

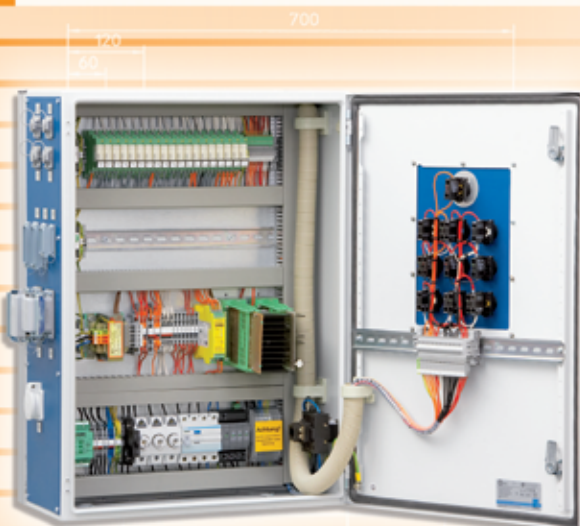
Leseprobe



Christiani

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Switch Cabinet Training Concept Basic Module



Documentation for
Lecturer/Trainer

Dr.-Ing. Paul Christiani GmbH & Co. KG
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Preface

Today, action situations are extremely important. They are usually a central requirement of a company. Training organisations and facilities must take this requirement into account.

In one action situation, trainees need to acquire expert knowledge and learn how to work in a team, as well as finding out about project work, costs, and quality requirements. In their later work as experts in the field, these will be vital aspects which they will be expected to master during their everyday working life. Such knowledge and skills are increasingly demanded by companies.

Typical instruction methods such as the four-step method are familiar to many, but they do not encourage and challenge trainees in all possible ways. Personal action is therefore hailed as an integral part of capacity building, and is promoted without trainees even really noticing it.

This also means that trainees are faced with new tasks.

This document is based upon the promotion of action competence and is intended to be used as a work aid/manual for trainers.

Note: The trainer must always be a qualified expert in the field of electro-technology!

The overall task of constructing the switch cabinet can be subdivided into the following work steps:

- Assembly of base support
- Production of practice sheet
- Creation of cutouts for side and front panels
- Mounting of switch cabinet to base support
- Preparation and mounting of side and front panels
- Preparation of mounting plate
- Equipping of side and front panels
- Installation of mounting plate and cable conduit
- Mounting of main switch and strain relief
- Basic wiring of mounting plate
- Wiring of safety relay
- Assembly of 24V/5V prototype PCB
- Visual examination
- Inspection as per VDE 0100

We wish you every success in carrying out this project work.

Dr.-Ing. P. Christiani GmbH & Co. KG
Technical Institute for Vocational Training

Basic Module

1 Switch Cabinet Training Concept

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1.1 Presentation of Modules

The switch cabinet concept is for training people for careers in technical or industrial electronics professions. The switch cabinet concept is a future-oriented concept which, along with the didactically prepared manual, aims to help you to impart the learning content to trainees. The reusable modular system allows you to enhance the training course with extra modules or your own ideas. You can connect up various handling units via the interfaces in the side wall. Because it is reasonably compact in size, the switch cabinet sits perfectly on the work bench. The base support brings the switch cabinet to a comfortable working height, regardless of whether the trainee is working standing up or sitting down. The switch cabinet can be reused in conjunction with the consumable materials kit. The practice sheet will help novices to easily get to grips with metal working. The rectifier PCB helps to impart basic knowledge on electrical engineering and soldering technology.

The switch cabinet module is a project task which aims to help the trainer to impart the learning content of the training course. Imparting knowledge on the basis of an action object is vital when it comes to helping trainees to understand interactions between the various tasks. The result of the training project is a switch cabinet with a 24 V and 5 V DC voltage, variably assigned interfaces for power, data, and sensors, and a control panel in its front door. It can be extended by adding supplementary modules as is evident in the overview. The switch cabinet thus forms the basis for further control tasks within the field of installation engineering.

The integrative work tasks allow core training skills to be imparted. Due to the project-like nature of the training course, the action object can also be used to impart more general expert skills to trainees.

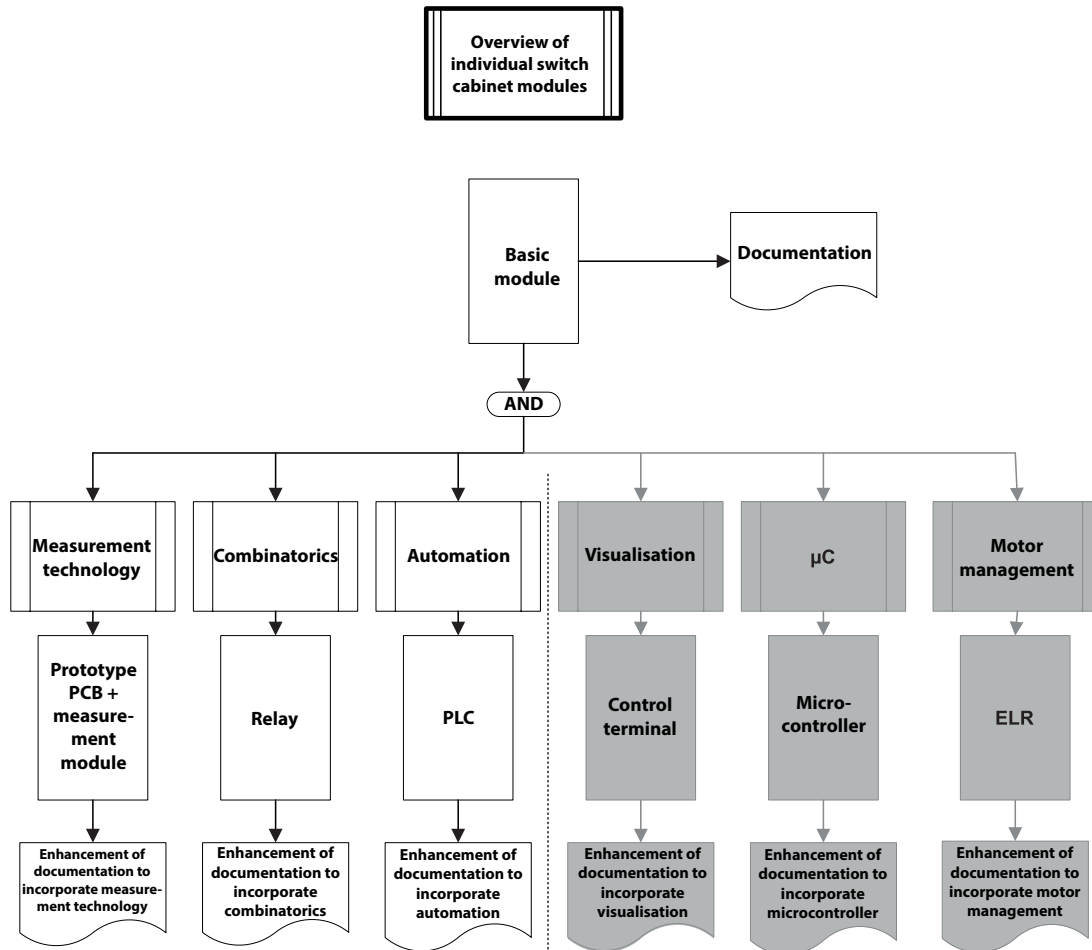
Certain parts of the training project can be used as preparation for Part 1 of the final examination. This documentation should help you to quickly implement the switch cabinet concept in your field.

This document is the manual for the basic module. It will help you to teach the basics of the topics stated in the next chapter.

The following illustration shows planned enhancement modules. They can be used to extend the switch cabinet. Each enhancement module constitutes a project in itself but only works in conjunction with the basic module. Only one enhancement module can be used with the basic module at any one time.

Switch Cabinet Training Concept

Basic Module



Basic Module

2 Concept

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2.1 A New Concept for Vocational Training

Trainers in companies have a great responsibility towards vocational training. They are responsible for the on-the-job training part of the dual system vocational training qualifications. In collaboration with the vocational school, they are meant to contribute to the development of sound professional **action competence** in the trainees on the basis of extensive qualification measures. Action competence is the willingness and ability of the individual to behave appropriately maturely, individually, and socially responsibly in professional, social and private situations. Trainers therefore make a significant contribution to facilitating the transition of the trainees into working life.

In addition, new developments in working life must be incorporated into the training process and a willingness to continue learning throughout one's life must be developed in the future professionals - who will possibly be the colleagues of the trainers in the future. This will promote opportunities and the ability to be mobile within the trainees' chosen professions and the employment market.

The action competence to be developed in the trainees at all places of learning therefore incorporates methodological, social, and personal skills in addition to technical competence. These skills are promoted by means of learning processes which focus on concrete professional tasks and actions.

"Action orientation" denotes a training principle where learning is as independent and holistic as possible, so that complex professional tasks can be mastered competently and completely.

At all places of learning, training content and methods must be comprehensively designed to clearly lead the trainees towards their goal of acquiring action competence. For this reason, practical work and learning assignments, exercises, and projects need to concentrate on self-learning or, to be more precise, **action orientation**.

2.2 Changed Requirements Relating to Future Technicians

The need for the promotion of professional action competence is due to changes to how work takes place within companies. Organisational and technical working conditions must be taken into account when planning training.

2.2.1 The Changing Face of Work

Technicians are faced with new challenges due to the increasing complexity of industrial production and the use of modern, flexible production procedures. Future technicians are expected to act independently, holistically, and with sound social skills. In order to meet these requirements, they need to acquire a sound basis during vocational training.

Due to high time and cost pressures and the increased requirements placed on the quality of goods and services by customers, quality assurance by each individual technician is more important than ever. The complexity of his or her tasks has also increased. Future technicians will need a wide range of qualifications and will have to be able to constantly acquire new knowledge and adapt to changing working techniques. Lifelong learning is an increasingly important concept, and means that independent learning and action competence must be promoted as early as the vocational training stage.

2.2.2 Changes in Training

In order to appropriately take into account the changed requirements within companies, professional production processes must be incorporated into training courses for technicians.

Here, professional, action-oriented instruction contributes to the clarification of real-life professional scenarios in a practical manner. This is achieved by means of active learning and tasks which are concrete and relevant to real life. However, action-oriented learning cannot completely replace on-the-job experience. Nevertheless, for pedagogic and organisational reasons it may be necessary to simulate real life at a company for certain time-limited training tasks. The way in which real-life scenarios are adapted to meet the needs of training varies depending on the type and complexity of the qualifications to be gained. It also depends on the learning progress of the trainees. Knowledge on professional practices must be presented, imparted, and analysed in a targeted manner. To enable this, real life is simulated to a certain extent. When being supervised by the trainer, the trainee is allowed to make errors; this is part of the learning process.

The action-oriented tasks which are simulated in order to teach the trainees have been modified with regard to actual tasks in the workplace in accordance with the principles of *replacement* (substitution), *simplification* (reduction), and *emphasis* (accentuation). The action-oriented process which replaces real life at the workplace allows the trainees to perceive important technical, organisational, financial, and social aspects of working life. The simplification of individual tasks in comparison with real life makes it easier for them to comprehend the content of the training course. In order to stress specific elements of the training experience or modify the content in line with the learning level of the trainees, more attention may need to be paid to certain aspects of the action-oriented process in comparison with its counterpart task in real life. Thus, the complexities of real life are replaced by targeted, action-oriented training tasks. However, there must be an *element of seriousness and a correlation to real life* in order for trainees to transfer what they have learned to actual working situations.

Training therefore makes the most of its inherent possibilities if it follows these two principles:
It must be *didactically structured*.
It must be *oriented towards workflows in companies*.

2.2.3 Promoting Professional Action Competence

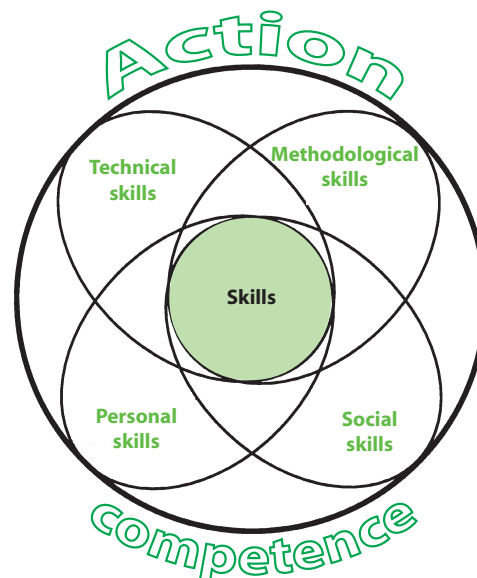
Extensive qualifications are required in order to master the tasks faced in industrial professions. This requires technicians with appropriate professional action competence, who are able to constantly adapt to changing requirements.

"Qualification" means the ability to use and apply what one has learned.

"Competence", on the other hand, describes a person's capacity to work appropriately and responsibly in the given action situation and his or her willingness and ability to achieve new qualifications.

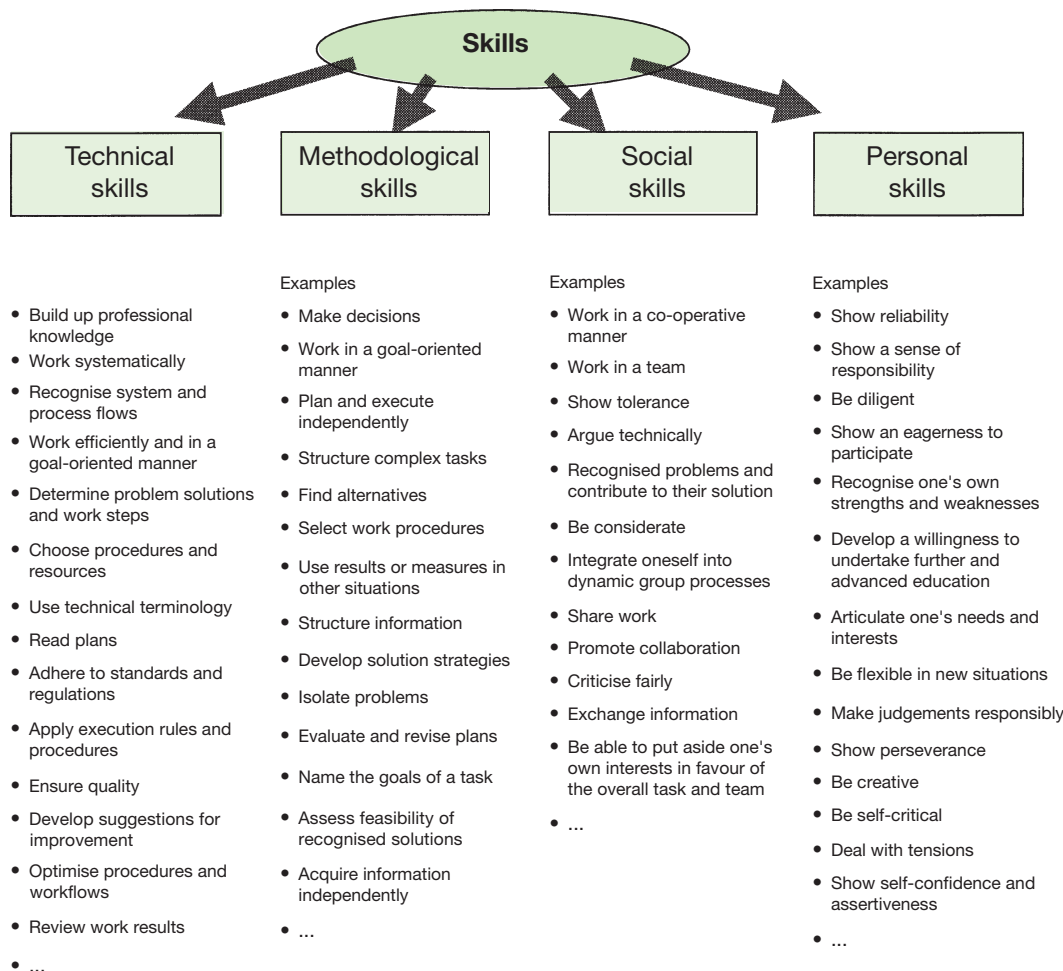
This means that technicians are increasingly expected to have key methodological, social, and personal skills which are not directly related to the technical nature of their job.

Action competence is the ability to constantly master new tasks. A technician must be able to deliver the required results in an appropriate amount of time, decide about which resources, materials, and procedures are to be used, acquire the necessary information, and communicate with the client as well as with colleagues. He or she must be able to plan, execute, and check all work in a sensible manner. For this reason, vocational training means the acquisition of action competence. The term "competence" is much more all-encompassing than the term "qualification". A technician who is perfectly well qualified is not necessarily capable of carrying out his or her job as required, maybe because he or she is not capable of working in teams, is not motivated, or lacks the ability to independently and responsibly plan his or her work.

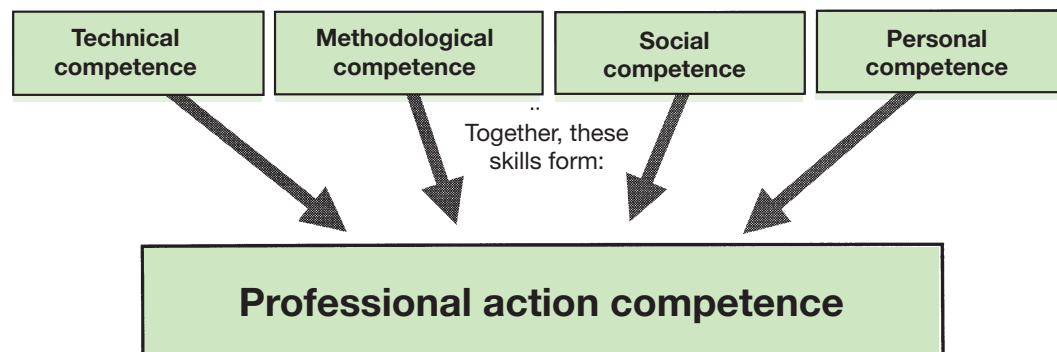


Concept

Basic Module



Mastering and consolidating these many skills leads to:



Basic Module

4 Mechanical Processing

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4.2	Production of Practice Sheet	83
4.3	Creation of Cutouts for Side and Front Panels	105
4.4	Mounting of Switch Cabinet to Base Support	131
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4.1.2 The Calliper Gauge



Measurements possible with a calliper gauge

A calliper gauge is a length measuring instrument. It has two measuring tips for measuring external dimensions and two measuring tips for measuring internal dimensions. It also has a depth measuring probe to be used to measure bores, for example.

General information

Unlike a screw gauge, a calliper gauge does not observe the Abbe Comparator Principle. The resulting first order measuring error causes an element of measurement inaccuracy due to the structure of the calliper gauge. This cannot be avoided. Other possible errors include parallax errors, guidance errors, system errors on the object being measured, wear (damage), and the effects of dirt.

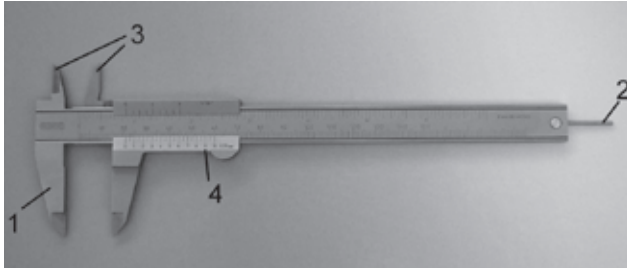
The advantages of a calliper gauge in comparison with other measuring instruments are as follows:

- Robust design
- Quick measurements
- Inexpensive
- Easy to use
- Mobile

Disadvantage:

- The measurement uncertainty for calliper gauges is larger than the display resolution.
- The repeat accuracy is worse than for a measuring instrument with a constant measuring force (micrometer or dial gauge).

4.1.3 Guiding Questions with Solutions for the Calliper Gauge



1. **What is the part of the calliper gauge shown in pos. 1 called?**
 - (1) Stop
 - (2) Measuring jaws
 - (3) Measuring bar
 - ☒ (4) Fixed measuring tip
 - (5) Moving measuring tip

2. **For what measuring task is the calliper gauge part labelled "2" especially suited?**
 - (1) Measuring bore spacings
 - (2) Checking thread pitches
 - (3) Measuring slot widths
 - (4) Checking large bore diameters
 - ☒ (5) Measuring bore depths

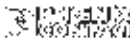
3. **What are the sharp, knifelike tips of the calliper gauge for?**
 - (1) For marking out hole spacings
 - (2) For marking out scaled workpieces
 - ☒ (3) For measuring bore diameters and slot widths
 - (4) For measuring the core diameter of external threads
 - (5) For measuring slot depths

4. **How long is the reference gauge on the calliper gauge?**
 - (1) 40.0 mm
 - (2) 39.9 mm
 - ☒ (3) 39.0 mm
 - (4) 38.9 mm
 - (5) 38.1 mm

4.3.5 Illustration and Drawing of Switch Cabinet Cutouts



This illustration shows the switch cabinet with the cutouts for the front and side panels.

1 Front panel cutout				52.35JR		495x15x695	
Quantity	Designation			Part	Material	Dimensions	
-	-	-	-	2006 Drawn	Date 08.03.2006	Name P. Pokuk	 Training Project: Switch Cabinet & Co 2835 Blue Long - 1998
-	-	-	-	Checked			
-	-	-	-	Overall			
-	-	-	-	Fitting dimensions	Allowances	Scale 1:5 CAD A4	
-	-	-	-	29.11. A. Freit	Switch Cabinet		
-	-	-	-	11.10. H. Amiri			
Change		Date	Name				