Christiani

Technical Institute for
Vocational Training

Since 1931

Renewable Energy/ Sanitation/HVAC 2017

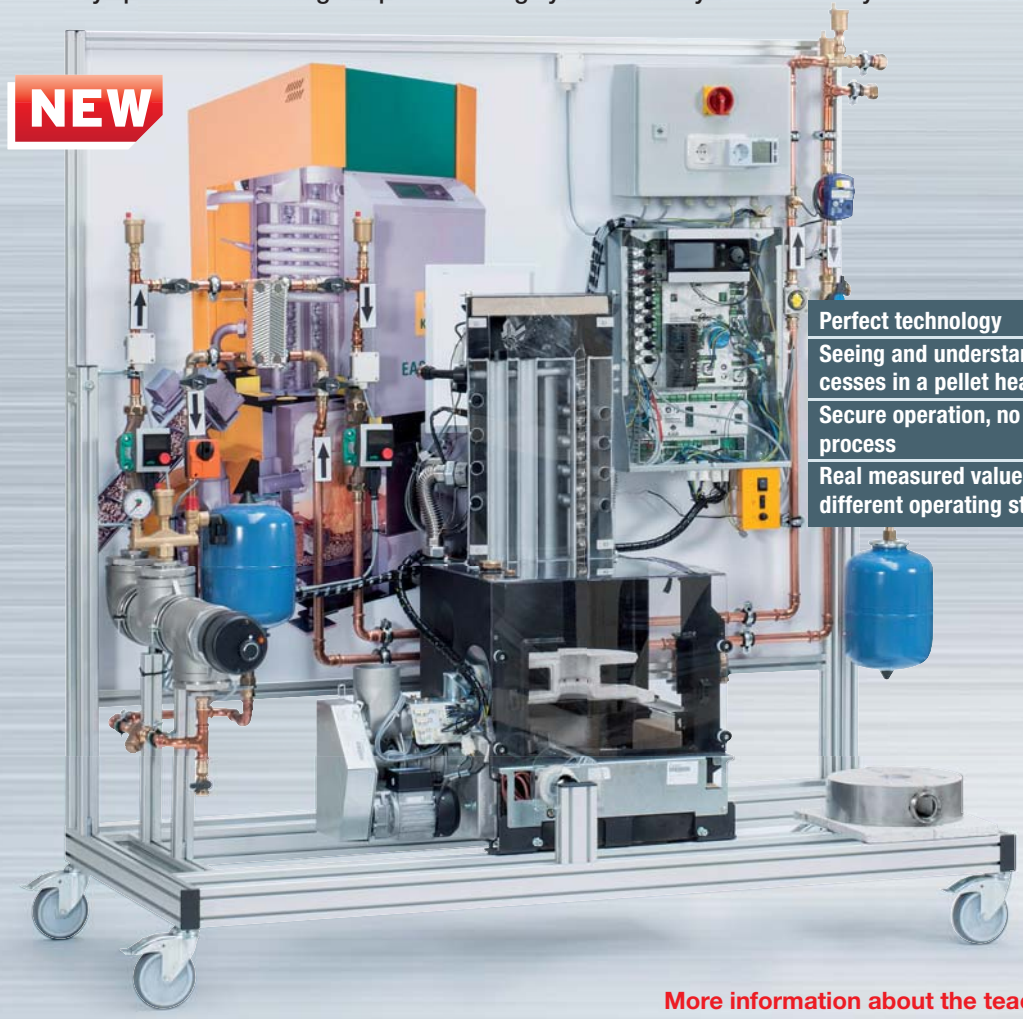
TVET – Made in Germany

christiani-tvet.com

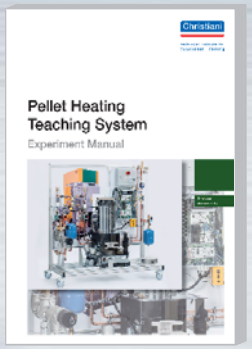
Pellet heating teaching system

Teaching biomass and pellet heating technology effectively

The new entry in the teaching system for heating technology with renewable energy range:
The S7 Pellet Heating training stand can be combined with other training stands of the teaching system for heating technology with renewable energy.
The hands-on teaching system enables you to teach the fundamental principles of biomass heating systems and the necessary specialist knowledge of pellet heating systems clearly and effectively.



- **Perfect technology**
- **Seeing and understanding of all processes in a pellet heating system**
- **Secure operation, no real burning process**
- **Real measured values or simulation of different operating states**



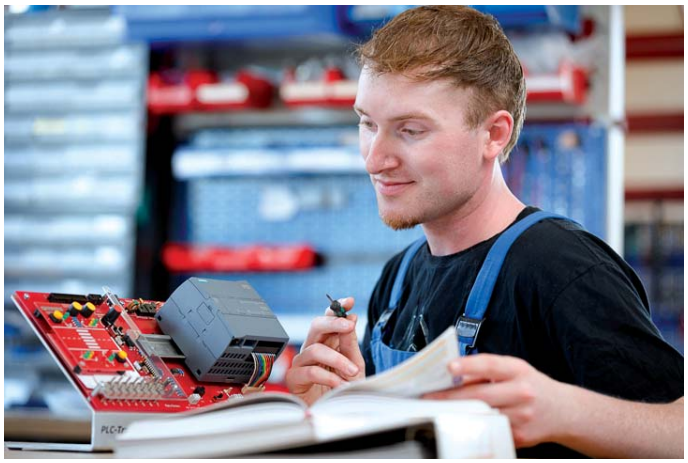
More information about the teaching system for heating technology with renewable energy from page 52

Content

Your partner for technical vocational education and training

Find out more at:
www.christiani-tvet.com

Training Lab Concepts



Renewable Energy, Sanitation/HVAC 25

Christiani – your expert in technical training and hands-on learning

Hands-on learning is a fundamental aspect of technical training – it helps learners to acquire knowledge, skills and competences which are essential in working life since they are close to the needs of industry. With its products and activities Christiani is promoting and implementing this learning model. Christiani has been active in the field of technical vocational training for over 80 years and stands for high-quality, hands-on training and continuing education. Christiani is further expanding its business abroad – our products are already used in more than 70 countries.

As a consequence the number of teaching materials in foreign languages is steadily growing thus supporting hands-on learning abroad based on the German dual system and its action-based didactic methods.

Services and products:

- Developing of teaching materials
- Manufacturing of learning systems
- Publishing of books & multimedia products
- Providing of examination materials
- Train-the-Trainer, consulting
- Textbooks
- Didactic teaching material
- Interactive learning programs
- Project works, cutaway models
- Teaching systems, training stands
- Laboratory furniture

Important facts & figures:

- Over 15 000 products
- Delivery to over 70 countries
- In the market for more than 80 years
- Global sales network
- Over 50 000 customers
- 150 employees

Our company has been firmly anchored in Constance since 1936 and we wish to contribute with our daily work to make Constance with its universities an important knowledge center. With over 150 employees, we have become one of the most important 'job providers' in the region.

Strong together: Industry and didactics, hand in hand

In developing our innovative products, we work closely with well-known partners from industry and trade. This enables us to combine the technical expertise of the industry with our didactic skills, in order to create unique offers. Our joint aim is to bring young people up to speed in technology matters and to enable them to achieve a successful start to their careers.

Lasting learning success through an overall didactic concept

Media	Hardware	Services
Specialised books	Training stands	Analysis & consultation
Interactive Learning Programmes	Teaching systems	Didactic concepts
Training Software	Workstation systems	Educational services
Tasks for exam preparation	Training lab equipment	Planning of training labs
Distance learning courses	Cut away models	Train-the-trainer
	Material kits	Seminars & workshops
	Projekt Works	In-house production

Mechanics | Electronics | Automation | Automotive | Renewable Energy | School/Physics

85 years experience in technical education

2010
UNIVERSITY
Offering training systems for universities

2009
General & Secondary Schools
Offering teaching aids for technics and physics

2008
Christiani Sharpline Technical Training
An Indo-German Joint Venture, founded 2008 in Mumbai, India

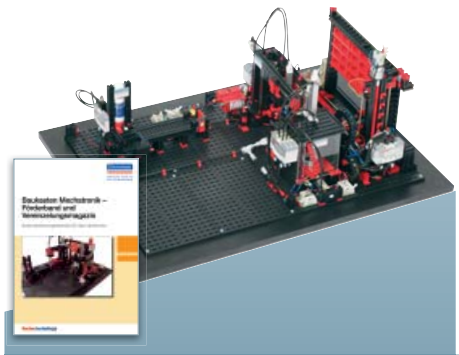
2001
International Business
Opening up to international markets

1971
Vocational Training
Entering the field of vocational training and developing examination tasks

1931
Further Training
Founded as correspondence college in Frankfurt, Germany

Learning example: Mechatronics

This example shows the continuous training concept applied by Christiani. In school, the pupils set up a factory simulation – it's fun and simple. Training continues in a practical and realistic manner in vocational training and in universities. Finally, the further professional training offerings from the Christiani Academy provide your employees with the opportunity to increase their level of specialisation while continuing in full employment.



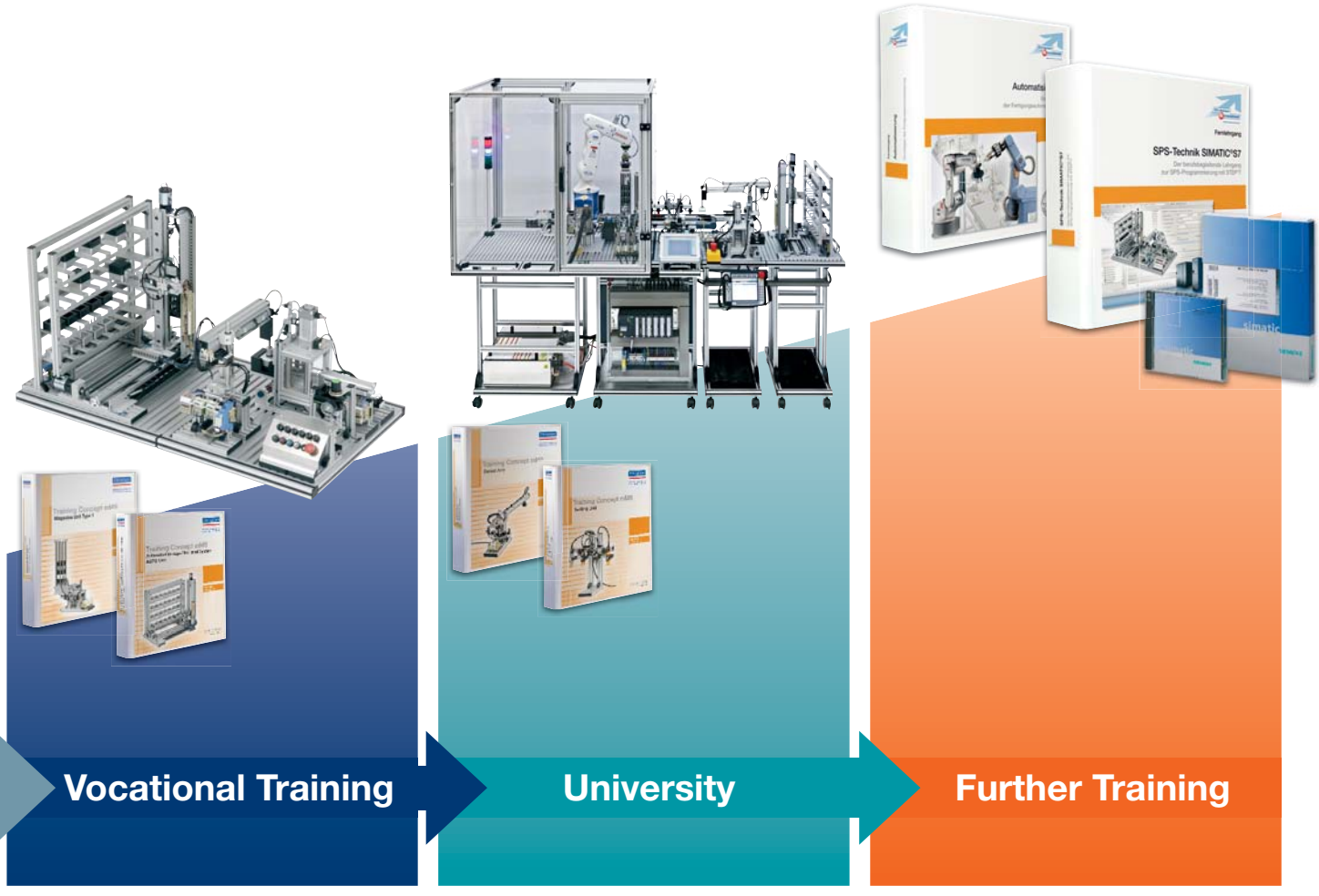
General & Secondary Schools

mMS modular Mechatronic System „junior“

Life-long learning:
Didactics and practice from a single source

Technical training from the outset and life-long learning – that‘s what Christiani and its teaching materials and service offering stand for. After all, the subject of training is not only relevant for schools and vocational training these days, but rather it accompanies people throughout every phase of their lives.

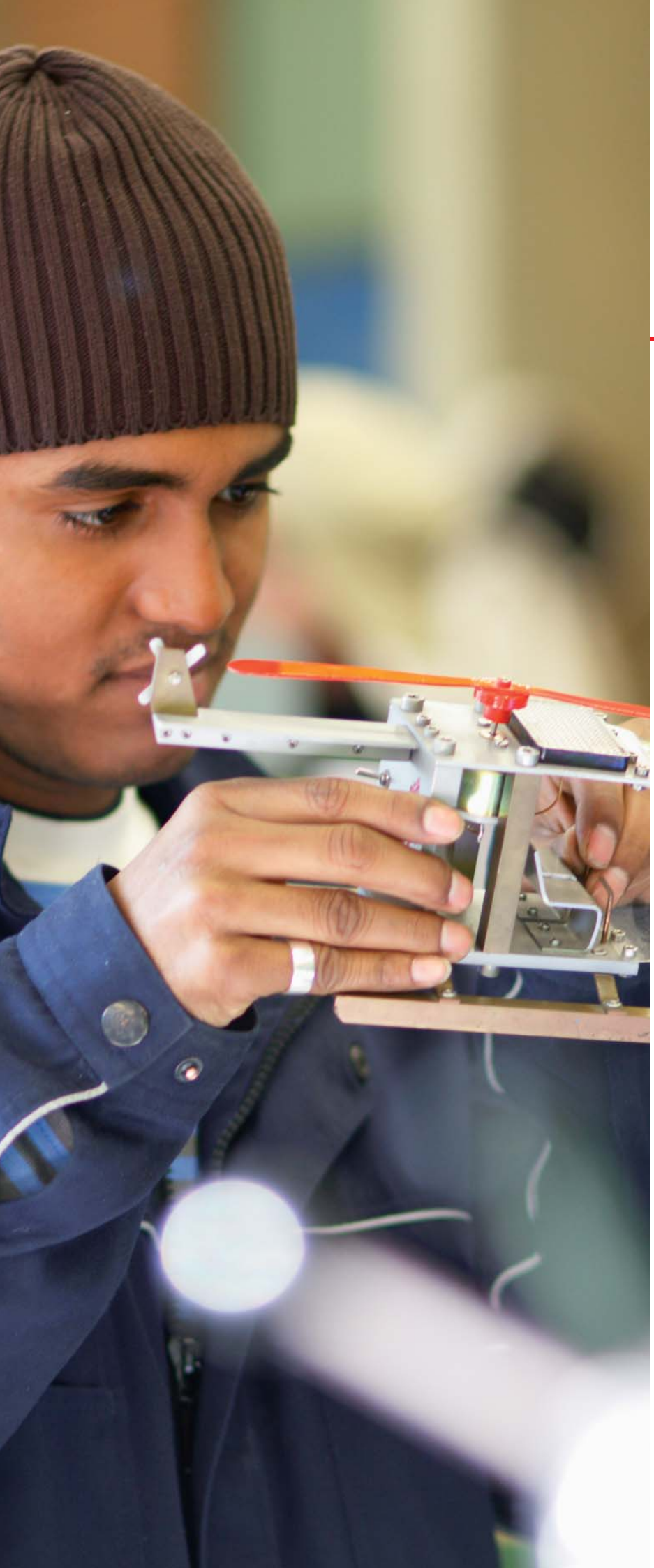
Christiani has been actively involved in the training and education sector for over 80 years. Our expertise: We are a complete provider of all aspects of technical training as well as innovative offers for all training levels – from pre-school, school and vocational training to universities and further professional training. By combining didactic documents and hardware, and by cooperating with partners from schools, industry and trade, we can assure absolute practical relevance.



mMS modular Mechatronic System Cube Assembly Mini V5

mMS modular Mechatronic System Cube Assembly Compact Endless

Courses and distance learning for automation technology and PLC-technology



1 Information

Gathering all information which is needed to fulfill the task. Guiding questions in the documentation and references to other training media assist in examining the skills and information that will be required.

2 Planning

The trainee systematically plans the work process, the use of the correct tools and aids as well as the sequence of the individual work steps. A work plan sheet is provided in the documentation.

3 Deciding

Choosing the best method for completing the project task, taking into account the materials used, time available, tools employed and skills applied. Once made, the selection, work plan and answers to the guiding questions are discussed with the trainer.

4 Action

All work is now performed in the sequence specified during planning.

5 Monitoring

Upon completion of the task, the trainee checks whether the work meets the specified requirements. The inspection and evaluation sheet included with the documents is used for monitoring.

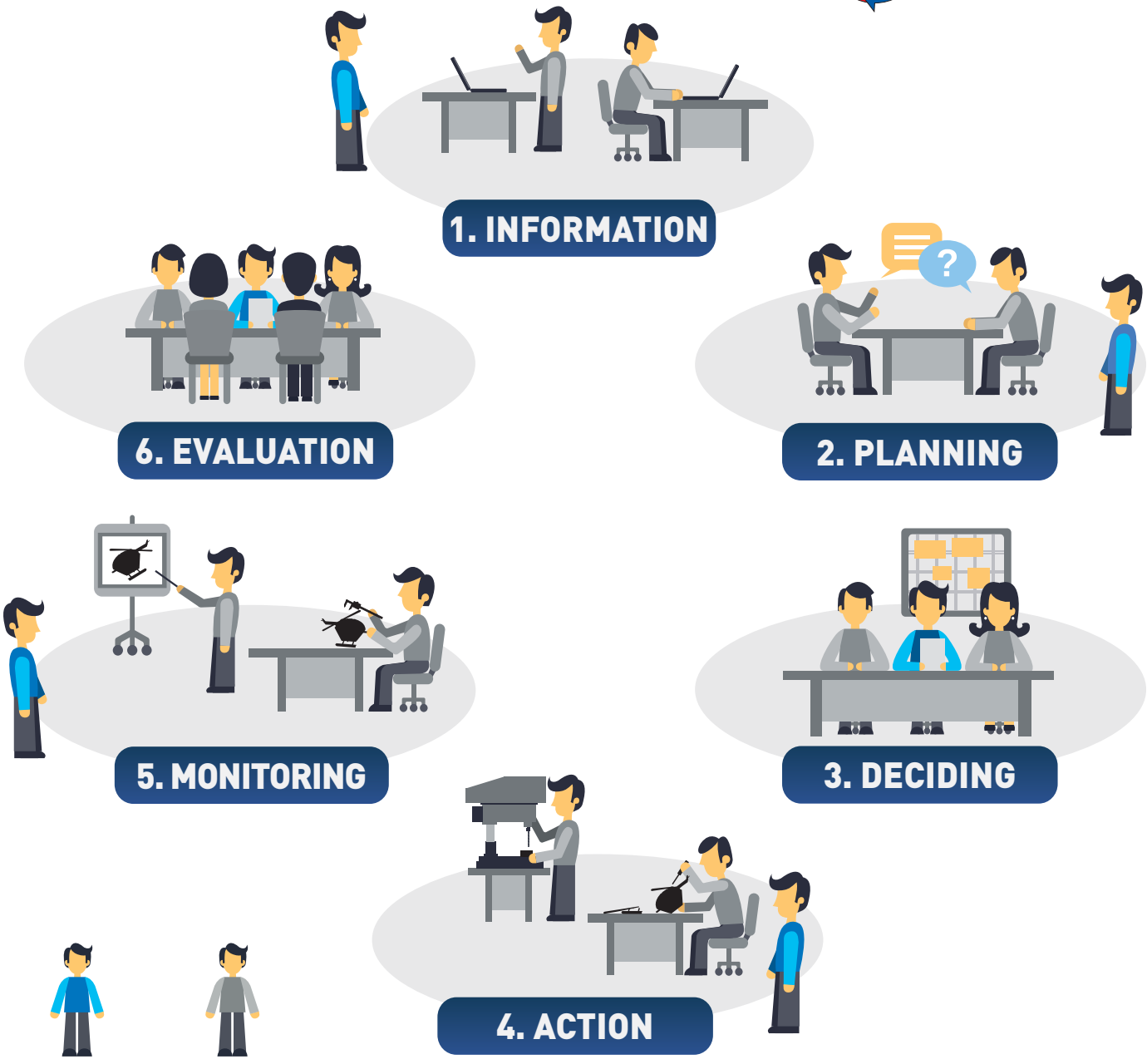
6 Evaluation

The work result as well as the inspection and evaluation sheet are again discussed together with the trainer. This consolidates the experiences gained during the project and minimises errors in the future.

Model of complete action

The concept of complete handling provides for six handling steps: Information, planning, deciding, action, monitoring, evaluation. The person shown in blue is the trainer, who either takes part actively in the individual stages, or is simply on-hand as an observer.

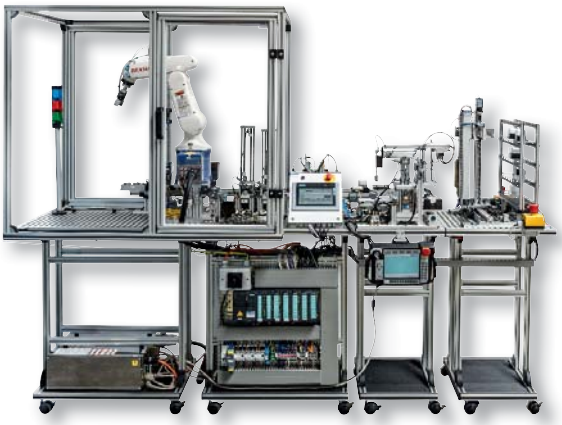
Apart from technical skills, modern working environments also require technicians to act and plan independently and with an awareness of quality issues as well as to work in teams. For the trainee to become accustomed to this style of working early on, it is important to already develop methods during training that he/she will be able to employ successfully as a technician in the future. Christiani products support the trainee in learning to decide, to act and to evaluate independently to an large extent and provides orientation towards the working style of qualified technicians. This action-oriented training method is known as the model of complete action. Christiani products, which are developed according to this model are marked with this symbol:

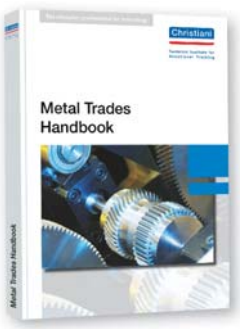


Training equipment and teaching methods

As a single-source provider for technical training, our portfolio covers both the hardware for the training labs and the teaching materials prepared for the lessons. This conclusive overall concept contributes to a lasting learning success!

By means of our know-how and our wide product range, we have clearly developed into a complete supplier in the field of technical training and education.
Our range of teaching materials primarily serves the fields of mechanics, electrical engineering, automation, automotive mechatronics and renewable energies. We provide complete solutions – be it a mechatronic laboratory, an electronics or metal training workshop or a facility for training in automotive jobs.
Whether for vocational institutes, colleges and universities or for small and medium-sized companies and major corporations: We offer to our customers guidance, conception, planning and execution as well as train-the-trainer courses.





Specialised Books

Teaching Systems

Workstation Systems

Project Works

Interactive Learning Programmes

Teaching & Experiment Manuals

Christiani training lab concepts: We accompany you step by step

Whether you want to extend your existing specialised training lab or set up a new one – Christiani is your partner for designing and setting up workshops and laboratories for advanced technical education and technical training. Using our knowledge and expertise as well as our network, we will find the solution to your needs.

Our modules at a glance:

1. Requirements Analysis

2. Planning & Consultation

3. Design

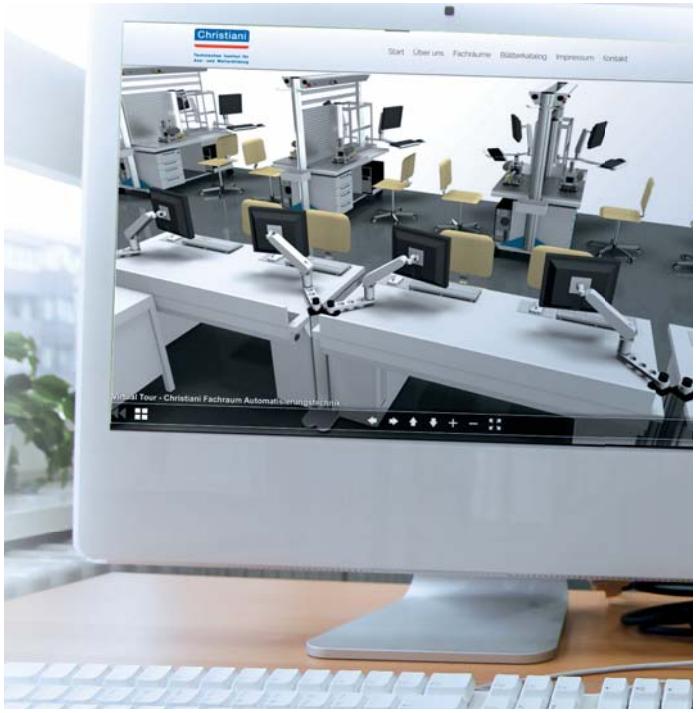
4. Implementation

5. Train-the-Trainer

6. Learning Outcome Test

360° View:
Our training labs are now also available to view online

Visit www.christiani-training-lab.com to „take a stroll“ around our 3D, virtual specialised training labs. You will also find detailed information about each of the showrooms and the learning objectives to be accomplished there.



www.christiani-training-lab.com

Experience our 3D and 360° all-round view of the Christiani technical training labs.

Technical Training in:

- Mechanics
- Automation Technology
- Electronics
- Renewable Energy
- Sanitation /HVAC
- Automotive Technology

Train-the-trainer:
We train your training staff

A well-equipped technical training lab is only one half of the story. A further component in our overall educational concept for sustainable and practical training is qualified training staff.

References Christiani train-the-trainer international

Peru: Automotive training stands and train-the-trainer seminar for technical institute TECSUP.

Tunisia: Automotive and renewable energy - equipment for training centers in Ariana and Kebili.

Romania: Seminars on modern teaching methods for Romanian teachers.

We train your staff according to the latest standards, while also showing you how much potential our teaching systems hold and how you can make the best possible use of this potential.

The meeting place for Technology

Christiani
Seminars and Workshops

Working in small seminars, you will learn details about:

- Which products are required to cover which training content
- How to best combine the use of media and teaching systems in the classroom
- How you can organise and communicate the teaching material so that it is both interesting and practical
- What options you have for monitoring learning and perfomance

We would also be happy to come to you:

Depending on the subject and the size of the group, the events take place at training centres or other educational establishments. Having agreed an appointment beforehand, we would also welcome the opportunity to visit you on your premises.

Christiani international: Technical training throughout the world

We offer an extensive portfolio of teaching materials for vocational training and further professional training for international training markets. We support companies in providing training and qualifying personnel according to German standards abroad too: with a wide range of teaching systems and foreign language teaching media, seminars, workshops and complete technical training labs.

Christiani projects international

BRAZIL
Christiani equipped the State University in Rio de Janeiro with a mechatronic system, incl. training for professors.

CHINA
Training stands for the training in the field of automotive technology, incl. training the trainers.

ETHIOPIA
In 2015 in Ethiopia, six automotive training centres are being equipped. Christiani is substantially involved in this project by supplying numerous high-quality training stands.

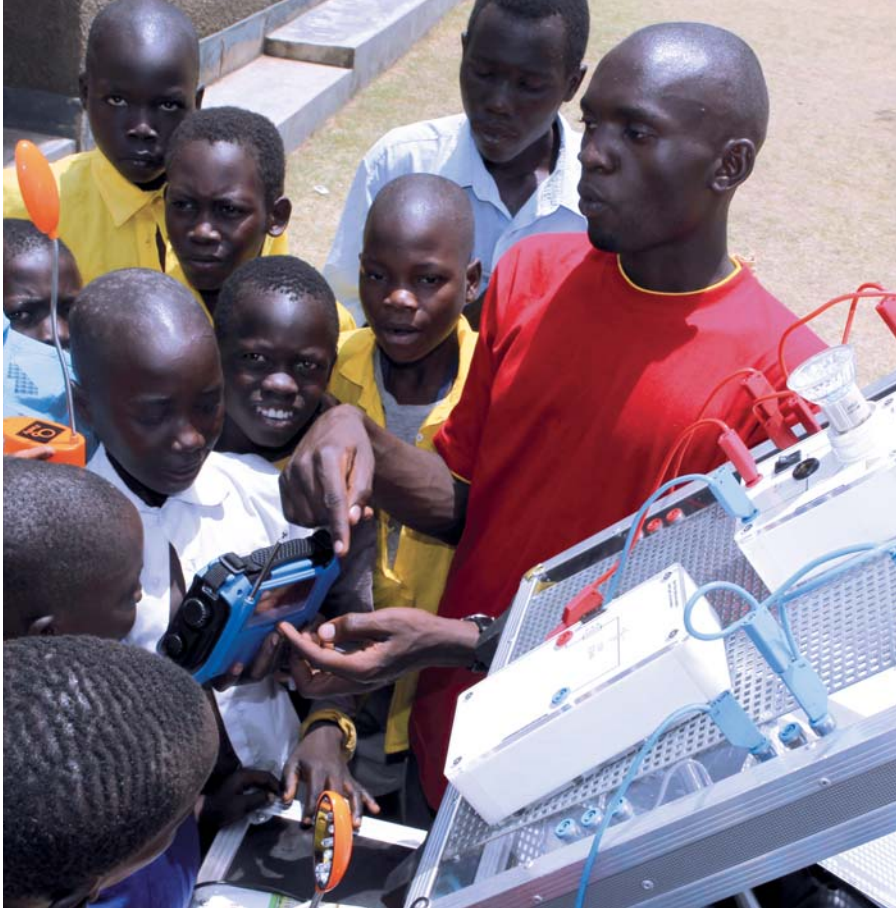
INDIA
Joint venture CSTT: Together with Sharpline, Christiani maintains a training centre in Mumbai, Courses are conducted mainly in the fields of CNC, PLC and mechatronics.

IRAQ
Christiani supplied training stands for the automotive sector to the University of Salahaddin in Erbil, northern Iraq. In addition to this, Train-the-Trainer courses.

LEBANON
Successful setup of an examination system in cooperation with the MEHE (Ministry of Education and higher Education).

LUXEMBOURG
Creation of a mechatronics training concept for the Luxembourg Ministry of Education.

MALAYSIA
Mechatronics teaching systems for five polytechnical colleges, incl. training the trainers.



christiani-tvet.com

Entering the world of technical training: by cklicking on the desired region you will be re-directed to the website or contact of your national representative.

MEXICO

Equipping a training centre in Mérida with automotive mechatronics equipment, incl. training the trainers.

MONGOLIA

Christiani is a partner in a GIZ project in Mongolia, which involves a 3-year training project in the industrial mechanics, electrotechnical and construction sectors.

MOROCCO

In 2014 in Morocco, Christiani contributed to equipping of a renewable energies training centre by supplying training stands.

PERU

Establishment of an automotive training centre at the technical educational institute TECSUP, incl. training the trainers.

ROMANIA

Seminars for teachers and trainers in mechatronics about the basics of the action-oriented training, incl. didactical documents and teaching systems.

SWITZERLAND

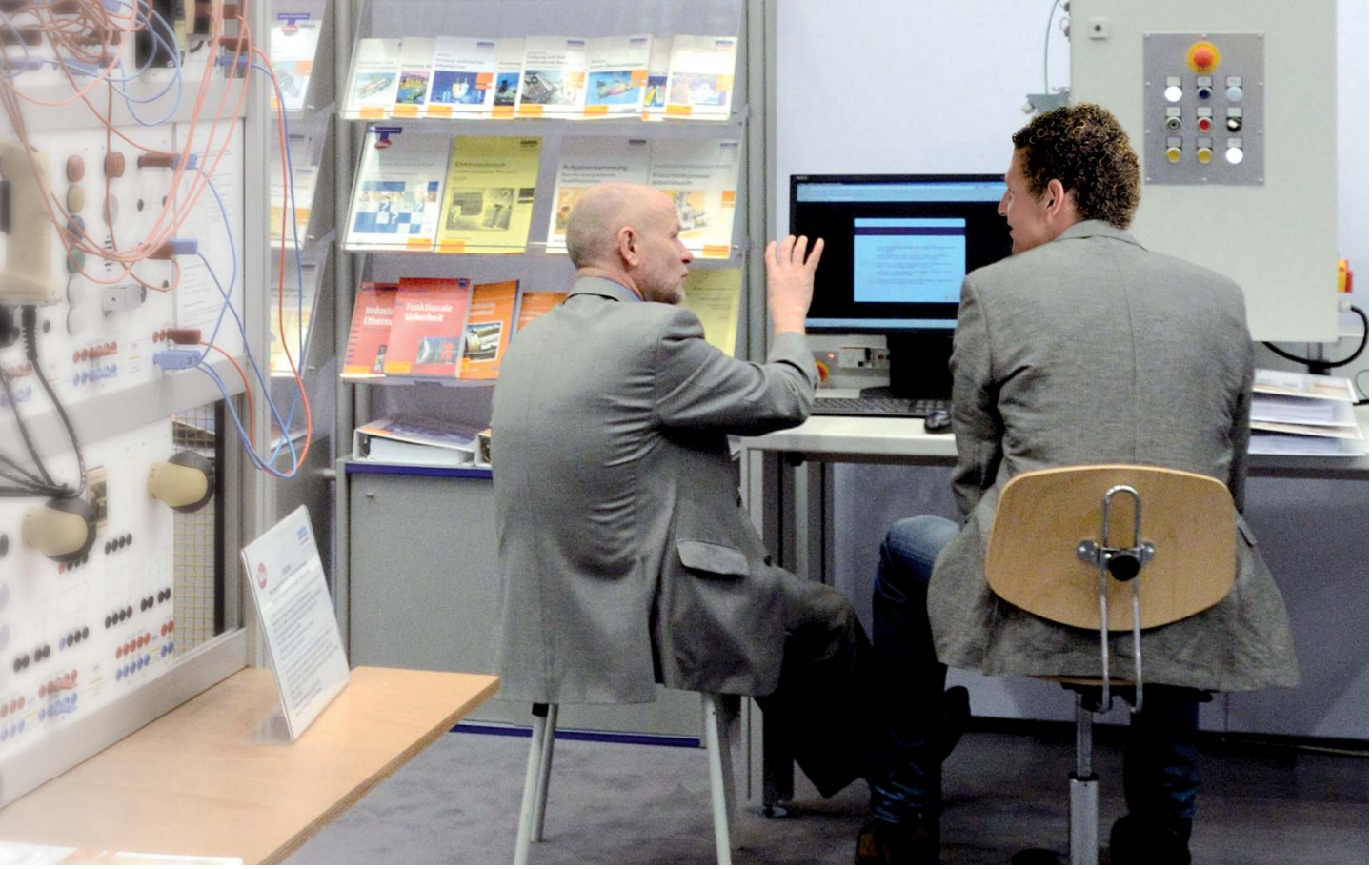
Equipment of four solateur schools (solarthermic profession) with teaching systems for the sector renewable energy.

TUNISIA

Equipping training centres in Kebili and Ariana, with training stands for the automotive and renewable energy sectors.

UGANDA

„Energy Explorers“ campagne for renewable energy with Christiani products.



Our international team is pleased to advice you

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Enter into the world of training at www.christiani-tvet.com

On the home page, select the desired region and you will be taken directly to the corresponding online shop or contact partner, who will provide you with assistance. In the online shop, you can find our complete range of teaching materials for technical-industrial training. There is a wide range of options to enable you to navigate your way straight to your desired products in the blink of an eye.

Our online shop offers a wide range of products for technical training. Use our shop and take the advantage of the following:

- **Direct contact** with Christiani consultants
- **Detailed product descriptions** as well as additional information, such as readings, videos, etc.
- **Navigation by media type**, subject or profession
- **Stay up-to-date** with news about product innovations

Furnishing, machines, working utilities – centralised performance by Christiani

We have created this example configuration to show you the wide range of options open to you when compiling your technical training lab. The fixtures, fitting, machines and equipment shown here offer you a brief overview of our product portfolio.

COMPACT INFO

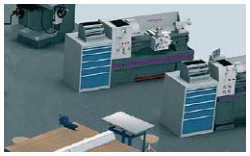
Technical Training Lab for Metal Engineering

Metalworking machines:

- Drills
- Drilling-milling machines
- CNC milling machines
- Lathes
- CNC lathes
- Metal band saws
- Metal circular saws
- Grinding machines
- Bending machines
- Sheet-metal cutters
- Comprehensive accessories
- Company facilities
- Furniture and fittings
- Tools, resources and test materials
- Workbenches
- Measuring and marking plates
- Surface plate

VIRTUAL TOUR

Experience the Christiani Training Labs now online in 3D.



More information:
www.christiani-training-lab.com

Technical Training Lab for Manual Material Processing

Topics/learning objectives:

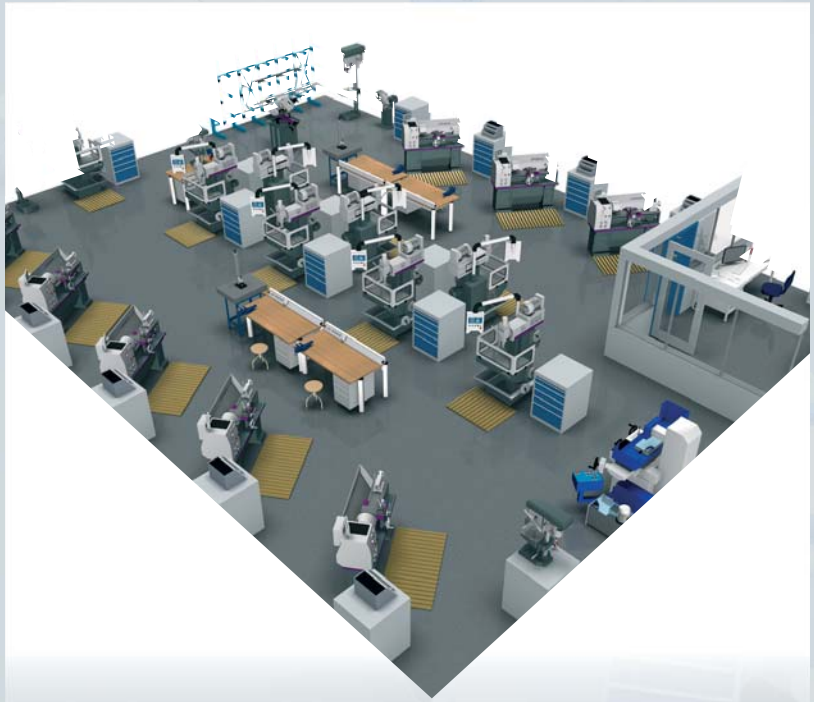
Manufacturing construction components using manual tools
- Filing, marking out, punching, sawing, chiselling, drilling, grinding, cutting, bending
- Partial, group and assembly drawings
- Technical documentation and information sources
- Fundamentals and processes of trimming and forming

Producing basic assemblies
- Tools and fixtures
- Fundamentals of force-fit, form-fit and bonded joining
- Standard parts
- Function check

Manufacturing individual parts using machine tools
- Cutting processes
- Machining parameters
- Cutting materials, main usage time

360° VIRTUAL TOUR
www.christiani-training-lab.com

Technical Training Lab for Machine-Based Material Processing



Topics/learning objectives:

Manufacturing components with machines
- Drilling, countersinking, reaming, milling, turning, grinding
- Functional units of machines and how they work
- Service life of tools
- Manufacturing data and its calculation

Maintaining technical systems
- Basic maintenance terminology, maintenance plans

Manufacturing individual parts with machine tools
- Cutting processes
- Machining parameters
- Cutting materials, main usage time

360° VIRTUAL TOUR
www.christiani-training-lab.com

Technical Training Lab for Hydraulics

Topics/learning objectives:

- Identification of the components
- Commissioning
- How is pressure generated
- Directional valves, travel direction of the cylinder
- Load pressure
- Setting speeds, inlet throttle
- Adjusting the pressure difference using system pressure
- Adjusting the pressure difference using load pressure
- Pressure transmission, outlet throttle
- Pressure reduction

360° VIRTUAL TOUR
www.christiani-training-lab.com

Technical Training Lab for Pneumatics

Topics/learning objectives:

Integrating components of the PLC and control technology

- Compressed air generation and compressed air distribution
- Compressed air treatment
- Cylinder and directional control valves

Installing and operating control systems

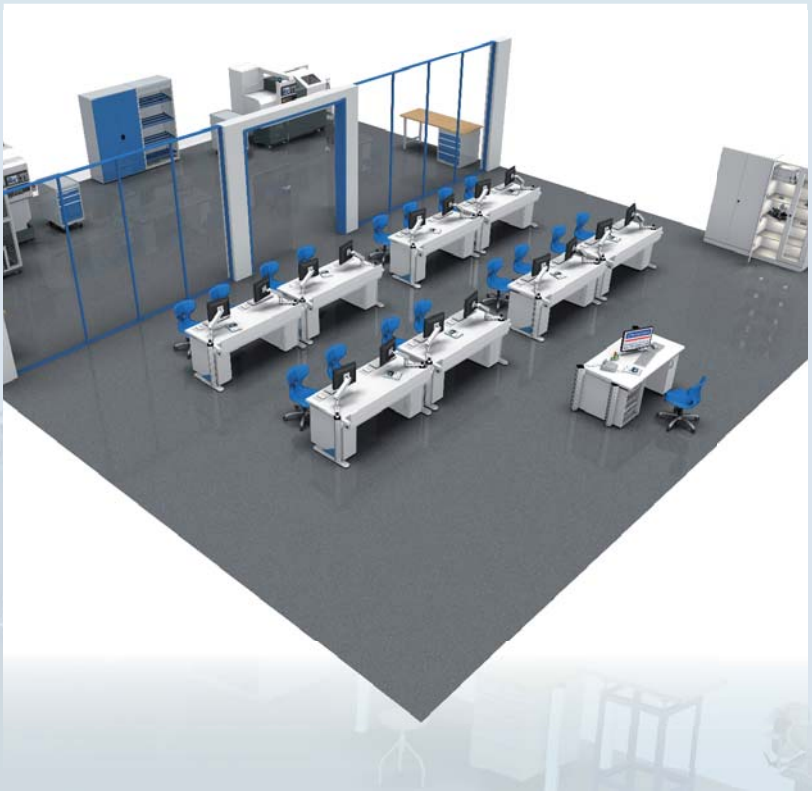
- Supply air and exhaust air flow control
- AND members/OR member
- Sequence control with individual valves
- Sequence control with chain of steps

Ensuring the operating ability of automated systems

- Measurements of voltage and current
- Solenoid valves
- Basic circuits with contacts
- Relay, lock
- Time relay
- Pneumatic-electric converter

360° VIRTUAL TOUR
www.christiani-training-lab.com

Technical Training Lab for CAD-CAM-CNC



Topics/learning objectives:

Manufacturing using numerically controlled machines

- Work plan, tool plan, set-up sheet
- Design and function of CNC machines
- Coordinate systems
- Reference points
- Geometric data
- Technology data
- Programme architecture
- Tool correction

360° VIRTUAL TOUR
www.christiani-training-lab.com

Technical Training Lab for Electrical Engineering

Topics/learning objectives:

- Analysing electrical systems and testing functions
- Planning and executing electrical installations
- Installing electrical operating equipment in compliance with safety aspects
- Analysing and adjusting control systems
- Configuring the hardware and software of assemblies

360° VIRTUAL TOUR
www.christiani-training-lab.com

Technical Training Lab for Control Technology

Topics/learning objectives:

- Operational and technical communication
- Measuring and testing electrical variables
- Designing and testing electric, pneumatic and hydraulic control systems
- Programming mechatronic systems
- Testing and setting functions on mechatronic systems
- Commissioning and operating mechatronic systems
- Maintaining mechatronic systems

360° VIRTUAL TOUR
www.christiani-training-lab.com

Technical Training Lab for Renewable Energy/Sanitation/HVAC

Topics/learning objectives:

Establishment of in-depth knowledge of planning, setup and configuration of systems

- Photovoltaics
- Solar heating
- Heat pump
- Gas technology
- Bathroom installation
- Drinking water
- Heating technology and heating hydraulics
- Wood pellet heating system

Gaining sound knowledge on

- Optimising heating systems, including troubleshooting, fault assessment and elimination

360° VIRTUAL TOUR
www.christiani-training-lab.com

Technical Training Lab for Renewable Energy

Topics/learning objectives:

Conveying basic skills of energy technology
Establishment of in-depth knowledge of planning, setup and configuration of systems

- Photovoltaics
- Solar heating
- Heat pump
- Wood pellet heating system

360° VIRTUAL TOUR
www.christiani-training-lab.com

Technical Training Lab for Sanitation/HVAC

Topics/learning objectives:

Planning, setup and configuration of systems

- Gas technology
- Bathroom installation
- Drinking water
- Photovoltaics
- Solar heating
- Heat pump
- Wood pellet heating system

Gaining sound knowledge on

- Optimising heating systems,including troubleshooting, fault assessment and elimination

360° VIRTUAL TOUR
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Technical Training Lab for Automotive Technology

Topics/learning objectives:

- Working with maintenance schedules, wiring diagrams, symbols, terminal designations, wires and wiring connections
- Measuring and evaluating electrical variables and signals
- Using repair manuals, function diagrams, troubleshooting schedules during diagnosis
- Occupational safety and accident prevention when working with electrical components
- Making use of the possibilities offered by commonly used workshop diagnosis testers
- Encoding control units, adapting software statuses and checking data communications wires, taking account of legal stipulations and manufacturer specifications
- Documenting work results and evaluating by comparing with calculated variables and manufacturer specifications

360° VIRTUAL TOUR
www.christiani-training-lab.com

Theory Room

Example arrangement:

Represents particularly in large rooms the best conditions for a lively class lesson.
For instance, the remaining part of the room can be used for demonstrations purposes on teaching systems or other illustrative materials.
All benches are equipped with power and ethernet connection so that this theory room is ideal for programming of for example mechatronic systems placed in the centre of the room.

Renewable Energy & Sanitation/HVAC

Content	Page
Training Equipment and Teaching Methods	26
Technical Training Labs	
• Renewable Energy/Sanitation/HVAC	28
• Renewable Energy	32
• Sanitation/HVAC	36
• Flexible Workstation Systems	40
Training Lab Equipment	
• Mobile PV Generator	42
• Generator Bike	44
• Energy Trainer	46
• Solar Work Case	47
• Solar Power Case	48
• Solar Power Laboratory	50
Teaching Systems and Training Stands	
• Teaching System for heating technology with renewable energy	52
S1: Geothermal Energy Source	56
S2: Fan Convector	57
S3: Solar Collector	58
S4: Hydraulic Switch	59
S5: Heat Pump	60
S6: Hybrid Collector	61
S7: Wood pellet heating system	62
• Sanitation/HVAC	64
Gas Technology	64
Bathroom Installation	66
Drinking Water	68
Heating Control Compact Model	70
Heating Hydraulics	71
Workstation System Learning Unit	72
WILO-Brain Box Classic plus	74

Training equipment and teaching methods

Our training material in renewable energy suits to new technologies used in daily working life. Especially training stands for heat pump, solar heating and photovoltaic show very realistic appliances. For flexible training either inside or outside in the sun, our solar cases can be used everywhere and give an easy access for beginners. Sanitation and HVAC are easily explained with our brand new training stands.

As a single-source provider for technical training, our portfolio covers both the hardware for the training labs and the teaching materials prepared for the lessons. This conclusive overall concept contributes to a lasting learning success!

Whether for vocational institutes, colleges and universities or for small and medium-sized companies and major corporations: We offer to our customers guidance, conception, planning and execution as well as train the trainer courses.

Teaching Systems

Christiani materials are available in many different languages. Visit:

christiani-tvet.com

You can directly access the online shops and the contacts for the respective regions.

Experiment Manuals

Training Cases

Workstations

Ideal learning conditions

With its technical training lab concept for renewable energy and sanitation/HVAC, Christiani offers the key fundamentals for successful qualifications and further training. The practically oriented training concept is aligned with current and future requirements in the field of building energy supply and provides optimum support for instructors and trainers.

The technical training lab shown here contains the standard equipment for sanitation, heating and air conditioning technology, as well as renewable energies. We will be happy to develop the individual, tailor-made solution for your requirements.

Our modules

- Requirements analysis
- Planning and consultation
- Conceptual design
- Implementation
- Train-the-trainer

VIRTUAL TOUR

Experience the Christiani Training Labs now online in 3D.

More information:
www.christiani-training-lab.com

COMPACT INFO

Technical Training Lab for Renewable Energy/Sanitation/HVAC

Example configuration for 16 workplaces:

- 1 generator bike
- 8 solar power cases
- 8 solar power laboratory lab benches, complete
- 1 teaching system - heating technology with renewable energy (consisting of 7 training stands)
- 1 WILO Brain Box classic plus
- 1 learning unit
- 1 gas technology training stand
- 1 bathroom installation training stand
- 1 drinking water training stand
- 1 heating hydraulics training stand

Suitable for:

- HVAC plant mechanics
- Electronics engineer specialising in building services technology
- Further training in renewable energies/HVAC

Topics/Learning objectives:

Establishment of in-depth knowledge of planning, setup and configuration of systems

- Photovoltaics
- Solar heating
- Heat pump
- Gas technology
- Bathroom installation
- Drinking water
- Heating technology and heating hydraulics
- Wood pellet heating system

Gaining sound knowledge on

- Optimising heating systems, including troubleshooting, fault assessment and elimination

The Christiani technical training lab for renewable energy/sanitation/HVAC offers you the following:

- Theory and practice from a single source
- Motivation to learn and sustainable learning success
- Didactic diversity and practically oriented training media
- Strong partnerships with industry
- Professional consulting – from the planning stage, all the way up to implementation

Powerful Specialised Lab Components

At Christiani, specialised technical training lab equipment and didactic training materials are precisely matched to one another. With this uniform holistic concept, you can offer state-of-the-art training, as well as conveying practically oriented specialist knowledge and the necessary personal skills. In developing our innovative products, we work closely with strong partners from the industrial sector.

S7 Pellet heating
S4 Hydraulic switch, plate heat exchanger and buffer storage
S1 Underfloor heating

WILO-Brain Box Classic Plus

The WILO-Brain Box classic plus reveals what is often concealed by insulation or plaster in reality: On the mobile experiment stand, all the essential components of a heating system are grouped together. In part transparent, they are connected by pipes in such a way that the heating process can be reproduced almost completely. Thus, defects can be demonstrated on the Brain Box and corrected professionally.

Suitable for:

Vocational education and further training at
- **Vocational colleges**
- **In-house or third-party training centres**

Topics/Learning objectives:
- Pumps and controllers
- Hydraulics
- Pressure maintenance
- Filling and purging heating systems

Specifications:
- **Dimensions when folded out in working position (H x W x D):** 1980 x 1900 x 780 mm
  Folded in: 1980 x 1000 x 780 mm
- **Weight:** 80 kg

Article	Order-No.
Wilo-Brain Box classic plus	**58129**

More information at: www.christiani-international.com/58129

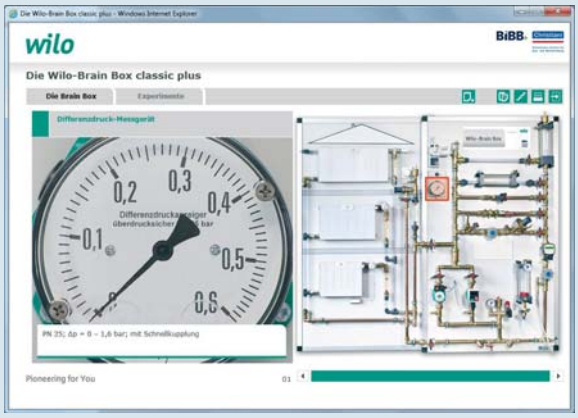
Practically Oriented Training Media

Our teaching materials have been drafted by didactically and technically experienced instructors and experts. They are also continuously updated.

„Train-the-Trainer“

Only those trainers who are themselves well-prepared and properly trained can guarantee optimum learning.
We offer tailor-made trainer training for all requirements with our practically oriented training concepts.

WILO-Brain Learning System



Outstanding
The activity-based WILO-Brain learning concept is available for download free of charge

Typically Christiani: There is a didactically well thought-out learning concept to match the practical WILO Brain-Box training stand. Practical learning is the focus here – from the time of order acceptance through to on-site repair. With WILO-Brain, plant mechanics can learn about the heating, ventilation and air conditioning technology of their trade and can practice professional interactions with customers. Available for download free of charge at www.christiani-international.com/95280

Winners in the category: Vocational training and study, training

digita 2014 Deutscher Bildungsmedien Preis

A training room full of energy technology

Experiencing energy technology for oneself and learning how to deal with new energy technologies is the basic principle of the renewable energies technical training lab concept. From teaching knowledge to working on units for solar heat, heat pumps, photovoltaics and much more, everything is possible here.

The technical training lab shown here contains the standard equipment for the renewable energies field. We will be happy to develop the individual, tailor-made solution for your requirements.

Our modules

- Requirements analysis
- Planning and consultation
- Conceptual design
- Implementation
- Train-the-trainer

VIRTUAL TOUR

Experience the Christiani Training Labs now online in 3D.

More information:
www.christiani-training-lab.com

COMPACT INFO

Technical Training Lab for Renewable Energy

Example configuration for 16 workplaces:

- 1 generator bike
- 8 solar power cases
- 8 solar power laboratory lab benches, complete
- 1 teaching system - heating technology with renewable energy (consisting of 7 training stands)

Suitable for:

- Electronics engineer specialising in building services technology
- Further training in renewable energies

Topics/Learning objectives:

Conveying basic skills of energy technology

Establishment of in-depth knowledge of planning, setup and configuration of systems

- Photovoltaics
- Solar heating
- Heat pump
- Wood pellet heating system

The Christiani technical training lab for renewable energy offers you the following:

- Theory and practice from a single source
- Motivation to learn and sustainable learning success
- Didactic diversity and practically oriented training media
- Strong partnerships with industry
- Professional consulting – from the planning stage, all the way up to implementation

Powerful Specialised Lab Components

State-of-the-art training stands and teaching media, combined with sophisticated teaching documentation and competent training and consultation: these are the Christiani building blocks for successful technical training lab concepts.

Practically Oriented Training Media

Our teaching materials have been drafted by didactically and technically experienced instructors and experts. They are also continuously updated.

„Train-the-Trainer“

We train your training staff to the latest standards and show how you can most effectively use our training systems and materials.

Renewable Energy

Please feel free to get in touch with one of our customer consultants.

ASIA-PACIFIC

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The right place for sanitation and HVAC experts

State-of-the-art and well thought-out sanitation, heating and air conditioning technology training stands form the core of this technical training lab. In addition to the “classical” technologies such as gas, water and heating installations, this technical training lab also offers applications for photovoltaics and solar heat.

The technical training lab shown here contains the standard equipment for the sanitation, heating and air conditioning field. We will be happy to develop the individual, tailor-made solution for your requirements.

Our modules

- Requirements analysis
- Planning and consultation
- Conceptual design
- Implementation
- Train-the-trainer

VIRTUAL TOUR

Experience the Christiani Training Labs now online in 3D.

More information:
www.christiani-training-lab.com

COMPACT INFO

Technical Training Lab for Sanitation/HVAC

Example configuration for 16 workplaces:

- 1 teaching system - heating technology with renewable energy (consisting of 7 training stands)
- 1 WILO Brain Box classic plus
- 1 learning unit
- 1 gas technology training stand
- 1 bathroom installation training stand
- 1 drinking water training stand
- 1 heating hydraulics training stand

Suitable for:

- HVAC plant mechanics
- Electronics engineer specialising in building services technology
- Further training in renewable energies/HVAC

Topics/Learning objectives:

Establishment of in-depth knowledge of planning, setup and configuration of systems

- Gas technology
- Bathroom installation
- Drinking water
- Photovoltaics
- Solar heating
- Heat pump
- Wood pellet heating system

Gaining sound knowledge on

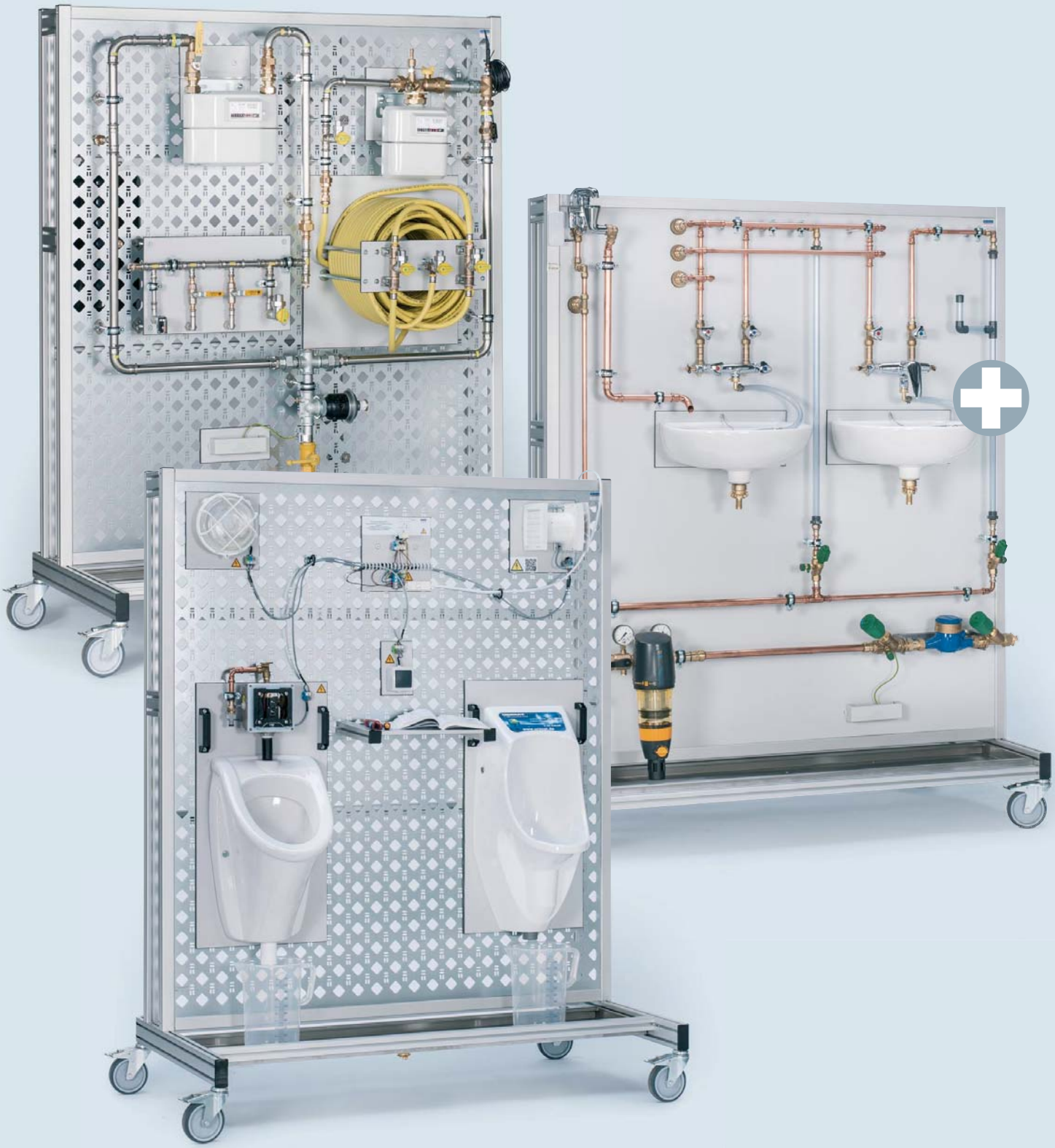
- Optimising heating systems,including troubleshooting, fault assessment and elimination

The Christiani technical training lab for sanitation/HVAC offers you the following:

- Theory and practice from a single source
- Motivation to learn and sustainable learning success
- Didactic diversity and practically oriented training media
- Strong partnerships with industry
- Professional consulting – from the planning stage, all the way up to implementation

Powerful Specialised Lab Components

At Christiani, specialised technical training lab equipment and didactic training materials are precisely matched to one another. With this uniform holistic concept, you can offer state-of-the-art training, as well as conveying practically oriented specialist knowledge and the necessary personal skills. In developing our innovative products, we work closely with strong partners from the industrial sector.



Practically Oriented Training Media

Our teaching materials have been drafted by didactically and technically experienced instructors and experts. They are also continuously updated.

„Train-the-Trainer“

Only those trainers who are themselves well-prepared and properly trained can guarantee optimum learning. We offer tailor-made trainer training for all requirements with our practically oriented training concepts.

Please feel free to get in touch with one of our customer consultants.

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Theory and practise in the space-saving mode

In just one square metre, the Christiani learning unit provides four working stations, on each of which several trainees can be working. With several learning units, rooms can be designed in which whole classes can practise and conduct experiments at the same time. When not in use, the roll-up learning units can easily be moved to the side.

The technical training lab shown here contains a sample configuration for a theory and practise room. We will be happy to develop the individual, tailor-made solution for your requirements.

Our modules

- Requirements analysis
- Planning and consultation
- Conceptual design
- Implementation
- Train-the-trainer

VIRTUAL TOUR

Experience the Christiani Training Labs now online in 3D.

More information:
www.christiani-training-lab.com

COMPACT INFO

Technical Training Lab
Flexible Workstation Systems

Example configuration for 16 theory seats and workstation systems:

- 4 learning units

Suitable for:

- HVAC-/Building technology
- Renewable energy
- Electrical engineering
- Hydraulics
- Pneumatics

The Christiani technical training lab flexible workstation systems offers you the following:

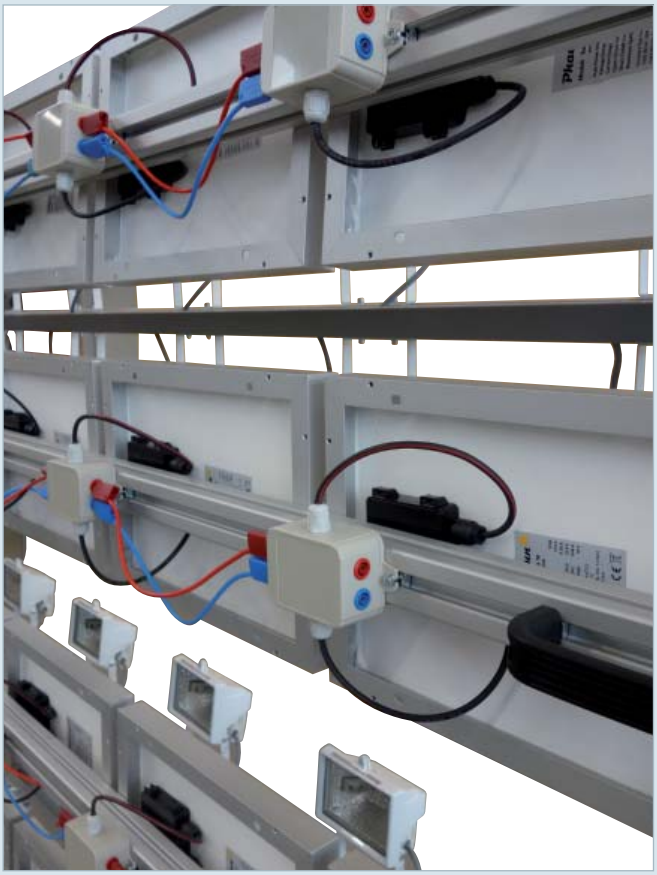
- Theory and practice from a single source
- Motivation to learn and sustainable learning success
- Didactic diversity and practically oriented training media
- Strong partnerships with industry
- Professional consulting – from the planning stage, all the way up to implementation

String by string for the optimum PV system

Mobile PV Generator Teaching System

The mobile PV Generator Teaching System conveys the basic information and basic circuits required for photovoltaic technology. The 20 PV modules can be individually strung via safety cables. Operation is possible with halogen headlights as solar simulation or with real sunlight. The model teaches trainees how to design, test, commission and optimise PV systems.

The modules of the mobile PV generator can each be adjusted in five rows and can be operated with both the halogen headlights supplied and with sunlight.



The PV modules can be connected in either series or parallel via distributor boxes and safety cables.

The didactic and methodical concept of the PV Generator Teaching System conveys the practical knowledge and skills required by specialists using photovoltaic energy systems. The teaching system simulates – completely harmlessly from a safety perspective – commercially available energy technology components that are operated with voltages of up to 400 V in real-life situations. It is therefore designed for professional energy qualifications and can be used for practical measurement and testing work on PV systems within the scope of further and advanced training.

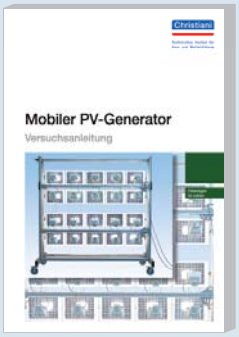
In combination with the following energy systems for grid feed, storage and energy management, the "mobile PV generator" is the real energy source for a complex, state-of-the-art energy system.

Learning objectives:

- Basic knowledge of the physical processes involved in generating electricity from light. Understanding of the system conditions for photovoltaic systems
- Knowledge of the physical operating conditions of PV generators
- Consultancy expertise on choosing a location for installing PV modules
- Knowledge of safety-related installation conditions for PV modules
- Systematic approach to testing and commissioning a PV generator
- Ability to draw up test records for modules and complete module circuits
- Understanding of processes for energy optimisation in PV generators
- Knowledge of how to adapt the power of a PV generator to downstream inverters and energy systems
- Understanding of the energy system integration of photovoltaics into other energy-related concepts
- Consultancy expertise on the energy-related restoration and optimisation of PV generators

Suitable for:

- Electronics engineers specialising in energy and building services technology
- Advanced photovoltaic training



With detailed didactic documents containing basic information on photovoltaics and using the PV generator, as well as numerous tasks and solutions.

Item	Order no.
Mobile PV generator	**98385**

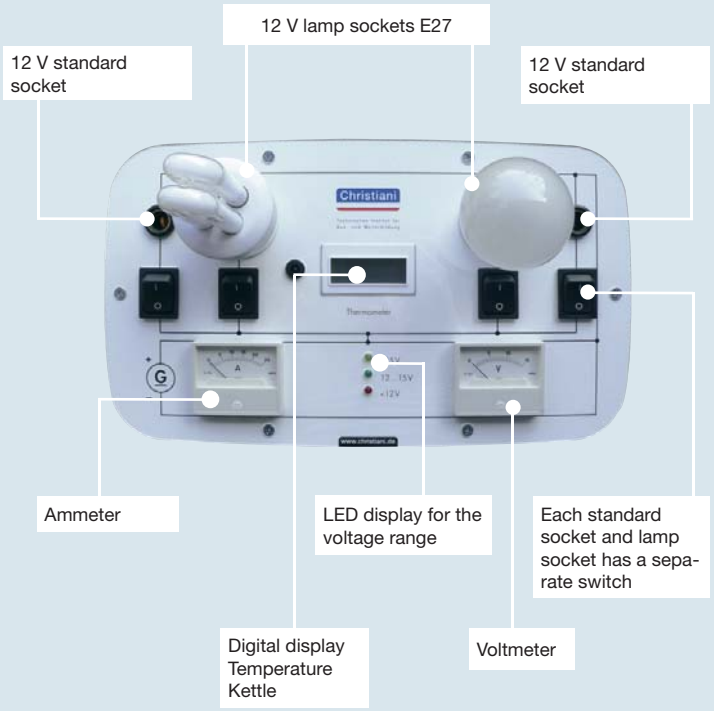
You can find more information at: www.christiani.de/98385

The Generator Bike – experience and understand energy in a hands-on way!

The generator bike is the ideal way to learn about renewable energy. Experience and understand energy in a hands-on way – this is the idea behind the generator bike. Various devices requiring electric power are powered using muscular force. Whereas the energy-saving lamp is illuminated without too much effort, hard work is needed for light from the conventional light bulb. Athletic performance is called for if the kettle is now switched on as well. Up to four devices can be operated simultaneously from the 12 V output sockets available.

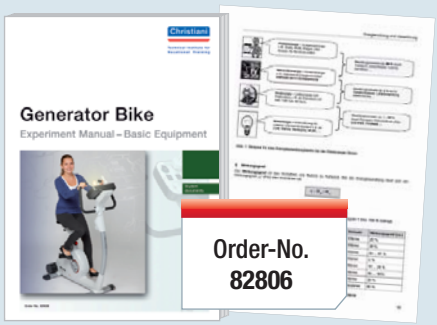
ONLINE
VIDEO
Find out about our functions and potential areas of application in our detailed product video.

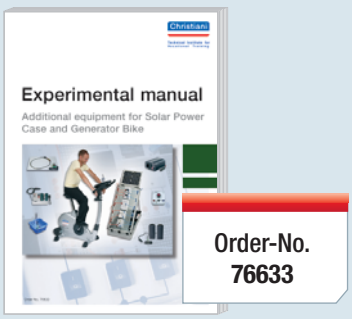
- **Activity-based knowledge transfer**
- **Understanding of the basic factors that are current, voltage, power and energy**
- **Optional USB interface**
- **Suitable didactic material**



Experiment Manual for Teachers and Students

The experiment manual is a major constituent in the overall didactic concept for the generator bike. A detailed description is given for each experimental set-up; the results are compiled and then analysed.
The experiment manual for the generator bike is made up of an information section, an exercise section and a section with the solutions.
The students' edition does not include the solutions.





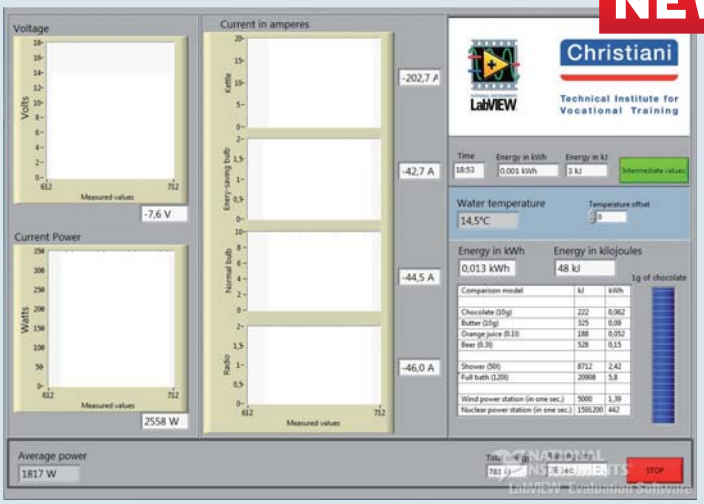
! The experiment manuals are supplied exclusively to customers that have also ordered a generator bike (Order-No.: 75637 or 93800) from Christiani.

The Generator Bike – The Basic Idea

The generator bike allows students to acquire fundamental, practical knowledge, working largely by themselves. The students can use the experiment manual to both quantify fundamental issues relating to energy as well as to derive and develop concepts on how energy can be saved. The experiments teach the students through practical experience. Over the course of only a few lessons, they acquire an integrated understanding of energy-related matters. The generator bike can become the main attraction at open days and project weeks at schools to test performance and show how electricity can be produced from muscular force, for example for the "Human-powered disco station", etc!

Generator bike with USB interface

NEW



The tried-and-tested Christiani generator bike is now available with an optional USB interface. The voltage, current and power are displayed both graphically in development curves and also as digital values via the interface and the supplied programme. The display also shows you when the amount of energy equivalent to a gram of chocolate has been produced by muscular force.
The values can be projected to the whole class at the same time using a projector (not included). The generator bike with USB interface follows on logically from the tried-and-tested generator bike that has been around for years.

Suitable for:

- **All general education schools** (primary, middle and secondary schools of all kinds) from infants to sixth formers
- **Vocational colleges** for all areas in which a basic understanding of energy is required
- **Company and industry training centres** (training and further education) for all areas in which a basic understanding of energy is required
- **Unions and associations** in the areas of environmental protection, energy and energy technology

Learning objectives/Skills:

- Arranging electrical devices in order of the energy they consume
- Integrating energy measurement values into one's own concepts and experiences
- Distinguishing between energy-saving measures according to their efficiency
- Supplying various consumers with power from the measuring and switching panel for the generator bike
- Developing an ability to judge energy-related issues by estimating, investigating and analysis
- Drawing conclusions regarding energy usage from the results
- Calculating the power and energy from the values measured for current, voltage and time
- Critically appraising the manual power outputted by a human being
- Calculating the time required to generate one "kWh" using human muscular force
- Measuring how hot a defined quantity of water becomes over a specified period of time
- Performing energy-related calculations with the measured values
- Assessing power conversions in energy systems
- Explaining and calculating the energy consumed by an energy-saving lamp and by a conventional light bulb for the same intensity of light
- Correctly assessing the potential for saving energy by using energy-saving bulbs compared to using other types of bulbs
- Measuring and calculating the difference in the power input at 12 V DC and 230 V AC
- Making suggestions on how energy can be saved when operating consumer electronics
- Physically experiencing and describing some of the basic principles of electrical engineering

Scope of delivery:

Generator bike with base frame and display
Kettle, radio recorder, energy-saving lamp, light bulb
Optional: USB interface with accompanying visualisation software

Generator Bike Basic Equipment

Similar to as shown

Active speaker with MP3 player

Similar to as shown

Kettle

Similar to as shown

Bulbs

Article	Order-No. English	Order-No. Spanish
Generator bike basic equipment	75637	
Generator bike with USB interface	93800	
Experiment manual: Generator bike basic equipment – Teachers' edition	76634	77652
Experiment manual: Generator bike basic equipment – Students' edition	82806	95577

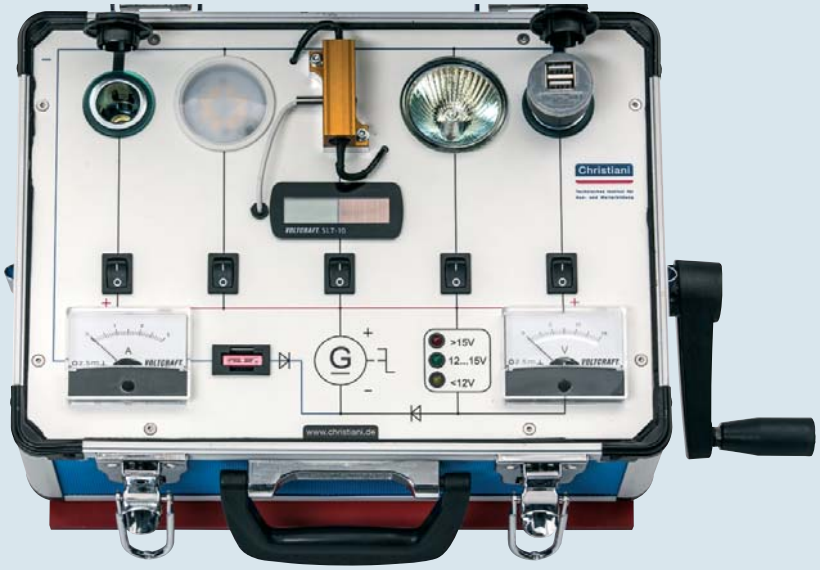
The Energy Trainer: Understand energy in an instant!

Energy Trainer

With the energy trainer, pupils quickly get the hang of energy: The handy case is fitted with a generator, which is operated via a crank handle. Various consumers can be operated with the self-generated electricity.

Pupils learn the differences in energy requirements using their own exertions. How much more energy must the pupil generate in order to power a halogen lamp, compared with an LED lamp? How much power is required to heat a thermal resistor to 40 degrees Celsius? How much power to play music through an active loudspeaker?

The new didactic learning case from Christiani: ideal for teaching the basics of energy.



Suitable for:

- **All general schools** from primary level upwards
- **Vocational colleges** for all areas in which a basic understanding of energy is required
- **Company and industry training centres** (training and further education)
- **Unions and associations** in the areas of environmental protection, energy and energy technology

Learning objectives (selection):

The pupil can

- Arrange electrical devices in order of the energy they consume
- Integrate energy measurement values into his/her own concepts and experiences
- Distinguish between energy-saving measures according to the efficiency of these
- Develop an ability to judge energy-related issues by estimating, investigating and analysis
- Draw conclusions regarding energy usage from the results
- Calculate the power and the energy from the values measured for current, voltage and time
- Physically experience and describe some of the basic principles of electrical engineering

Basic equipment:

- Manually operated energy trainer with generator for 12 Volt DC; Pmax = 35 Watt in a compact experimentation case
- Measurement and switching board with triple LED indication of the optimum voltage generated by the crank handle
- Analogue display for the current and voltage on the various consumers
- Switchable heat generator on metal plate with digital temperature display and own solar power supply, serving as a sample application for photovoltaics
- Further four switchable consumers via two 12-volt sockets, one LED lamp (12 V DC; 3 W) and a halogen lamp (12 V; 20 W)
- Active loudspeaker with integrated MP3 player
- Two screw clamps for fastening
- Experiment manual

Experiment manual for experience-oriented teaching

Using the experiment manual supplied, pupils qualitatively and quantitatively investigate basic questions relating to energy. This enables them to derive and develop concrete action concepts for saving energy. The experiments with the energy trainer make learning an experience.

Article	Order no.
Energy trainer with 1 pair of active loudspeakers + MP3 player, 2 screw clamps and 1 experiment manual	**97437**
Supplementary equipment:	
Simulation of a pumped storage power station with cable winch + bucket (5 litres)	**77493**
Model railway layout	**77494**
Voltage transformer 12/230 V; 150 W	**82809**

More information: www.christiani-international.com/97437

Creating a mobile source of energy

Solar Work Case

The solar work case generates electricity anywhere in the world via an integrated solar module. The robust case also contains a battery for storing energy, various consumers, detailed assembly instructions and accompanying educational material on photovoltaics. The solar workcase is ideal for advanced professional training in the field of renewable energy, for teaching at general schools, for international development projects and for all users who require a mobile source of energy.

- For use during training and in practice
- Mobile source of energy for mobile applications
- As a machining kit or fully assembled

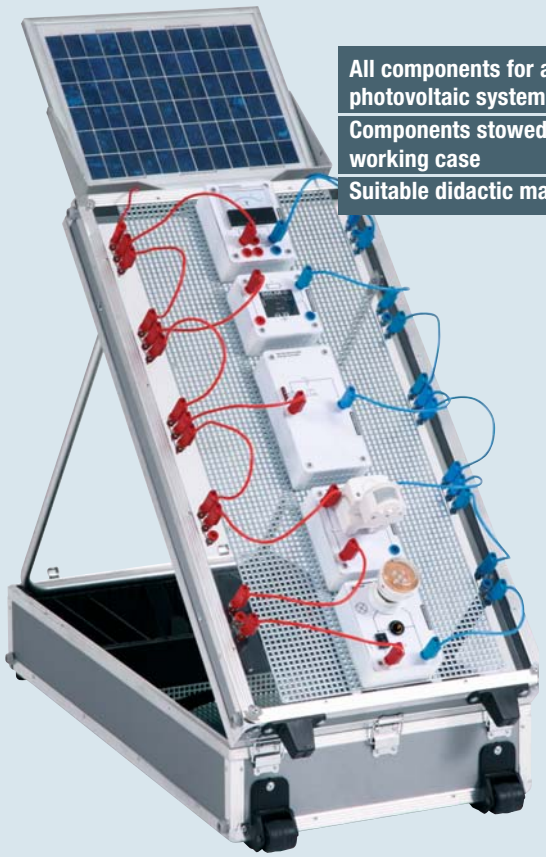
Original material kit

Solar Work Case	Order-No.
Original material kit	94920
Prepared material kit	94921
Fully assembled	94922

More information: www.christiani-international.com/94920

The Solar Power Case – the fast and simple way to understand photovoltaics

The solar power case follows the generator bike and constitutes the second stage of the overall didactic concept from Christiani in the field of renewable energy.
Instead of using muscles, the power for the solar power case comes from the sun. The way the solar power case has been designed as a modular system is a straightforward and entertaining introduction to electrical and solar engineering. Topping up a battery using the charging regulator, the installation of a motion sensor as well as the initial measurements of voltage and current provide the initial successes to be enjoyed besides building simple electrical circuits.
The solar power case can be used by the teacher to present the theoretical and practical sides of the technology and also by students, individually and in groups, to learn the basics of photovoltaic applications independently. The experiments teach the students through practical experience.



- All components for an off-grid photovoltaic system
- Components stowed away safely in the working case
- Suitable didactic material

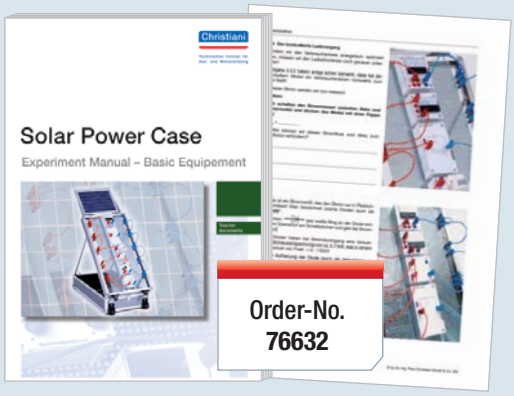
ONLINE
VIDEO

Find out about our functions and potential areas of application in our detailed product video.

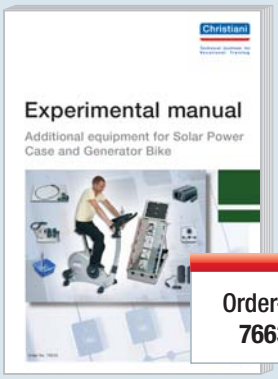
With practical transportation system on wheels!

Experiment Manual for Teachers and Students

The experiment manual is a major constituent in the overall didactic concept for the solar power case. The experiments have been designed and selected based on the knowledge to be mediated and the practical experience from qualified solar specialists. The experiment manual is made up of an information section, an exercise section and a section with the solutions.



Order-No. 76632



Order-No. 76633

! The experiment manuals are supplied exclusively to customers that have also ordered the solar power case (Order-No.: 75636 or 76704) from Christiani.

The Solar Power Case – The Basic Idea and Possibilities for Use

The solar power case is an effective system that can be used by both teachers and students.
Used in practical project-based teaching, it allows students to understand the relationship between the sun as a source of energy, and photovoltaic technology as a way of converting and utilising that energy.

Generating, storing, using and understanding energy – Modules of the solar power case

Case

Photovoltaic module

Consumer (low-voltage socket and E27 bulb socket)

Charging device, 12 V light bulb, 12 V energy-saving bulb, 12 V LED lamp

Lead-gel battery

Generator connection (voltmeter)

Motion sensor

Ammeter

Schottky diode

Charge regulator

Article	English Order-No.	Spanish
Solar Power Case basic equipment	**75636**	
Solar Power Case enhanced equipment (Basic equipment item no.: 75636, buzzer, halogen spotlight with stand, digital multimeter)	**76704**	
Experiment manual: Basic solar power case equipment Teachers' edition	**76632**	**77650**
Experiment manual: Basic solar power case equipment Students' edition	**82805**	**83304**

Suitable for:

- **All general education schools, from approx. age 9** (primary, middle and secondary schools of all kinds)
- **Vocational colleges**
- **In-house and third-party training centres** (training and further education)
- **Unions and associations**

Learning objectives/Skills:

- The electric circuit: Understanding the system with a source of energy, cables and consumer modules
- The energy accumulator: The link bet ween the charging circuit and the consumer circuit
- The solar power system: Understanding the individual functions and the work the components shall perform
- The energy efficiency: Investigating ways to optimise the components in the electric circuit
- The project: Designing, building and testing an entire solar-powered off-grid technology system
- The result: Operating an alarm system using solar power (designing, constructing and testing)
- The transfer: Planning other projects for solar power at the school

Technical data:

- **Dimensions (H/W/D in cm):** 45/87/21
- **Weight:** 17 kg

Scope of delivery:

Each component has its own unique place in the case in this construction and storage system designed specifically for schools. This simplifies the training in use for both instructors and students and ensures that this system for teaching and learning has a long service life.

- Working case
- Photovoltaic module
- Ammeter
- Lead-gel battery 12 V, 4.5 Ah with vehicle fuse
- Motion sensors
- Consumer (low-voltage socket, E27 bulb socket)
- Charge regulator
- Generator connection (voltmeter)
- Schottky diode
- Charging device, 12 V light bulb, 12 V energy-saving bulb, 12 V LED lamp
- 15 x red MC wires + 15 x blue MC wires
- 3 x spare fuses 7.5 A

The Solar Power Laboratory – for the photovoltaics professionals of the future

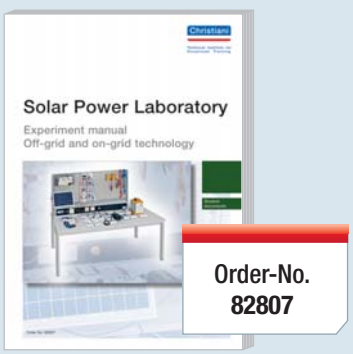
The solar power laboratory provides students with a practical understanding of both off-grid and on-grid technology. Entire classrooms can be fully equipped with laboratory workplaces. Christiani supplies the fitments required to fully equip these specialist rooms. We will gladly help you from the initial concept stage right through to its realisation. The solar power laboratory can also be installed as an individual workplace for learning purposes both in companies and in educational institutes. An experienced and professional educational specialist has developed the components and the experimental set-ups together with solar engineering specialists. The comprehensive description provided for the experiments rounds off the overall didactic concept in an ideal manner. The technology used in the solar power laboratory has been optimally tailored to suit the requirements of practical applications in domestic engineering.

- Learning based on industry components
- Modular design
- Suitable didactic material

Detailed illustration:
Power supply channel

Experiment Manual for Teachers and Students

The experiment manuals for the solar power laboratory are the result of various further-education concepts. Besides basic information on climate protection and renewable energy given in separate sections, the manuals provide an introduction to off-grid and on-grid technologies.The teachers' edition is in colour, available in German and English and includes the solutions for the exercises. The students' edition is printed in back and white and does not include the section with solutions.

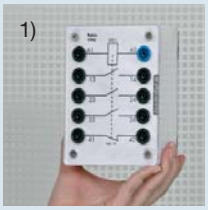


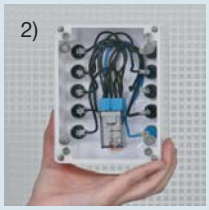
! The experiment manuals are supplied exclusively to customers that have also ordered the solar power laboratory (Order-No.: 82371 or 76970) from Christiani.

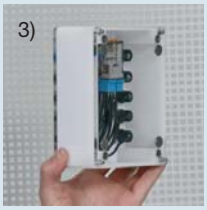
Solar Power Laboratory – Concept and Type

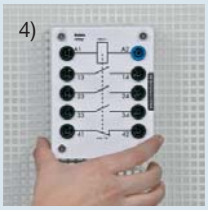
Working with the individual modules, students gain a clear insight into the circuits commonly used in photovoltaics. The modules are made of sturdy, shatter-proof material and have replaceable sides, fronts and backs. In addition, the rear wall is transparent to make the technology inside visible to the trainees.

The solar power laboratory modules are state-of-the-art in photovoltaic technology









1) Standardised and easily-remembered symbols, made from extremely robust and shatterproof material

2) See-through back panel: Show students the interior

3) + 4) Held safely in place by powerful magnets; flexible for use on bread board walls, metal panels and boards on steel walls

and comply with the relevant requirements (VDE 0100 Part 712). The inverters for the PV on-grid technology are from the Steca company.

The modules are identified by embossing with standardised symbols. All connections are routed to 4 mm shatter-proof safety sockets on the front panel. There are no live connections from any installed devices to the outside. The back panel has been designed to hold boards on steel walls for illustrating theory, as well as laboratory breadboards for demonstrating the practical side of a tutorial. As well as the holding system, the modules are fitted with four spring-loaded dowel pins for stability on the lab breadboard. The circuit diagrams can be visualised by attaching the modules to the steel panels for better comprehension.

	English	Spanish
Article	**Order-No.**	
Solar power laboratory, complete (Consisting of: laboratory bench with breadboard wall and power supply duct, roller container, components for on-grid and off-grid technology and experiment manual, teachers' edition)	**82371**	
Laboratory bench with power supply duct and breadboard wall	**89387**	
Roller container	**89784**	
Solar power laboratory components for off-grid technology	**76970**	
Solar power laboratory components for on-grid technology	**76971**	
Experiment manual: Solar power laboratory, teachers' edition	**82017**	**83302**
Experiment manual: Solar power laboratory, students' edition	**82807**	**83303**

Suitable for:

- **General education schools** (e.g. technical secondary schools or specialised physics courses)
- **Vocational colleges**
- **Company and industry training centres** (training and further education)
- **Universities and colleges**
- **Unions and associations**

Learning objectives/Skills:

Off-grid technology learning objectives

- Measurements with the solar power circuit: Open-circuit voltage and short-circuit current at various light intensities, angles of incidence and temperatures
- Identifying the IV characteristic and the MPP
- The battery is the energy accumulator in the PV off-grid technology: Discharge protection and charging regulator; current distribution during charging and draining; internal-resistance measurements of module and battery, exhaustive discharge protection
- Electric circuits with the off-grid PV system: Individual functions of surge voltage protection; fuses, distributors and consumers
- Off-grid inverter: Measurement of voltages and currents; efficiency and AC voltage types
- Project: Developing a back-up power supply for safety lighting
- Transfer: Designing, constructing and testing solar power off-grid technology

On-grid technology learning objectives

- Investigating devices in the StecaGRID on-grid feed system
- Measuring and optimising PV string concepts; circuit variations, measurement recording and safety concepts
- Overvoltage protection and safety regulations for grid feed
- ENS basic function and functional test
- Setting up, measuring and expanding the feed-in system
- Transferring data from the inverter to the display
- Efficiency and balancing calculations of the power for consumption and supply
- Transfer: Expanding the circuitry and service
- Project: Designing and building a PV ongrid system for use in practice

Technical data:

- **Dimensions** total (H/W/D in cm) 153/180/90
- **Dimensions** Laboratory bench (H/W/D in cm) 72/180/90
- **Weight** total approx. 120 kg

Scope of delivery:

- Laboratory bench with power supply and breadboard wall
- Roller containers for storing the modules
- Solar power laboratory components for off-grid technology
- Solar power laboratory components for on-grid technology
- Experiment manual, teachers' edition

The complete system for heating technology with renewable energy

S1 geothermal energy source or floor heating

S2 fan convector as the source or the sink

S3 solar collector with solar simulation

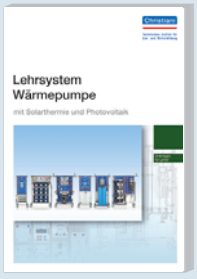
The original system for hands-on learning!

This hands-on teaching system with original components enables you to provide teaching about solar thermal technology, heat pumps and biomass and pellet heating systems. The teaching system for heating technology with renewable energy has a modular structure. You can combine training stands depending on the technology you are teaching – such as the heat pumps teaching system or the new pellet heating teaching system. Specific examples are provided on the following pages.

In addition to providing training in conventional skills for HVAC plant mechanics, the teaching system can also be used to impart specialist knowledge of electrical and hydraulic systems. Using the training stands, students can develop an understanding of all relevant processes and a wide range of tasks from real-life practice. Teaching is always centred around activity-based, independent work by the students.

Experiment manuals

Experiment manuals also available in other languages



The experiment manuals each contain an information section and an exercise and solution section. These are included in the S5 (heat pump) and S7 (pellet heating) training stands.

Key features

- 7 mobile training stands on castors
- For simulating diverse real-world situations and system concepts through various combinations and parameterisations of the training stands
- Experiments and simulations with original industry components used in practice
- Comprehensive description of the experiments

Learning objectives of the teaching system for heating technology with renewable energy

Learning objectives/Skills:

- Understanding of system conditions for heat-pump heating systems, solar thermal systems and pellet heating systems
- Knowledge of the electrical, hydraulic and control operating conditions
- Knowledge of the physical processes in the cold circuit of a heat pump
- Task-oriented acquisition of skills required for planning, setting up and commissioning heat pump and solar thermal and pellet heating systems
- Ability to use measurements to observe and evaluate electrical and hydraulic processes
- Understanding of the processes used to optimise the energy in heating systems using heat pumps, solar thermal energy and pellets.
- Ability to judge the electrical and hydraulic values measured in heat pump heating systems and to plan any related process changes
- Understanding of how to optimise the controls and energy use of the circulation pumps used in heating systems
- Ability to optimise energy processes in heating systems

Suitable for:

- HVAC plant mechanics
- Advanced HVAC training
- Electronics engineers specialising in energy and building services technology

Now with pellet heating

S4 hydraulic switch, plate heat exchanger and buffer storage

S5 heat pump
with switchover function for heating or cooling (optional)

S6 hybrid collector

NEW

S7 pellet heating

Pellet heating teaching system
Teaching biomass and pellet heating technology effectively

The new entry in the teaching system for heating technology with renewable energy range: The S7 pellet heating training stand can be combined with the S4 and S1 or S2 training stands, for example. The hands-on teaching system enables you to teach the fundamental principles of biomass heating systems and the necessary specialist knowledge of pellet heating systems clearly and effectively.

More information **on p. 55 and p. 62/63**

Decades of experience combined into a single teaching system

The Didactic Concept of the Teaching System

S2 fan convector as source

S5 heat pump

S1 underfloor heating

Application example

Structure of a heating system with an air source heat pump and underfloor heating

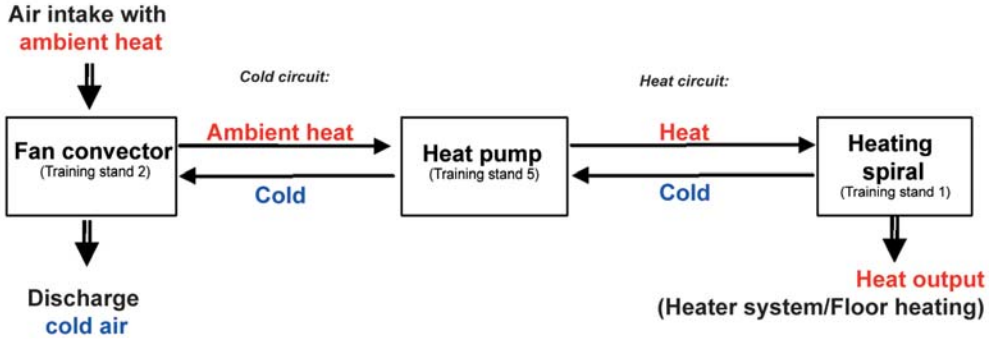
Experiment set-up

The ambient air is taken in at the fan convector (training stand S2) with the ambient temperature, and the ambient heat is fed to the heat pump (training stand S5). Here the heat is removed and transferred via the hot circuit to the three pipe systems (training stand S1), which, in this experiment, can be considered to be the floor heating or the heater core. The cold which is generated in this process at the same time is discharged by means of the fan convector (training stand S2).

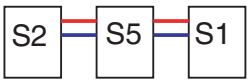
ONLINE VIDEO

Find out about our functions and potential areas of application in our detailed product video.

Diagram of the Principle:

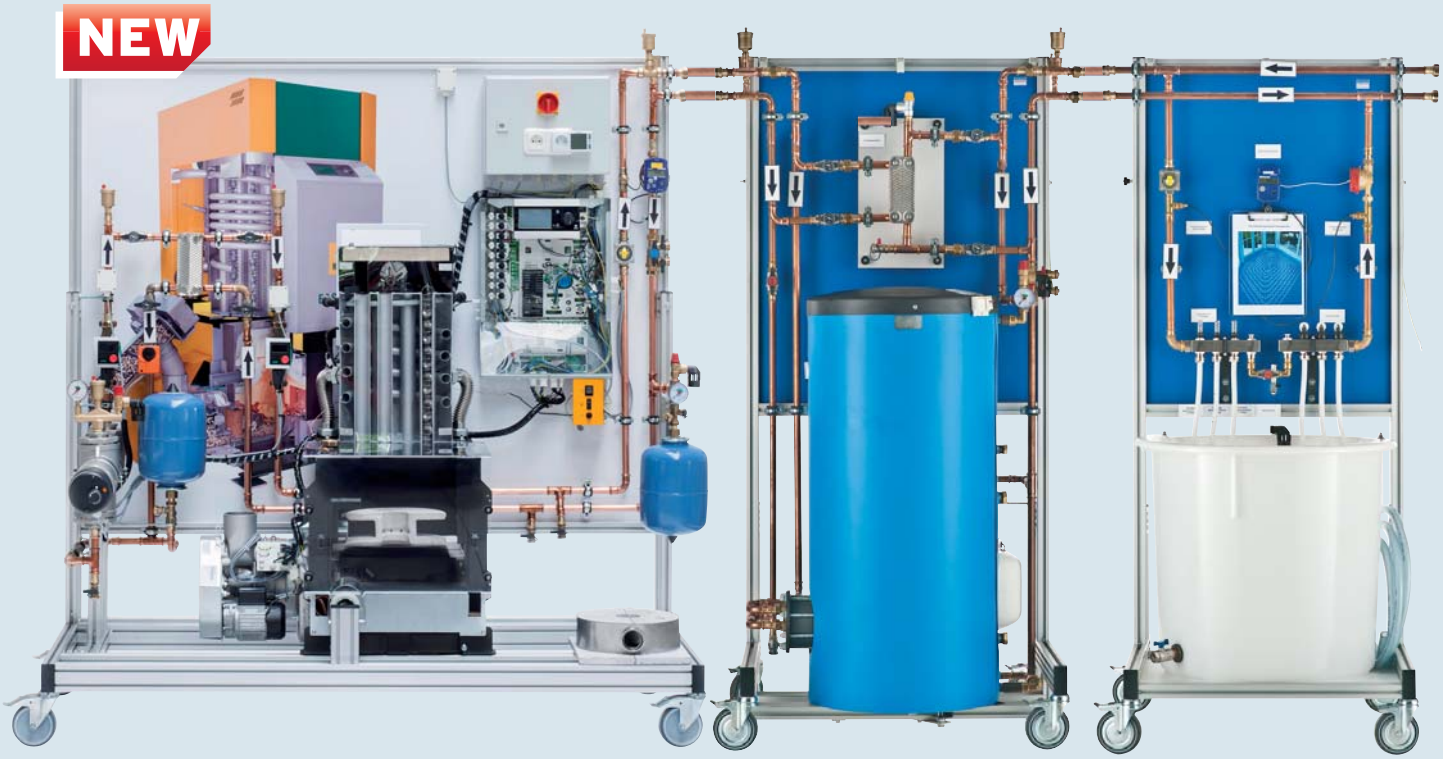


Simplified view of the experimental set-up:



Pellet heating teaching system

NEW



S7 pellet heating

S4 hydraulic switch, plate heat exchanger and buffer storage

S1 underfloor heating

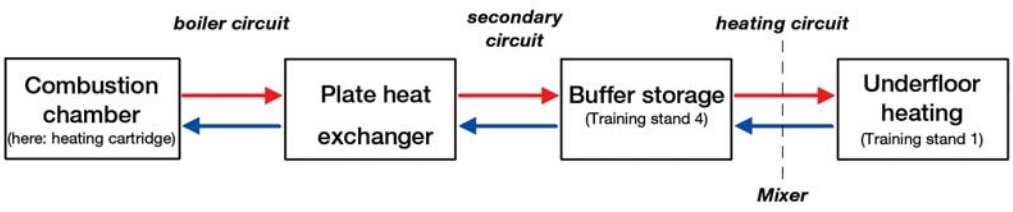
Application example:

Pellet heating system with buffer storage and underfloor heating

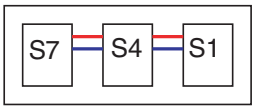
Experimental setup:

Due to the didactic setup of the combustion chamber and the heat exchanger in this teaching system, the heat usually generated in the combustion chamber of the pellet heating system is generated by a heating cartridge. The heat generated in this way in the boiler circuit is transferred to the secondary circuit via a plate heat exchanger. The secondary circuit supplies the buffer storage (training stand S4) with heat. The heat sink (heating circuit) in this case is the underfloor heating (training stand S1). A mixer (optional) ensures that the temperature in the heating flow is optimal. During this process, all major sensors in the original pellet heating system are used. Sensor values can be switched between real measured values (where these are useful) and adjustable measured values that are recorded by a potentiometer for simulating various real-life situations.

Diagram of the principle:



Simplified view of the experimental setup:



Sanitation/HVAC

Renewable Energy

Training Stand 1: Geothermal Energy Source or Underfloor Heating

This training stand can be used as a source of heat in the configuration "brine heat pump“ (training stand 5) or as the heat sink in combination with the heat pump or the solar heat stand (training stands S3 and S4).

Operation with or without filling with water is possible here.

- 200-litre water tank
- 3 pipe systems (10, 20 and 30 metres in length)
- Integrated hot-medium meters to measure the overall flow, the hot and the cold outputs as well as the admission and return temperatures
- Bypass valve between the heating circuits for the experiments to bypass the three pipe systems
- Experiments on "hydraulic adjustment" with the three pipe systems routed in parallel using the volumetric flowmeters and throttle valves

ONLINE
VIDEO

Find out about our functions and potential areas of application in our detailed product video.

Experiment Manual

All the experimental set-ups together with other combinations and possible uses are described in detail in the experiment manual. The experiment manual contains an information section, an exercise section and a section with the solutions, and is included free-of-charge in the delivery when the S5 training stand (heat pump) is ordered.

Technical data:

- Dimensions: (W/D/H in mm) approx. 1100 x 800 x 1980 mm
- Weight: approx. 80 kg

Article	Order-No.
S1 geothermal energy source or underfloor heating	82125

! The experiment manuals are supplied exclusively to customers that have also ordered the S5 training stand for the heat pump (Order-No.: 82129) from Christiani.

Training Stand 2: Fan Convector as Source or Sink

Both the source of energy and the energy sink with discharge of warm air can be realised with the fan convector in these experiments.

- Fan power air throughput up to 2300 m³/h
- Heating power up to 22.4 kW at 90/70/20°C
- Adjustable cooling performance from 3 to 5.4 kW at 7/12/27°C
- Continuous throttle action in the hydraulic circuit by turning valves on the convector
- Series of experiments to optimise the energy between the heating power available from the heating circuit and the energy conveyed from the convector to the air in the room
- Integrated hot-medium meter

ONLINE
VIDEO

Find out about our functions and potential areas of application in our detailed product video.

Experiment Manual

All the experimental set-ups together with other combinations and possible uses are described in detail in the experiment manual. The experiment manual contains an information section, an exercise section and a section with the solutions, and is included free-of-charge in the delivery when the S5 training stand (heat pump) is ordered.

! The experiment manuals are supplied exclusively to customers that have also ordered the S5 training stand for the heat pump (Order-No.: 82129) from Christiani.

Technical data:

- Dimensions: (W/D/H in mm) approx. 1100 x 800 x 1980 mm
- Weight: approx. 80 kg
- Power supply: 230 V AC

Article	Order-No.
S2 Fan convector as the source or the sink	82126

Training Stand 3: Solar Collector with Solar Simulation

The main components of this training stand are the flat plate collector, the solar heat regulator and the circulation pump with the new more powerful thermal collector

- Clear glass collector with copper absorber (collector area > 2 m², standstill temperature to about 208°C)
- System regulator with diverse regulating functions and energy measuring/sensing for the functional value using a data stick
- High-efficiency pump (minimum power input 5.8 W and maximum delivery height 5 m) as the wet-running meter with EC motor, and with automatic adjustment of the power
- 8 x 400 W halogen spotlights for simulation of the irradiated solar power
- Safety devices with diaphragm expansion vessel and 6-bar pressure control valve
- 2 ball valves, with integrated thermometer and gravity braking system in the collector circuit
- Flowmeter and "Flow Check" for controlling the flow (5 to 40 L/min)
- Fittings for filling and flushing

ONLINE
VIDEO

Find out about our functions and potential areas of application in our detailed product video.

Experiment Manual

All the experimental set-ups together with other combinations and potential areas of application are described in detail in the experiment manual. The experiment manual contains an information section, an exercise section and a section with the solutions, and is included free-of-charge in the delivery when the S5 training stand (heat pump) is ordered.

! The experiment manuals are supplied exclusively to customers that have also ordered the S5 training stand for the heat pump (Order-No.: 82129) from Christiani.

Technical data:

- Dimensions: (W/D/H in mm) approx. 2150 x 800 x 1980 mm
- Weight: approx. 130 kg
- Power supply: 230 V AC

Article	Order-No.
S3 solar collector with solar simulation	82127

Training Stand 4: Hydraulic Switch, Plate Heat Exchanger and Buffer Storage

This training stand is used for adaptation to the hydraulic conditions. The hydraulic switch, the plate heat exchanger or the heat exchanger integrated in the storage system can be used for various experimental set-ups.

- Hydraulic switch and plate heat exchanger are interchangeable using an exchangeable disc (the component not being used is fastened to the rear of the stand)
- Hydraulic switch:
  Stainless steel vessel (volume approx. 1 litre), primary circuit and secondary circuit are at the same pressure but are not hydraulically coupled
- Plate heat exchanger:
  16 exchange plates, exchanger performance 17 kW at 70/50°C primary and 35/45°C secondary
- Enamel reservoir for holding 160 litres of water, with integrated straight-tube heat exchanger

ONLINE
VIDEO

Find out about our functions and potential areas of application in our detailed product video.

Rear view of S4

Experiment Manual

All the experimental set-ups together with other combinations and potential areas of application are described in detail in the experiment manual. The experiment manual contains an information section, an exercise section and a section with the solutions, and is included free-of-charge in the delivery when the S5 training stand (heat pump) is ordered.

Technical data:

- Dimensions: (W/D/H in mm) approx. 1200 x 800 x 1980 mm
- Weight: approx. 80 kg

Article	Order-No.
S4 coupling component hydraulic switch, plate heat exchanger and buffer storage	**82128**

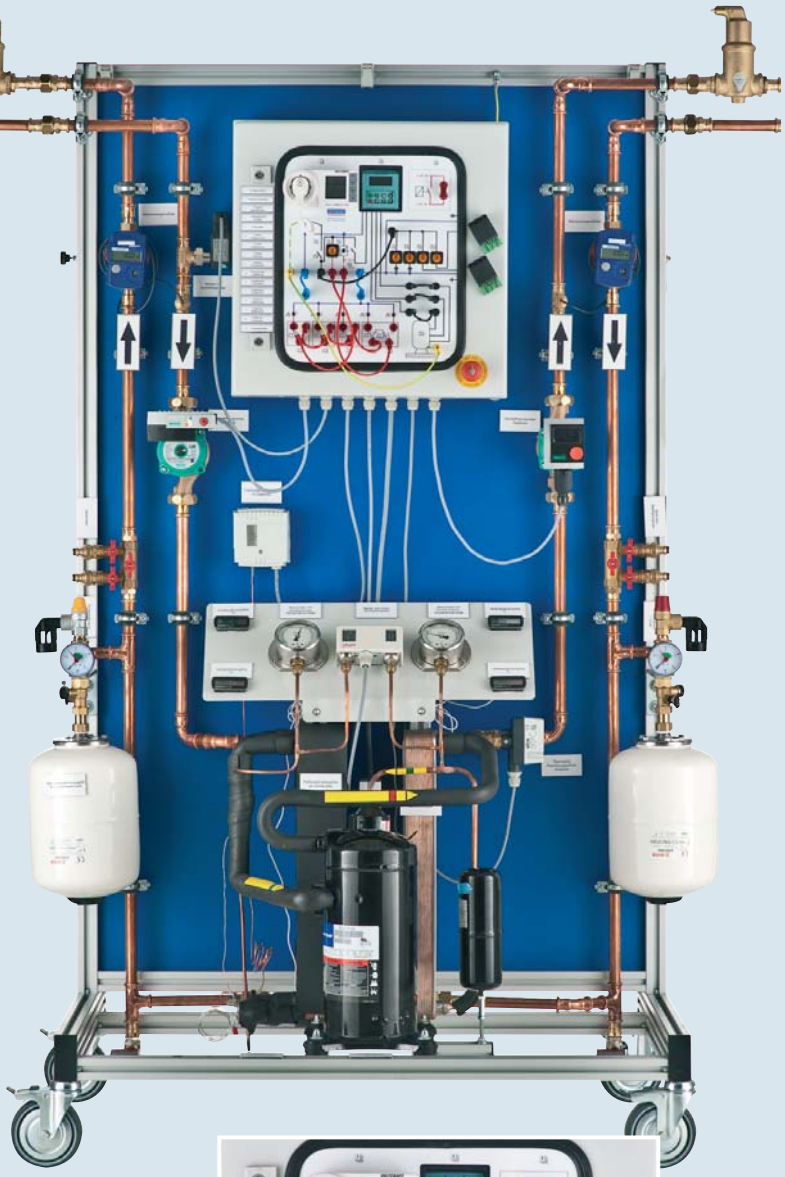
! The experiment manuals are supplied exclusively to customers that have also ordered the S5 training stand for the heat pump (Order-No.: 82129) from Christiani.

Training Stand 5: Heat Pump

This training stand constitutes the central element of the teaching system.

Besides the heat pump, the stand contains all the power supply points for the other training stands. With the brine and heating circuit connection, the circulation pumps and the safety devices are already installed for the professional operation of a heat pump.

- Conventional heat pump with evaporator, scroll compressor, liquefier and expansion valve in line with state-of-the-art technology.
- Permanently fitted cold circuit (not accessible for experimental interventions), refrigerant R407c.
- Manometer for sensing and measuring physical events in the cold circuit.
- Digital thermometers for measuring the temperatures in the cold circuit downstream of the evaporator, air compressor, liquefier and expansion valve.
- Low and high-pressure control devices energy measuring device, high-efficiency circulation pumps and other components.
- Power supply, measuring and switching unit with RCT, main fuses, energy measuring device, control-circuit fuse and contactor relay.



ONLINE VIDEO

Find out about our functions and potential areas of application in our detailed product video.

Experiment Manual

All the experimental set-ups together with other combinations and possible uses are described in detail in the experiment manual. The experiment manual contains an information section, an exercise section and a section with the solutions, and is included free-of-charge in the delivery when the S5 training stand (heat pump) is ordered.

! The experiment manuals are supplied exclusively to customers that have also ordered the S5 training stand for the heat pump (Order-No.: 82129) from Christiani.

Technical data:

- Dimensions: (W/D/H in mm) approx. 1200 x 800 x 1980 mm
- Weight: approx. 120 kg
- Power supply: 230 V AC

Article	Order-No.
S5 Heat pump	82129

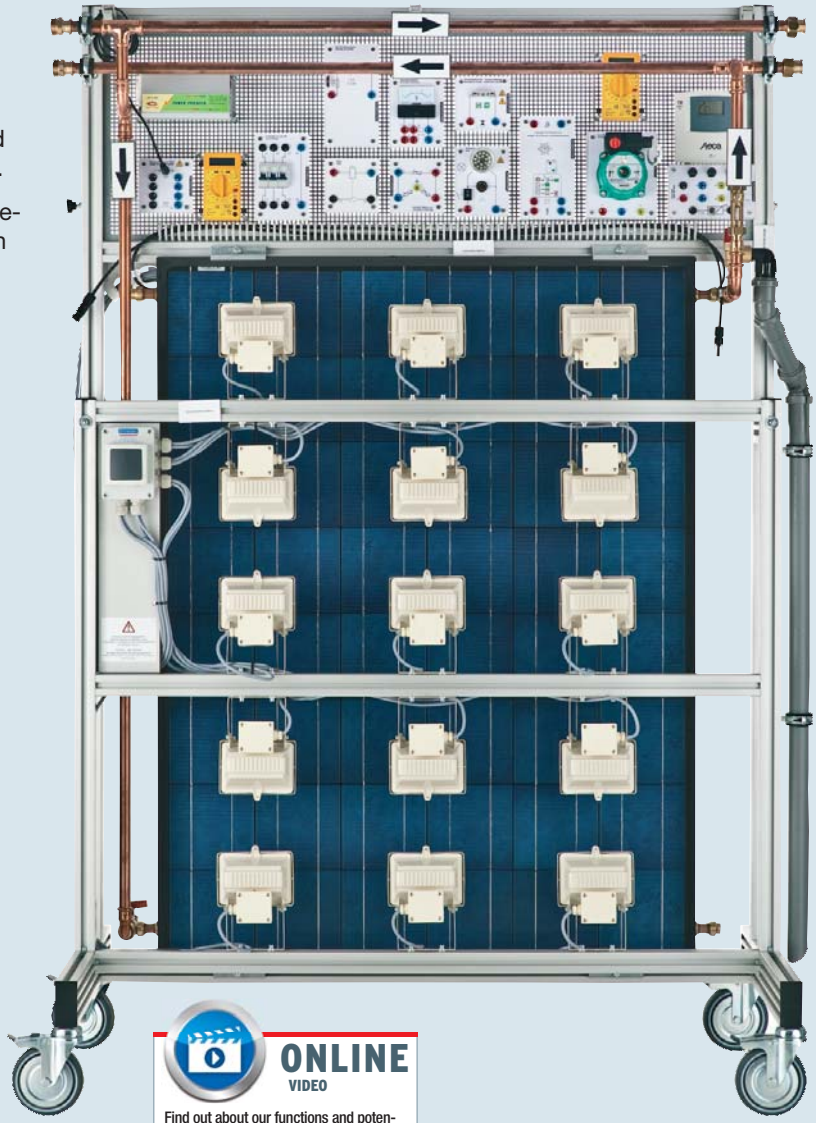
Training Stand 6: Hybrid Collector

This training stand adds a further key technology - photovoltaics - to the teaching system. This also allows a solid fundamental knowledge of hybrid collectors to be accumulated and built upon.

Thus, heat pump system concepts can be developed and tested using photovoltaics and hybrid collectors.

The training provides an excellent opportunity to experience the process of system integration as a solution with its many benefits.

- To understand the function of a hybrid collector on the basis of experiments and measured values
- To plan heat pump systems with hybrid collectors as an energy source for the heat pump
- To understand the effect of the temperature profile on the thermal collector and PV module
- To record and analyse measured values
- To plan and execute an emergency power system for a circulation pump with regulator
- Sensible use of PV electricity in off-grid systems or in the emergency power system
- Experimental derivation
- To understand the physical process of a hybrid collector in thermal energy extraction through the brine circuit of a heat pump
- To understand the process of water extraction through condensation at the hybrid collector



ONLINE VIDEO

Find out about our functions and potential areas of application in our detailed product video.

Experiment Manual

All the experimental set-ups together with other combinations and possible uses are described in detail in the experiment manual. The experiment manual contains an information section, an exercise section and a section with the solutions, and is included free-of-charge in the delivery when the S5 training stand (heat pump) is ordered.

! The experiment manuals are supplied exclusively to customers that have also ordered the S5 training stand for the heat pump (Order-No.: 82129) from Christiani.

Technical data:

- Dimensions: (W/D/H in mm) approx. 1450 x 800 x 1980 mm
- Weight: approx. 100 kg

Scope of delivery:

- Training stand S6 hybrid collector
- Modules: circulation pump and solar heat regulator
- Modules: Safety lamp, consumer, lead-gel battery, fuse distributor, 12 V relay, overvoltage protection, generator connection, multimeter (2 pieces), power connection module, 300 W inverter
- Connecting cable

Article	Order-No.
S6 hybrid collector with PV components	85317

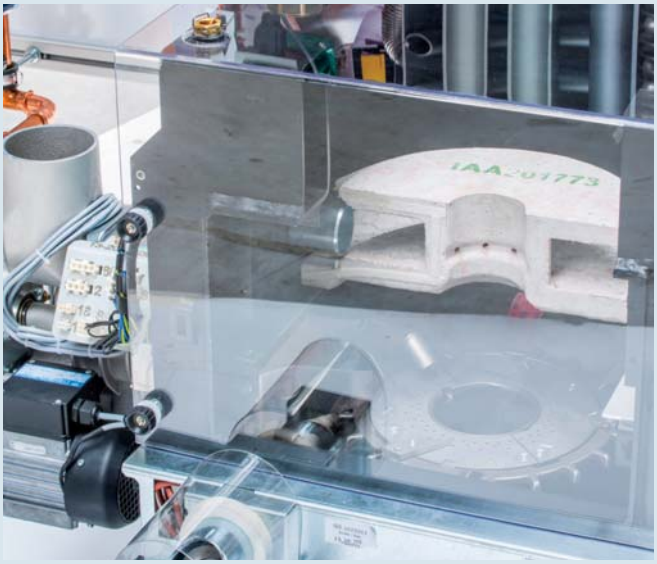
Teaching biomass and pellet heating technology effectively

Training Stand 7: Pellet Heating

In combination with training stands S4 and S1 or S2, training stand S7 (pellet heating) is a practical teaching system. This high-tech teaching system enables you to convey a basic knowledge of biomass heating systems and a specialist knowledge of pellet heating systems clearly and effectively. Heat is generated via a heating cartridge, which means that no waste gas discharge is required.

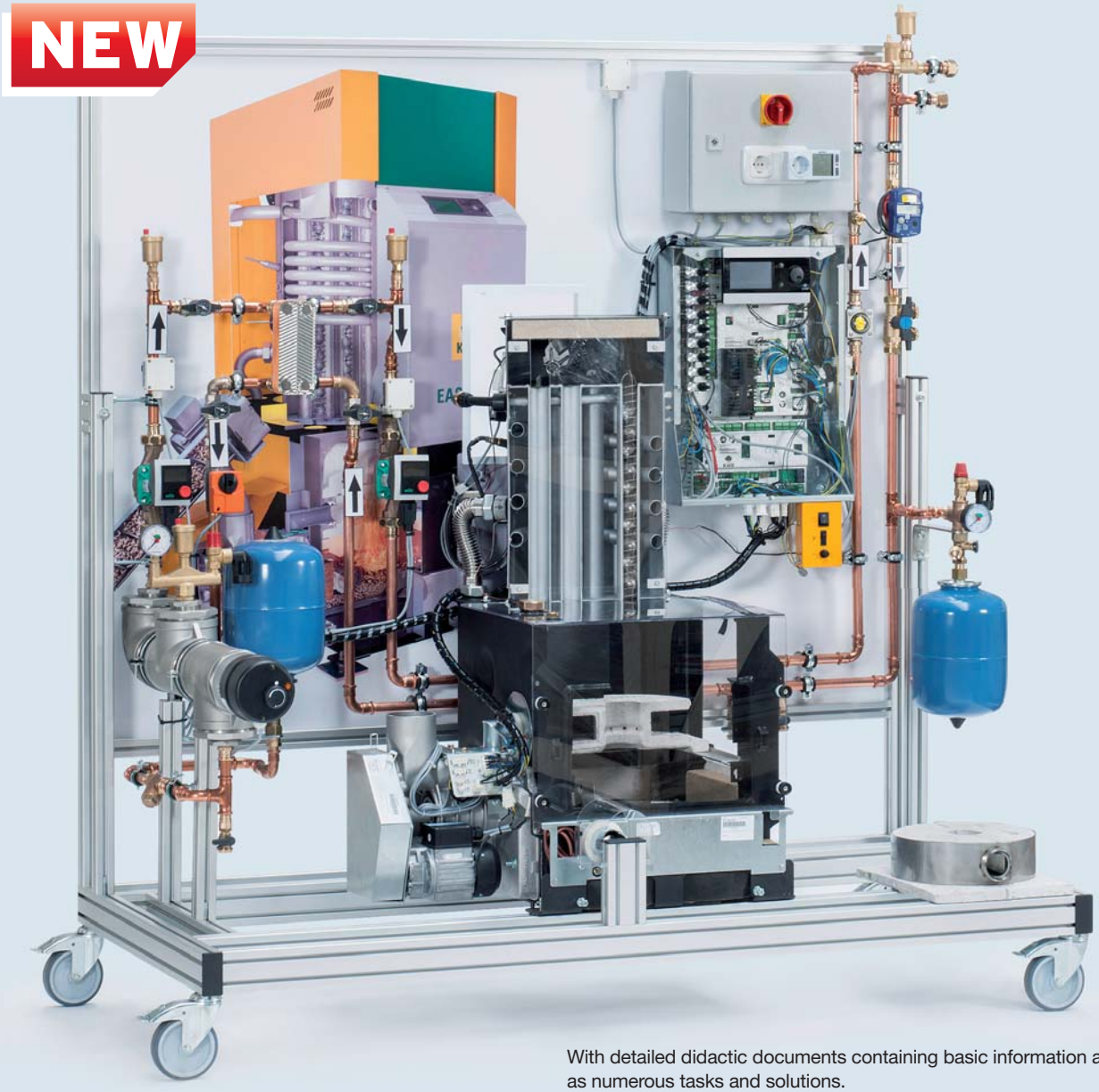
Didactically designed pellet heating system with all major components and functions:

- Sectioned combustion chamber for easy access to processes and sequences
- No real combustion process, therefore no waste gas discharge required
- Heat generation in the boiler circuit via heating cartridge; all other processes (hydraulic and electrical) are identical to those in the real-life operation of a pellet heating system
- Switchable sensors: Real measured values or simulation of various operating states via potentiometer
- The pellet heating training stand is used as a heat source and can be combined with a storage tank (coupling component, item no. 82128) and a heat sink (fan heating system, item no. 82126 or underfloor heating, item no. 82125)



Sectioned combustion chamber with turntable and spiral conveyor

NEW



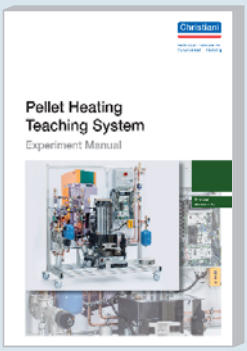
With detailed didactic documents containing basic information as well as numerous tasks and solutions.

Learning objectives include:

- Basic knowledge of biomass heating systems
- Understanding of the structure and function of a pellet heating system and all major components
- Understanding of the sequences involved in the combustion process of a pellet heating system
- Knowledge of physical and energy-based relationships when operating a pellet heating system
- Ability to plan, install, commission and maintain a pellet heating system
- Consultancy expertise on the key features of a pellet heating system, including in comparison with other heating systems
- Understanding of the energy-related system integration of the pellet heating system into existing hydraulic supply systems
- Knowledge of the safety instructions throughout the life cycle and operating states of the pellet heating system

Suitable for:

- HVAC systems mechanics
- Advanced HVAC training



All the experimental set-ups together with other combinations and possible uses are described in detail in the experiment manual. The experiment manual contains an information section, an exercise section and a section with the solutions, and is included free-ofcharge in the delivery.

Designation	Order no.
Training stand S7 pellet heating	**98380**

You can find more information at:
www.christiani-international.com/98380

Full perspective for increased safety

Gas technology training stand (with compressed air operation)

Gas installations require a particular level of precision and safety. For the full perspective, the gas technology training stand is equipped with a camera in the gas flow monitor.

The stand is ideal for these learning objectives, learning situations and topics, amongst others:

- Replacement of a pipeline section
- Inspection of a gas installation
- Installation of a gas line in a detached house
- Selection of raw materials for a gas line
- Determination of the safety fittings
- Implementation of a serviceability inspection

Included in the scope of delivery: Practical experiments for versatile use of the training stand.

Workflow of a customer order for a gas installation, e.g.:

- **Order analysis**
  (technical rules, corrosion protection, attachment of gas lines, etc.)
- **Order planning**
  (planning of the route, work planning for the production of a pipeline section, etc.)
- **Order implementation**
  (production of the pipeline section, documentation of the work, commissioning, etc.)
- **Order assessment**
  (costs calculation, etc.)

NEW

Technical features:

- Camera in the gas flow monitor
- Gas pressure regulator
- Single pipe and two-pipe bellows meter
- Various sections as pipe package with different bends for determining pressure losses
- Flow rate float for visualisation of pressure ratios
- Measurement test connections
- Gas pressure measuring device
- Insulator
- Main shut-off device with TAE
- Connection to the equipotential bonding
- Dimensions: 1,500 x 900 x 1,940 mm (W x D x H)

Order-No.
95740

Practical, with current technology
With camera in the gas flow monitor
Safe operation with compressed air

Topics/Learning Objectives

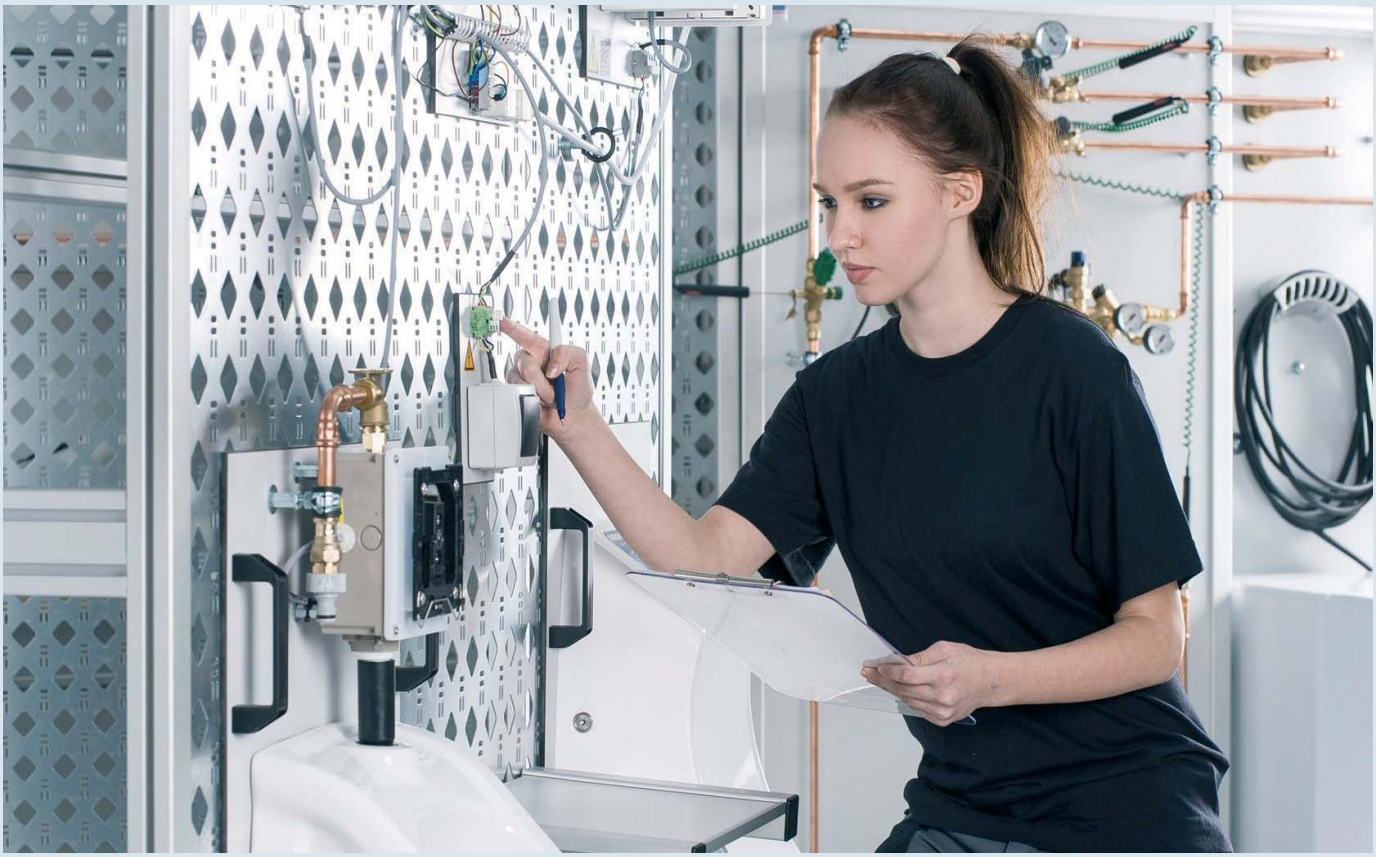
Installation of fuel supply systems – incl.:

- Planning the installation of fuel supply systems for natural gas
- Analysis, planning and realisation of systems for fuel supply
- Preparation for initial commissioning
- Documentation of the results of the leak test
- Notification of customer with regard to prescribed and precautionary inspections as well as what to do in the event of leaks

With camera in the gas flow monitor

Best prepared for trade examinations

Bathroom installation training stand



From planning a bathroom to assessment of the order: With this teaching system, you can teach all aspects of bathroom installation technology, e.g. for the following learning objectives, learning situations and topics:

- Setup of a guest bathroom with urinal
- Selection of a urinal: Creation of layout and outline; material properties, functional processes (flushed and waterless), mounting of urinals, use of sound insulation mats, comparison of water consumption with different urinal types, etc.
- **Electrical connections for HVAC components in order to achieve the *Electrician for defined activities*** qualification

Included in the scope of delivery: Practical experiments for versatile use of the training stand.

Workflow for customer orders, equipment of washrooms:

- **Order analysis**
  (Distinction between flush mechanisms, operating principle of waterless urinals, control technology workflows, etc.)
- **Order planning**
  (Creation of an outline, taking into account the relevant standards, material and tool composition, etc.)
- **Order implementation**
  (Implementation of wiring and VDE measurements, documentation of the work, etc.)
- **Order assessment**
  (Costs calculation, etc.)

NEW

Technical features:

- Comparison of different urinals (with flush and waterless)
- Fans and fan control
- Electrical connection of an optoelectronic tap and abath fan
- Dimensions: 1,500 x 900 x 1,940 mm (W x D x H)

Order-No.
95741

Practical, with current technology
For plumbing and electrical installations
Flexible and mobile

Topics/Learning Objectives

- Planning the configuration of washrooms, taking into account the customer's wishes
- Preparation of assembly work
- Development of planning proposals
- Assessment of taps and devices with regard to function and mechanism
- Observation of the means to save drinking water and for efficient use of energy
- Comparison and assessment of different equipment options
- Documentation of plans
- Presentation of decisions in the form of customer-oriented consultations

An abundance of practical expertise in full flow

The installation and maintenance of drinking water systems requires extensive expertise and skills. With the new drinking water training stand, you can simulate many practical exercises and tasks, including for the following learning objectives, learning situations and topics:

- Backflow testing
- Maintenance work on the service line
- Equipotential bonding
- Professional insulation of drinking water lines to protect against heating or cooling
- Safeguarding of drinking water
- Measures to save drinking water
- Anti-corrosion measures in drinking water systems
- Commissioning of a drinking water line
- Pipe network analysis
- Assembly of an instantaneous water heater
- Construction elements of drinking water heating systems
- Illustration of pipe faults, such as stagnant side arm, trapped air, pressure surges

Included in the scope of delivery: Practical experiments for versatile use of the training stand.

Workflow for customer orders, e.g. for maintenance of technical systems in a drinking water system:

- **Order analysis**
  (liquid categories, safety valves, tasks of components, electrical hot water provision, knowledge about corrosion and condensation etc.)
- **Order planning**
  (calculations, designs, principles for pipe dimensioning, etc.)
- **Order implementation**
  (measured value recording, insulation, leak test, etc.)
- **Order assessment**
  (measured value assessment, costs calculation, etc.)

NEW

Technical features:

- Domestic water connection with shut-off valves and non-return valve
- Water meter with water meter bracket
- Connection to the equipotential bonding
- Combination of pressure regulator and backwashable fine filter
- "Safe" aerator
- Copper pipe installation with transparent, plastic sub-sections
- Twin-tap and lever-mixer
- Electrical hot water tank
- Transparent diaphragm expansion vessel
- Circulation line with pump
- Various measuring points for pressure and temperature recording
- Safety valve
- Thermostatic valve for circulation line
- Balancing valve
- Dimensions:
  1,500 x 900 x 1,940 mm (W x D x H)

Order-No.
95743

Practical, with current technology

Incl. experiment manual for maintenance and installation

Flexible and mobile

Topics/Learning Objectives

- Maintaining technical systems
- Installing drinking water systems
- Installing systems for heating drinking water

Understanding the heating control of different units using the right diagram

Heating Control Compact Model

- Universal system for connecting commercially available controls, e.g. Honeywell, Landis, Viessmann, etc.
- Table model with 6 exchangeable disks
- Voltage supply using 5V controllers (no potential equalisation required)
- Terminal strips on rail to connect the controller
- Indicating the operating states of pumps, mixers, boilers, etc. using LED lights

Compact table model with 6 different exchangeable disks to show:

- 1 mixing circuit and floor heating
- 2 mixing circuits and solar heat
- 2 storage tanks, 2 mixing circuits and solids boiler
- Oil/gas boiler with tap water
- Oil/gas boiler with solar energy system
- Oil/gas boiler with 2 storage tanks and 2 mixing circuits

Specifications:

Voltage supply 5V
Dimensions: (L x D x H) 680 x 160 x 1080

Order-No.

97269

More information: www.christiani-international.com/97269

May we recommend:

Heating controller, prepared for the use together with the Heating Control Compact Model:

- Heating controller Honeywell SDC 12-31
  Best-Nr. 99772
- Heating controller Honeywell SDC 9-21WM
  Best-Nr. 99773

This is where hydraulic relationships become clear

Heating Hydraulics Training Stand

- Mobile training stand with four heater simulations, each one with a thermostat valve, flow meter and capture of the heater's output temperature
- Thermostat with simulated outside temperature (via potentiometer)

For many tasks in the heating hydraulics, e.g.

- Testing work on the diaphragm-type expansion tank
- Programming the outside thermostat
- Flow meter for the total volume flow and strand volume flows
- 4-channel temperature measuring device with data interface
- Gauge connections for both the flow and return, for temperature difference measurement
- Temperature measurements via sensor insert in the medium

Specifications:

- 4 strand regulation valves
- Short-circuit valve for maximum flow
- 3-way mixer unit with high-efficiency pump and safety group
- Heat transfer station with heat exchanger
- Dimensions: (L x D x H) 1500 x 900 x 1940

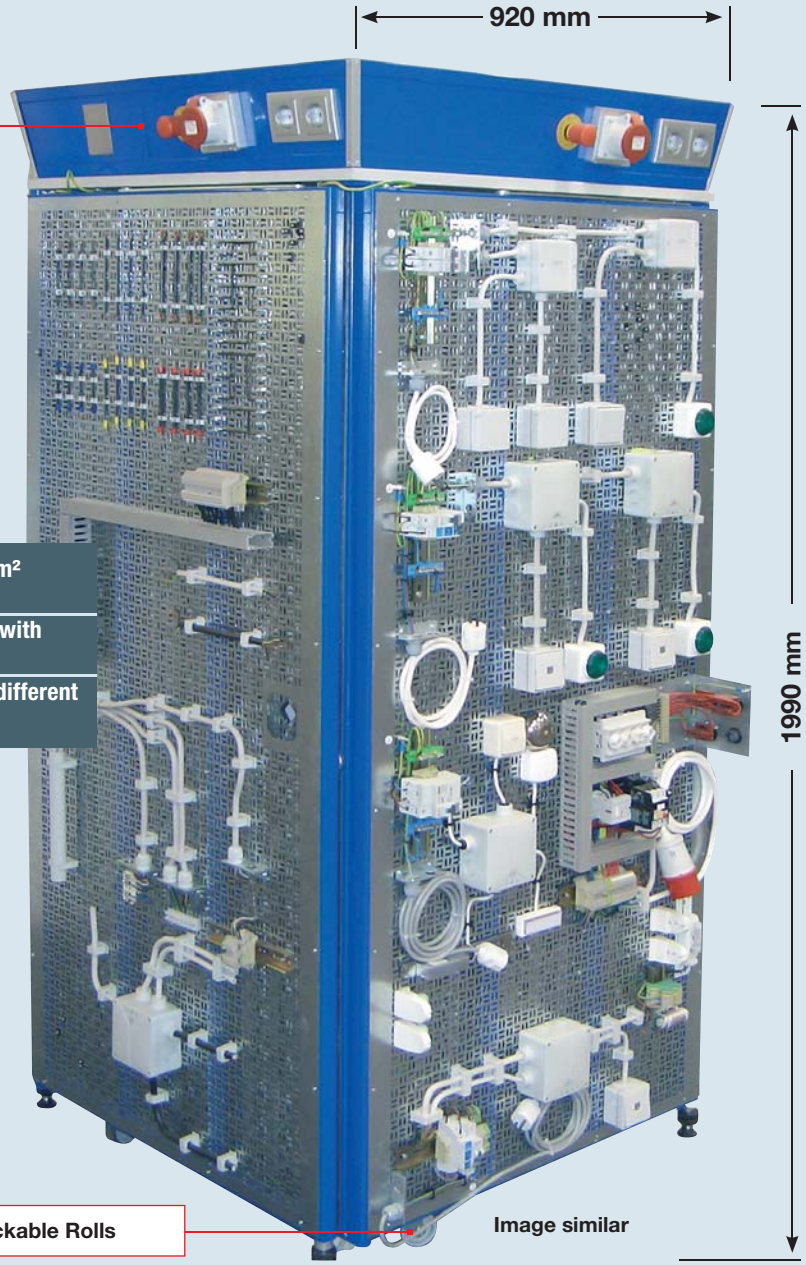
Order-No.
97177
More information: www.christiani-international.com/97177

The Christiani Learning Unit: Four entire training areas on only 1m² floor space

Save space and money: The Christiani learning unit can be used in various different specialist and training areas.

Be it electrics, metal, HVAC or renewable energy – you can customise the Christiani learning unit to your requirements, and convert it quickly and fl exibly. This makes it possible to carry out the practical exercises in parallel – even for different training areas – on a single learning unit. This saves space and money! In order to insert the components, various different hole patterns are available for the work walls. A power supply module is fitted in the top part of the learning unit.

EXCLUSIVE BY CHRISTIANI



- Floor space required only approx. 1 m² (furled)
- 4 folding double workstations, each with 5 m² work space
- Can be used flexibly for a variety of different occupations that require training

ONLINE VIDEO

We inform you about the functions and the fields of application of the training system in our extensive product video online.

Video at:
www.christiani-international.com/77582

Properties:

- Four one-sided work areas on the body:
  Two rigid and two folding, with access to the internal cabinet for storage of work materials
- Four unfolding two-man working areas
- Lockable doors for the working areas
- Table tops, shelving, etc. can be fitted to any of the working areas.
- Mobile frame made from welded rectangular steel tube, 30 × 30 mm
- Lockable wheels for parking the unit in position
- Floor space required (folded) approx. < 1 m²
- Electronics hole pattern: For plastic dowels
- HVAC hole pattern: Combination hole pattern for M8 steel dowel and for plastic dowel
- Additional customised hole patterns can be produced (by agreement)
- Power supply duct, each side with 2 safety sockets (230 V), 1 CEE socket (400 V) and an emergency stop switch, 16 A motor overload protection, the entire electrical system can be locked using a key

Folding double work spaces

Application example: HVAC

Practical internal cabinet

Article	Order-No.
Learning unit	77582
Steel dowel, 30 units	75482
Plastic dowel, 500 units	82187
More Information: www.christiani-international.com/77582	

Christiani

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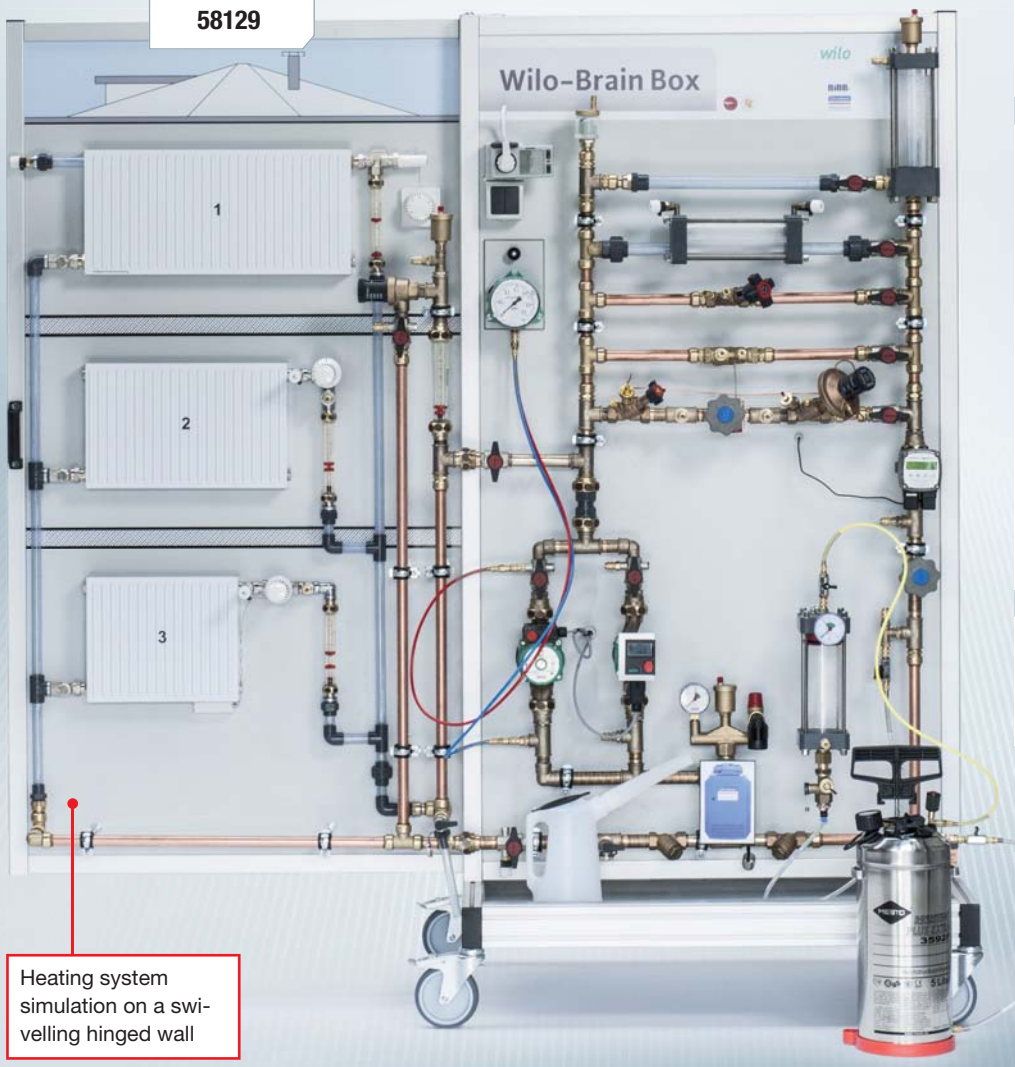
The clear model with building simulation –
ideal for initial training

Wilo-Brain Box "Classic Plus"

The WILO-Brain Box classic plus reveals what is often concealed by insulation or plaster in reality: On the mobile experiment stand, all the essential components of a heating system are grouped together. In part transparent, they are connected by pipes in such a way that the heating process can be reproduced almost completely. Thus, defects can be demonstrated on the Brain Box and corrected professionally.

Order-No.
58129



Heating system simulation on a swivelling hinged wall

Suitable for:

Vocational education and further training at
- **Vocational colleges**
- **Company and industry training centres**

Learning objectives/Skills:

According to the division of the system checklist in
- Pumps and controllers
- Hydraulics
- Pressure maintenance
- Ventilation
- In the Wilo-Brain Box, filling and bleeding of heating systems can be tested and demonstrated visibly and comprehensibly, how a membrane expansion tank works, for example, what it means for a pump when thermostat valves are not preset; what faults can be caused by air in the heating system, etc., and the measures that must be taken to ensure that heating systems are configured professionally and effectively.

Technical data:
- **Dimensions (H/W/D in cm) when folded out in its working position:** 198/190/78 **when folded up**: 198/100/78
- **Weight:** 80 kg

Mobile and functional
Imparts system skills
Clarifies the relationship between theory and practice
Describes the experiments with 19 examples
Provides scope for further individual experiments

4843/10.2016