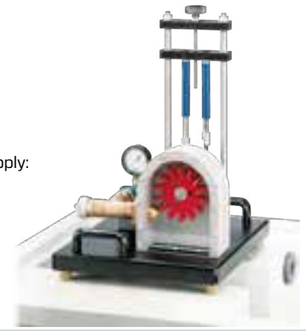
Hydropower and ocean energy

HM 150.19
Operating principle of a Pelton turbine

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

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

Order No.: 070.15019

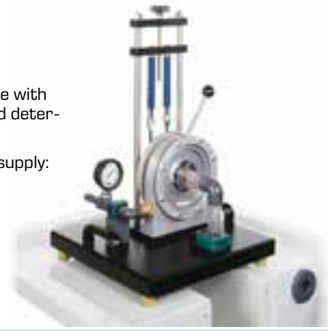


HM 150.20
Operating principle of a Francis turbine

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

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

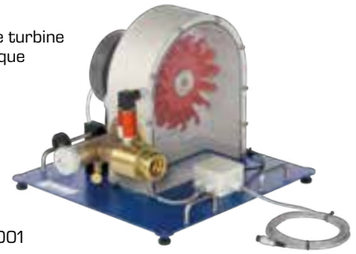
Order No.: 070.15020



HM 450.01
Pelton turbine

Model of an impulse turbine with speed and torque measurement

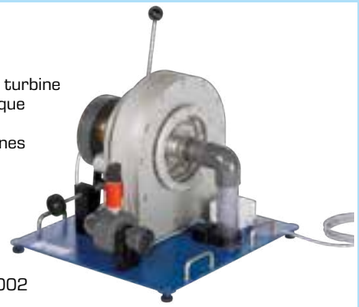
Order No.: 070.45001



HM 450.02
Francis turbine

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

Order No.: 070.45002



HM 450C
Characteristic variables of hydraulic turbomachines

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

Order No.: 070.450C0

HM 421
Kaplan turbine trainer

Four-bladed Kaplan turbine with guide vane adjustment for varying power

Order No.: 070.42100

HM 430C
Francis turbine trainer

Characteristics of a powerful Francis turbine with adjustable guide vanes

Order No.: 070.430C0

HM 365.31
Pelton and Francis turbine

Comparison of impulse and reaction turbines

Order No.: 070.36531

HM 365.32
Turbine supply unit

Water supply for HM 365.31

Order No.: 070.36532

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

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

ET 270
Wave energy converter

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

Order No.: 061.27000

Energy

Wind power:
fundamentals of wind energy technology

HM 170
Open wind tunnel

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

Order No.:
070.17000

HM 170.22
Pressure distribution on an aerofoil NACA 0015

Effective lift force and flow separation for different angles of attack

Order No.: 070.17022

HM 170.05
Drag body square plate

Order No.: 070.17005

HM 170.09
Drag body aerofoil NACA 0015

Order No.: 070.17009

ET 220
Energy conversion in a wind power plant

Conversion of kinetic wind energy into electrical energy

Order No.:
061.22000

ET 220.01
Wind power plant

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

Order No.:
061.22001

ET 220.10
Control unit for wind power plant ET 220.01

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

Order No.:
061.22010

Energy

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

Order No.: 030.21000

GL 212
Dynamic behaviour of multistage planetary gears

Investigation of rotational dynamics of a two-stage epicyclic gear with three planetary gears each

Order No.: 030.21200

PT 500.11
Crack detection in rotating shaft kit

Vibrational behaviour of a shaft with a radial crack

Order No.: 052.50011

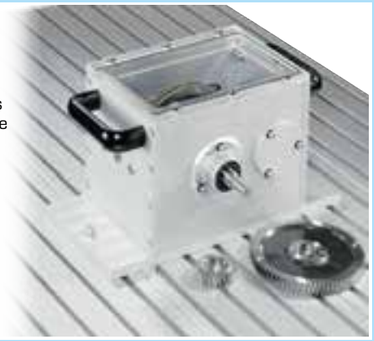
PT 500.12
Roller bearing faults kit

Assessment of bearing condition by vibration analysis

Order No.: 052.50012

PT 500.15
Damage to gears kit

Vibration analysis of gearing damage



Order No.:
052.50015

PT 500.19
Electromechanical vibrations kit

Investigation of vibrational behaviour of an electric motor

Order No.: 052.50019

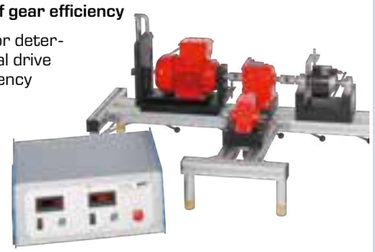
PT 500
Machinery diagnostic system, base unit

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

Order No.:
052.50000

AT 200
Determination of gear efficiency

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



Order No.:
031.20000

Energy

Biomass: bioethanol

CE 640
Biotechnical production of ethanol

Discontinuous conversion of starch-containing bio-resources into ethanol

Order No.: 083.64000

Energy

Biomass: biogas

CE 642
Biogas plant

Two-stage continuous degradation of organic substances.
First stage: hydrolysis and acidification, second stage: anaerobic degradation

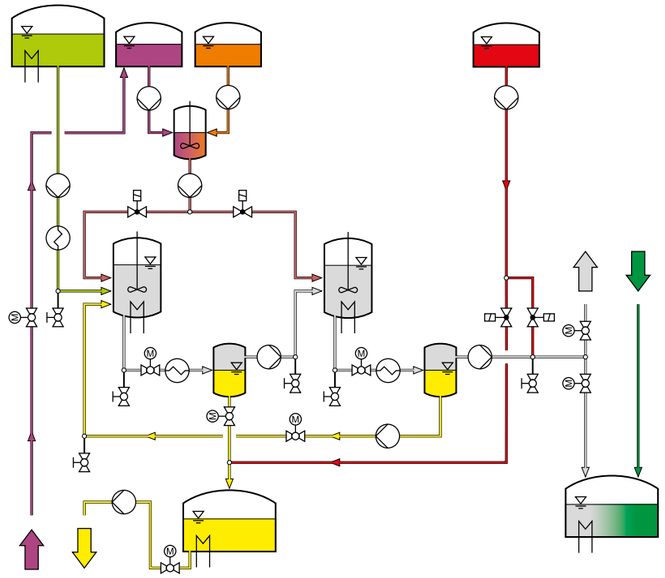
Order No.:
083.64200

Energy

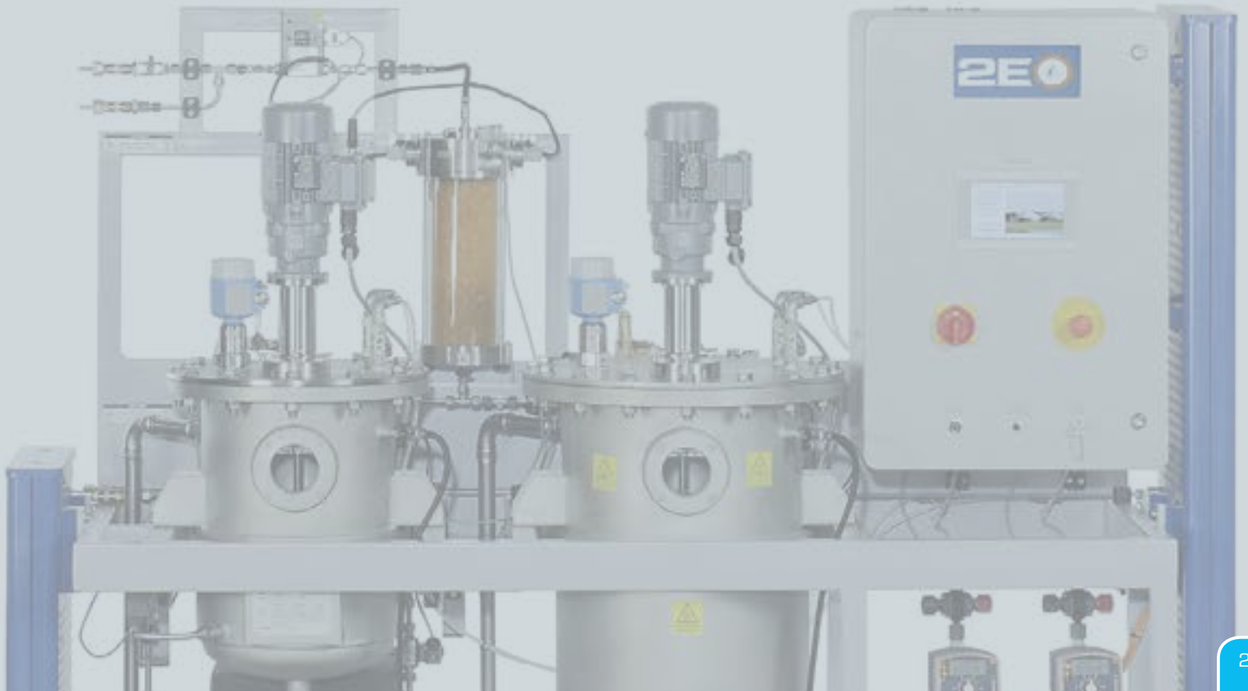
Biomass: biodiesel

CE 650
Biodiesel plant

Chemical transesterification of vegetable oils



Order No.: 083.65000



Energy

Geothermal energy: heat exchangers

WL 110
Heat exchanger supply unit

Measuring the transfer characteristics of four different heat exchanger models

Order No.: 060.11000

WL 110.01
Tubular heat exchanger

Demonstration of the function and behaviour of a tubular heat exchanger in parallel flow and counterflow operation

Order No.: 060.11001

WL 110.02
Plate heat exchanger

Demonstration of the function and behaviour of a plate heat exchanger in parallel flow and counterflow operation

Order No.: 060.11002

WL 110.03
Shell & tube heat exchanger

Demonstration of the function and behaviour of a shell and tube heat exchanger in cross parallel flow and cross counterflow operation

Order No.: 060.11003

WL 110.04
Jacketed vessel with stirrer & coil

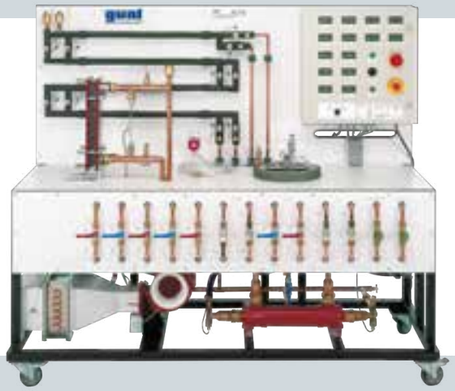
Heating using jacket or coiled tube; stirrer for improved mixing of medium

Order No.: 060.11004

WL 315C
Trainer for various heat exchangers

Comparison of plate heat exchanger, tubular heat exchanger, shell and tube heat exchanger, finned cross-flow heat exchanger, and jacketed vessel with stirrer

Order No.: 060.315C0



Energy

Geothermal energy: shallow geothermal energy

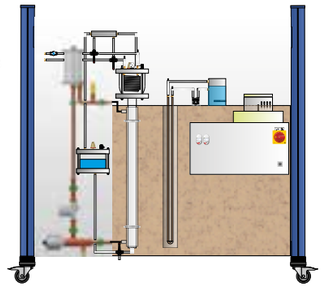
ET 101
Simple compression refrigeration circuit

Demonstration of a heat pump: cooling and heating of the heat exchangers directly tangible

Order No.: 061.10100

ET 262
Geothermal probe with heat pipe principle

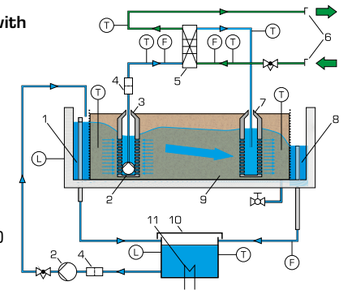
Transparent components offer insight into the changes of state of the working medium



Order No.: 061.26200

ET 264
Geothermal energy with two-well system

Open circuit for use of geothermal energy



Order No.: 061.26400

HL 320.01
Heat pump

Heat pump for operation with different sources

Order No.: 065.32001

HL 320.07
Underfloor heating / geothermal energy absorber

Can be used as heat sink or heat source

Order No.: 065.32007

HL 320.08
Fan heater / air heat exchanger

Can be used as heat sink or heat source

Order No.: 065.32008

Energy

Geothermal energy:
deep geothermal energy

ET 851
Axial steam turbine

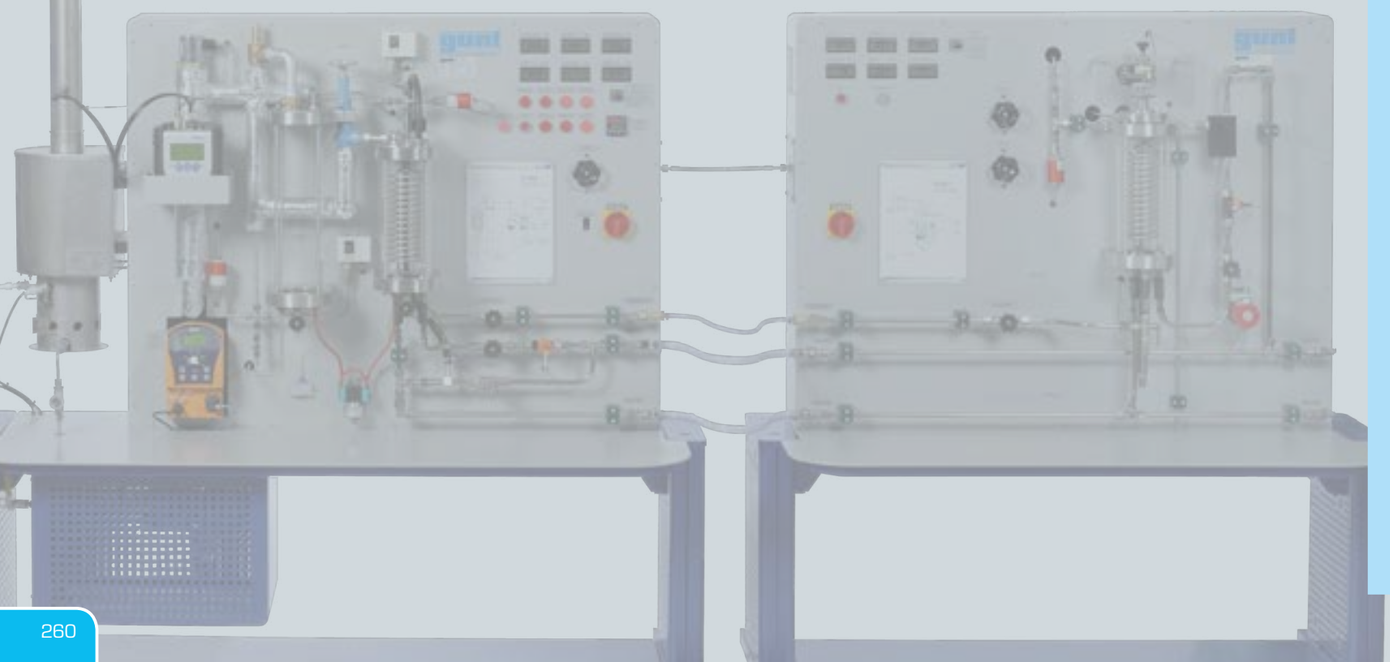
Single-stage steam turbine with power output measurement; steam supply from ET 850

Order No.: 061.85100

ET 850
Steam generator

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

Order No.: 061.85000



Energy

Energy systems:
conversion in energy systems

ET 292
Fuel cell system

Water-cooled polymer-membrane fuel cell combined heat and power

Order No.: 061.29200

ET 102
Heat pump trainer

Utilisation of ambient heat for water heating

Order No.: 061.10200

ET 794
Gas turbine with power turbine

Two-shaft system with radial compressor and two radial turbines using liquid gas

Order No.: 061.79400

HL 320.01
Heat pump

Heat pump for operation with different sources

Order No.: 065.32001

HL 320.07
Underfloor heating / geothermal energy absorber

Can be used as heat sink or heat source

Order No.: 065.32007

HL 320.08
Fan heater / air heat exchanger

Can be used as heat sink or heat source

Order No.: 065.32008

Energy

Energy systems:
storage in energy systems

Single-stage compressor ET 513
with drive unit HM 365

ET 513
Single-stage piston compressor

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

Order No.: 061.51300

HM 365
Universal drive and brake unit

Core component for experiments on various driving and driven machines

Order No.: 070.36500

HM 143
Transient drainage processes in storage reservoirs

Demonstration of the function of a rainwater retention basin and a dam

Order No.: 070.14300

ET 255
Using photovoltaics: grid-connected or stand-alone

Electrical components of a real life photovoltaic system

Order No.: 061.25500

ET 420
Ice stores in refrigeration

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

Order No.: 061.42000

ET 220
Energy conversion in a wind power plant

Conversion of kinetic wind energy into electrical energy

Order No.: 061.22000

ET 220.10
Control unit for wind power plant ET 220.01

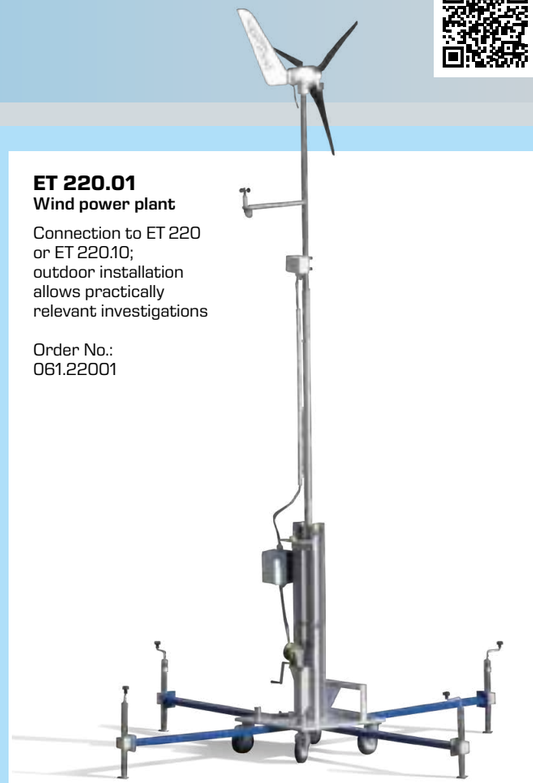
Use of wind energy in stand-alone operation under real weather conditions

Order No.: 061.22010

ET 220.01
Wind power plant

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

Order No.: 061.22001



HL 320.03
Flat plate collector

Pivotable flat plate collector for converting solar energy into heat

Order No.: 065.32003

HL 320.05
Central storage module with controller

Module with buffer storage and bivalent storage for heating systems with renewable energies

Order No.: 065.32005

Energy

Energy efficiency in building service engineering:
heat supply and air conditioning

WL 376
Thermal conductivity of building materials

Investigation of the insulation properties of typical materials from the building materials sector

Order No.:
060.37600

WL 110
Heat exchanger supply unit

Measuring the transfer characteristics of four different heat exchanger models

Order No.: 060.11000

WL 110.01
Tubular heat exchanger

Demonstration of the function and behaviour of a tubular heat exchanger in parallel flow and counterflow operation

Order No.:
060.11001

WL 110.02
Plate heat exchanger

Demonstration of the function and behaviour of a plate heat exchanger in parallel flow and counterflow operation

Order No.:
060.11002

WL 110.03
Shell & tube heat exchanger

Demonstration of the function and behaviour of a shell and tube heat exchanger in cross parallel flow and cross counterflow operation

Order No.:
060.11003

WL 110.04
Jacketed vessel with stirrer & coil

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

Order No.:
060.11004

HL 305
Hydronic balancing of radiators

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

Order No.: 065.30500

HL 630
Efficiency in heating technology

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

Order No.: 065.63000

ET 340
Building automation in heating and air conditioning systems

Operation and programming of a DDC (Direct Digital Control) for heating and air conditioning systems

Order No.: 061.34000

HM 283
Experiments with a centrifugal pump

Determination of the characteristics of a centrifugal pump

Order No.: 070.28300

ET 630
Split system air conditioner

Modern air conditioning unit with heat pump function: cooling or heating

Order No.: 061.63000

Energy

Energy efficiency in building service engineering: inclusion of renewable energies

HL 320.01
Heat pump

Heat pump for operation with different sources

Order No.: 065.32001

HL 320.02
Conventional heating

Electric auxiliary heater for the module system HL 320

Order No.: 065.32002

HL 320.03
Flat plate collector

Pivotable flat plate collector for converting solar energy into heat

Order No.: 065.32003

HL 320.04
Evacuated tube collector

Conversion of solar energy into heat in the evacuated tube collector

Order No.: 065.32004

HL 320.05
Central storage module with controller

Module with buffer storage and bivalent storage for heating systems with renewable energies

Order No.: 065.32005

HL 320.07
Underfloor heating / geothermal energy absorber

Can be used as heat sink or heat source

Order No.: 065.32007

HL 320.08
Fan heater / air heat exchanger

Can be used as heat sink or heat source

Order No.: 065.32008

Energy

Energy efficiency in building service engineering: energy efficiency in business and industry

ET 420
Ice stores in refrigeration

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

Order No.: 061.42000

ET 428
Energy efficiency in refrigeration systems

Investigation of a refrigeration system in multi-compressor operation

Order No.: 061.42800

RT 682
Multivariable control: stirred tank

Heated stirrer tank with heat recovery as model: coupled level and temperature control

Order No.: 080.68200

RT 396
Pump and valves and fittings test stand

Recording characteristic curves of industrial fittings and a centrifugal pump

Order No.: 080.39600

Environment

Water:
mechanical water treatment

HM 142
Separation in sedimentation tanks

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

Order No.: 070.14200

CE 579
Depth filtration

Removal of solids by depth filtration (sand filter)

Order No.: 083.57900

CE 587
Dissolved air flotation

Removal of solids from raw water using dissolved air flotation

Order No.: 083.58700

Environment

Water:
biological water treatment

CE 705
Activated sludge process

Laboratory scale wastewater treatment plant for aerobic biodegradation of organic substances

Order No.: 083.70500

CE 701
Biofilm process

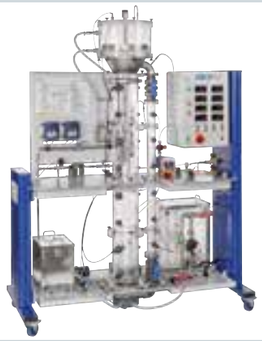
Biological, aerobic water treatment by the biofilm process: trickling filter

Order No.: 083.70100

CE 730
Airlift reactor

Aerobic submerged reactor

Order No.: 083.73000



CE 702
Anaerobic water treatment

Anaerobic degradation of organic substances in stirring tank and UASB reactor for biogas production (UASB: Upflow Anaerobic Sludge Blanket)

Order No.: 083.70200

Environment

Water:
physical / chemical water treatment

CE 583
Adsorption

Adsorption of dissolved substances on activated carbon

Order No.:
083.58300

CE 300
Ion exchange

Softening and desalination of water by ion exchange

Order No.:
083.30000

CE 584
Advanced oxidation

Oxidation of organic substances with hydrogen peroxide and UV light

Order No.:
083.58400

CE 530
Reverse osmosis

Membrane separation process for recovering the solvent from a salt solution

Order No.:
083.53000

CE 586
Precipitation and flocculation

Removal of dissolved substances by precipitation, flocculation and sedimentation of the flocs in the lamella separator

Order No.: 083.58600

Environment

Water:
multistage water treatment

CE 581
Water treatment plant 1

Three basic procedures of water treatment: depth filtration, adsorption and ion exchange

Order No.:
083.58100

CE 582
Water treatment plant 2

Two basic procedures of water treatment: depth filtration and ion exchange

Order No.:
083.58200

Environment

Air:
mechanical processes

CE 235
Gas cyclone

Solid separation from gases using a cyclone

Order No.: 083.23500

Environment

Air:
thermal processes

CE 400
Gas absorption

Separating a CO_2/air mixture by absorption in a solvent using counterflow

Order No.:
083.40000

CE 540
Adsorptive air drying

Basic principle of adsorption and desorption

Order No.: 083.54000

Environment

Soil:
hydrogeology

HM 165
Studies in hydrology

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

Order No.:
070.16500

HM 141
Hydrographs after precipitation

Correlations between precipitation and percolation; storage capacity and drainage methods

Order No.:
070.14100

HM 167
Ground water flow

Three-dimensional investigations and demonstration of flood and drainage

Order No.:
070.16700

HM 169
Visualisation of seepage flows

Graphical determination of flow fields and investigation of water pressure on structures

Order No.:
070.16900

Environment

Soil:
soil treatment

CE 225
Hydrocyclone

Separation of solids from liquids by using a centrifugal force

Order No.:
083.22500

CE 630
Solid-liquid extraction

Continuous or discontinuous extraction of the soluble components of a solid mixture using a revolving extractor

Order No.:
083.62000

Environment

Waste:
comminution

CE 245
Ball mill

Observation of the grinding process with regards to the comminution of solids

Order No.:
083.24500

Environment

Waste:
separation processes

CE 275
Gas flow classification

Zigzag sifter to separate solid compounds

Order No.:
083.27500

CE 280
Magnetic separation

Sorting with a drum-type magnetic separator

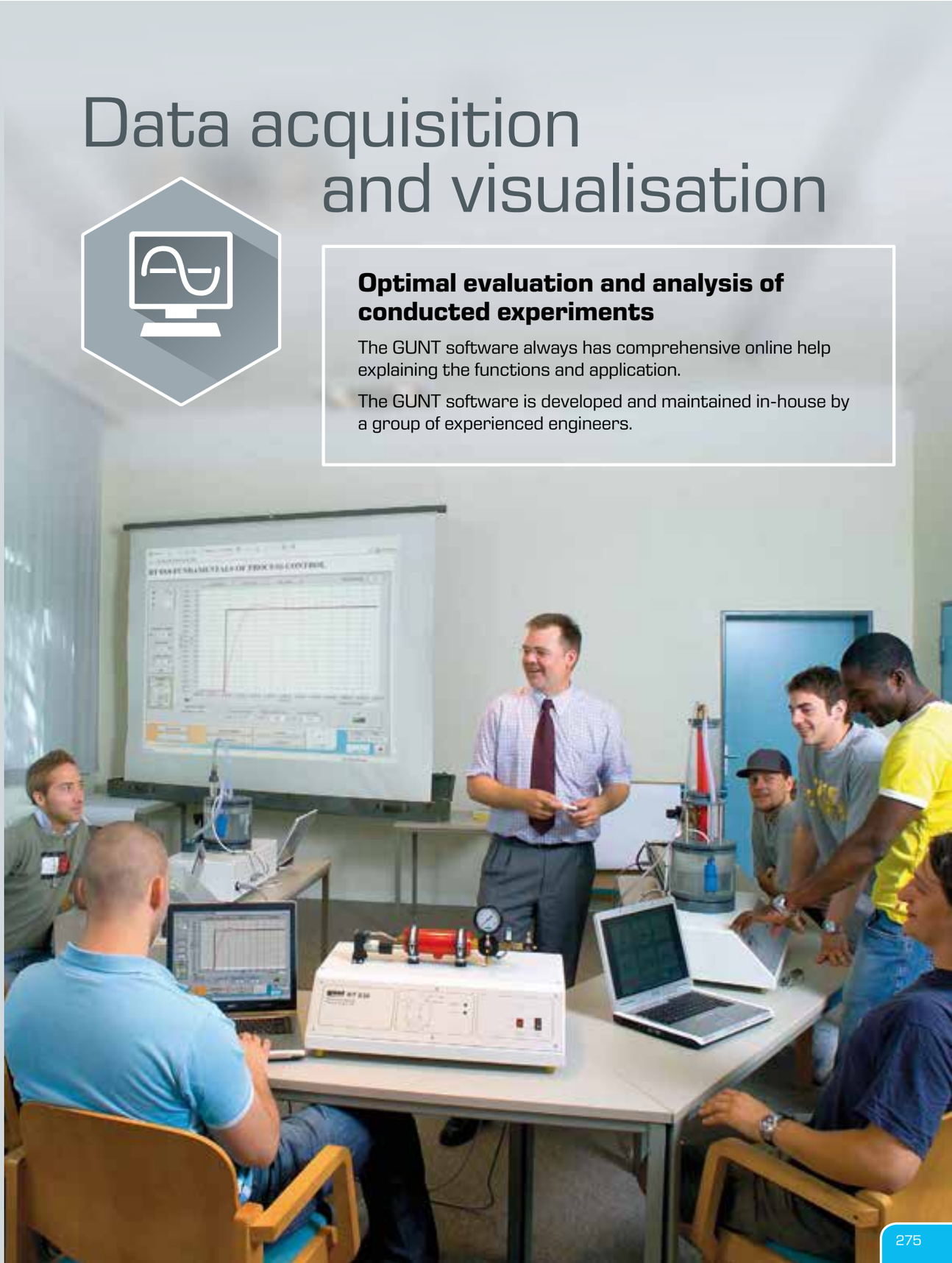
Order No.:
083.28000

Data acquisition and visualisation

Optimal evaluation and analysis of conducted experiments

The GUNT software always has comprehensive online help explaining the functions and application.

The GUNT software is developed and maintained in-house by a group of experienced engineers.



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