GUNT-Labline
Complete course on fluid machinery

The GUNT-Labline “Fluid Energy Machines” allows an easy introduction to a complex subject. The experimental units offer basic experiments to familiarise students with the function, the operating behaviour and the most important characteristics of positive displacement and turbomachines. Transparent housings allow observation during operation. The GUNT-Labline comes with microprocessor-based metrology and a device-specific GUNT software for control and data acquisition via USB.

Advantages of the device conception:

- the compact design enables mobile use of the experimental units
- easy transport thanks to handles on the tabletop devices and rollers on the frame
- the same device can be used for demonstration purposes in the lecture hall or the classroom or to conduct experiments in the laboratory
- only a power connection is required for operation of the equipment
- no external water supply required thanks to closed water circuits
- despite complex metrology and software analysis, the devices do not require any complicated wiring: a USB connection to the computer is sufficient
- transparent housing and clear arrangement provide an excellent insight on the functions of the components and on the procedures for operation of the equipment
- damage caused by incorrect operation is very rare thanks to the way in which the devices are designed
- the compact size of the experimental units and the low price make it easy to fit out a classroom or laboratory with a larger number of experiment workstations

Ideas in the didactic concept:

- a self-contained course on the topic of fluid energy machines
- the experimental units of one sub-field complement each other in terms of learning objectives
- each experimental unit forms a self-contained learning unit
- effective learning in small groups (2-3 people)
- the direct proximity to the experimental unit encourages inquisitive exploration of the technology
- development of characteristic properties of various types of machines
- comparison and evaluation of different types of machines

In addition, the common fundamentals of the experimental techniques can be practised, for example:

- selecting the chart axes
- selecting the increment when varying parameters
- waiting for the steady state
- averaging over time with fluctuating readings, etc.

Experiments for different fans and a radial compressor

HM 280
Experiments with a radial fan

HM 282
Experiments with an axial fan

HM 292
Experiments with a radial compressor

Experiments for different water turbines

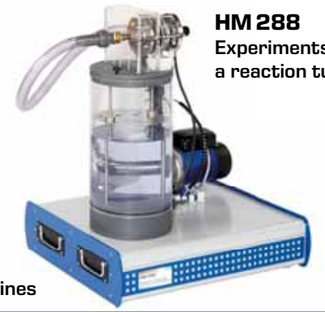
HM 289
Experiments with a Pelton turbine

HM 291
Experiments with an action turbine

HM 287
Experiments with an axial turbine

HM 288
Experiments with a reaction turbine

HM 290
Base unit for turbines



Experiments for centrifugal and positive displacement pumps

HM 283
Experiments with a centrifugal pump

HM 285
Experiments with a piston pump

HM 284
Series and parallel connected pumps

HM 286
Experiments with a gear pump

Learning concept of the GUNT-Labline range

Advantages of the learning concept

In order to enable optimal teaching in the demanding field of fluid energy machines, we have developed a learning concept that perfectly combines the various advantages of mechanical models, device-specific software and the instructional material.

Simple and clear mechanical models of the machines are connected to the PC via USB. Operation, measurement, display and analysis of measurement data are all carried out on the PC. To this end, the electronic data acquisition and control components are fully integrated into the models. The PC is therefore an integral part of the system. We call this the Hardware-Software Integration approach, or HSI for short.

The experimental units represent self-contained learning units, complementing the experimental units from a sub-field in terms of the learning objectives. During the experiments, importance is placed on the development of characteristic properties of the various types of machine. This allows the students to perform an evaluative comparison of the machine types and to assimilate criteria for later work in practice. The advantages and disadvantages of different types of machines can be demonstrated and discussed.

Mechanical model

Housing, pipes and tanks are transparent and provide a view of the key components and flow processes during operation (vortex, air bubbles, cavitation). Operating and flow noise and vibrations produce a realistic impression.

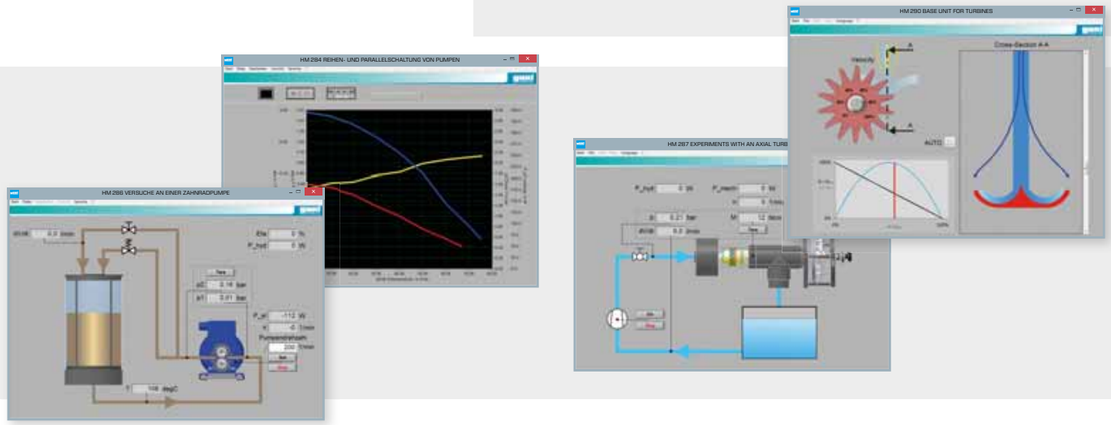
All this makes the function and processes in a machine understandable and guarantees a sustainable learning experience.

Water jet in the reaction turbine HM 288

Instructional material in paper form

A fundamental section with the relevant theory and model-based experiment instructions allow an intensive preparation for the experiment. Sample experiment results allow a qualified assessment of the students' own results.

Our didactic materials offer excellent support when preparing lessons, when conducting the experiments and when reviewing the experiment.



Device-specific GUNT software

The software forms a bridge between the mechanical model and the instructional material in paper form.

The software reflects the behaviour of the machine in specific measurements. The machine's behaviour can be studied and discussed in form of characteristic curves. Through simulation, the software provides the ability to visualise flow processes that cannot be seen and to show them in slow motion.

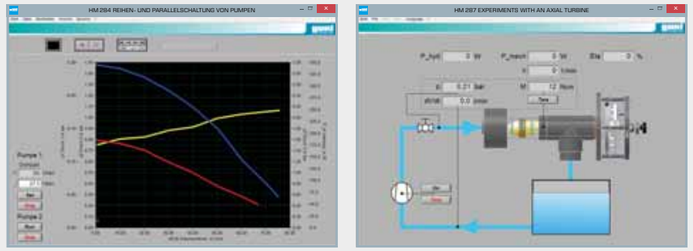
In particular the energy conversion between a mechanical component and a fluid in a fluid energy machine is easily understood.

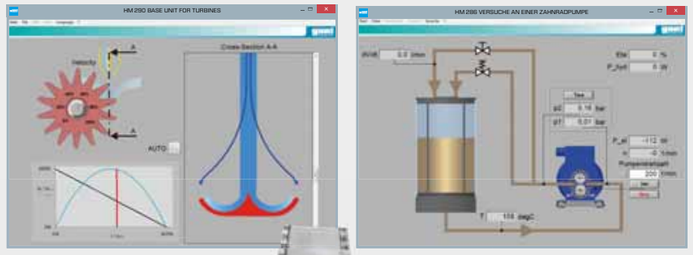
Learning concept of the GUNT-Labline range

A wide range of experiments with a variety of options

Device-specific GUNT software, together with the microprocessor, provides software-based experiment execution and assessment

- record typical characteristic curves
- measurement of the mechanical, electrical and hydraulic power as well as power consumption
- determine the efficiency
- effect of speed on pressure and flow rate
- advantages and disadvantages of various fluid energy machines
- how the impeller shape affects the characteristic and efficiency
- occurrence of cavitation
- function of an air vessel





Overview of the topics

Fans, compressors

- typical dependence of pressure on speed
- typical dependence of flow rate on speed
- hydraulic power output and efficiency

HM 280
Experiments with a radial fan

- characteristic of a radial fan
- effect of the impeller shape

HM 282
Experiments with an axial fan

- characteristic of an axial fan
- stall

HM 292
Experiments with a radial compressor

- characteristic of a 2-stage radial compressor
- stage pressure ratio
- temperature increase

Pumps

- powers and efficiency

HM 283
Experiments with a centrifugal pump

- typical dependence of pressure and flow rate on the speed
- characteristic of a centrifugal pump
- effect of direction of rotation
- cavitation

HM 284
Series and parallel connected pumps

- individual and overall characteristics
- advantages and disadvantages of series and parallel connections
- efficiency considerations and areas of application

HM 285
Experiments with a piston pump

- typical characteristic of a displacement pump
- cyclical pump process over time
- p,V diagram and internal power
- pulsation and air vessel
- mechanical drive power

HM 286
Experiments with a gear pump

- typical dependence of pressure and flow rate on the speed
- pressure limitation
- characteristic of a displacement pump

Turbines

- torque/speed characteristic curve
- hydraulic input power, mechanical output power
- efficiency

HM 287
Experiments with an axial turbine

- power regulation

HM 288
Experiments with a reaction turbine

- partial load behaviour

HM 289
Experiments with a Pelton turbine

- partial load behaviour with needle adjustment compared to a throttle control

HM 291
Experiments with an action turbine

- partial load behaviour with regulation via number of nozzles compared to a throttle control