

Highest level of professional training on circuit protection

Harald Kownatzky

EFEN GmbH, Eltville, Germany, harald.kownatzky@efen.com

Keywords: fuse training, circuit protection training, application of fuses, fuse recycling, NH/HH recycling

The association NH/HH-Recycling e.V. is officially accredited as a non-profit association. It was founded in 1995 and since then the association is busy with the recycling of LV and HV HRC fuse-links in Germany and that on a non-profit basis.

The association is collecting about 250 tons of fuses per year to be recycled in a copper converter. This process provides a recycling quote of 100%. Copper and silver are the main products from the recycling process, additionally we are saving energy and CO₂ for the protection of our environment.

In accordance to the articles of the association the surplus of the sales of copper and silver is sponsored for engineering research in the field of fuses, fuse-disconnectors and their applications, carried out at universities and colleges. Here are only two examples:

“Co-ordination of LV Fuses and PPE for personal protection against the thermal hazards of electric fault arcs”. You have seen the presentation from Mr. Dr. Holger Schau at this conference.

“Fault currents and protection techniques in photovoltaic systems”. There had been a presentation from Mr. Dr. Norbert Henze at last ICEFA conference. Meanwhile an application guide “Leitfaden für die Anwendung von Sicherungen in Photovoltaikanlagen“ had been worked out and published. This guide can be downloaded from the homepage of our association.

Most important project of the last years has been the following: support of professional training of electricians by circuit training system about circuit protection. Improvement of professional training helps to offer the market qualified and skilled people.

Unfortunately the classic electro-technical training and education is not the most sought after profession of young people today. Schools and colleges suffer from funding shortages, which leads to stagnation of training and education.

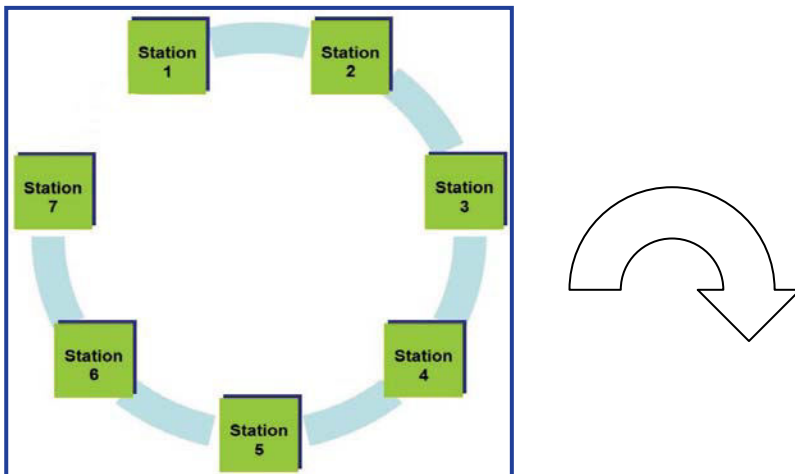
For years the NH/HH-Recycling-Association has been supporting training and education in Germany. During the last couple of years an excellent circuit training system about Circuit Protection was rolled out more and more in Germany. The target is to reach all vocational schools and all expectant electricians in Germany.

This will make the classic electro-technical training and education more interesting in the future and will provide excellent trained people for the companies in the electrical branch. The standard training modules of electro-technical education does not include very detailed information about fuses and other protection devices. Our circuit training system "Circuit Protection" provides the highest level of professional training for expectant electricians about circuit protection and fuses.

And these highly developed skills mean more safety for operators of electrical systems but finally also for all applicants and end-users of electrical devices.

How to realize the best training on fuses?

Circuit training system means that the pupils complete the training by themselves. For training, the class is divided into seven groups – each group with normally three or four pupils. After the groups have completed the training with the first topic, they continue with the second, after that with third and so on. That's why this system is called circuit training (in German: Lernzirkel) which is an international recognized method of education.



For training procedure one school class needs one circuit training carriage of seven topics.



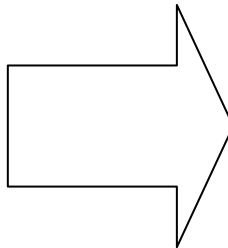
Circuit training carriages at stock



Teachers with "their" circuit training carriage handed over during a teacher training

Each of the circuit training carriage includes seven cases of topics:

- 1. LV HRC fuses**
- 2. HV fuses**
- 3. Miniature circuit breakers**
- 4. Miniature fuses**
- 5. D-type fuses**
- 6. D0-type fuses**
- 7. Selective circuit breakers**



Let's have a view inside:



1. LV HRC fuses



2. HV fuses



3. Miniature circuit breakers



4. Miniature fuses



5. D-type fuses



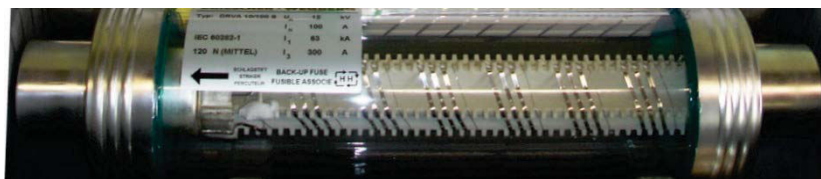
6. D0-type fuses



7. Selective circuit breakers

The “intelligent” content inside each case allows the group to complete the training without the teacher. Included are representative samples such as fuses, fuse-holders and disconnectors, design information, characteristic curves, technical data, FAQs and so on and so on.

A highlight of the training cases are the transparent samples of LV and HV fuses and circuit breakers, which provide a view into these products and help to understand their functionality, differences and communalities.

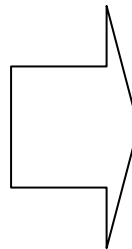


transparent sample of a high voltage fuse

Furthermore information about safety, standards and typical applications are given. All papers are laminated in order to provide a long-term use without damages.

The content of each of the seven topics has got a similar structure as shown here at high voltage fuses. Thus, the pupils are able to compare the different circuit protections systems easily.

- Description
- Application
- Electrical connection
- Ratings
- Functionality and operation
- State of circuit disconnection
- Re-usability
- Protection against unintentional switch-on
- Recycling




NH/NH-Recycling
HH

Lernzirkel Überstromschutzorgane


Elektroniker - Grundstufe
LFP: „Elektrische Installationen planen und ausführen“

2

Station 2 | HH-Sicherungen



HH-Sicherungen



Materialien für Station 2

U Informationsquellen zur Station 2

Fachbuch:	Seiten: _____
Tabellenbuch:	Seiten: _____
Informationsbrochüre zur Station:	Seiten: _____

U Fragen zum Thema

- 2.1 | Wofür steht die Abkürzung „HH“ bei den Überstromschutzorganen dieses Typs?
- 2.2 | In welchen elektrischen Anlagen oder Anlagenteilen kommen HH-Sicherungen zum Einsatz?
- 2.3 | Beschreiben Sie, wie der Anschluss einer HH-Sicherung an die spannungsführenden Leiter hergestellt wird.
- 2.4 | Benennen Sie eventuell notwendiges Spezialwerkzeug und beschreiben Sie die Tätigkeit, die mit diesem Werkzeug durchgeführt wird.
- 2.5 | Beschreiben Sie, welche Information durch den aufgedruckten Bemessungsbereich gegeben wird.
- 2.6 | Beschreiben Sie in Stichworten die Funktionsweise einer HH-Sicherung.
- 2.7 | Wodurch lässt sich eine ausgelöste (abgeschaltete) HH-Sicherung erkennen?
- 2.8 | Begründen Sie, ob eine ausgelöste HH-Sicherung wieder verwendet werden kann.
- 2.9 | Kann bei HH-Sicherungen konstruktiv verhindert werden, dass HH-Sicherungen durch solche mit einem höheren Bemessungsstrom ersetzt werden?
- 2.10 | Für Arbeiten an einer elektrischen Anlage wird, um einen spannungsfreien Zustand zu erreichen, eine HH-Sicherung entfernt. Wie kann ein Schutz gegen Wiedereinschalten während der Arbeiten erreicht werden?
- 2.11 | Beschreiben Sie, ob ein Recycling einer HH-Sicherung sinnvoll ist und wenn ja, welche Rohstoffe hierbei zurück gewonnen werden können.

Leitfragen



expectant electricians during the training

Finally we have to point out the initial activity. In 2011 a teacher of a professional school in Karlsruhe requested the NH/HH-Recycling-association to support the professional training with detailed information and a few samples. Of course we did and we sent him the book FUSE MANUAL and all requested materials. After that, he showed us his concept which had been presented at a teacher training and all participants had been deeply impressed. Afterwards, he organized the manufacture of the first ten carriages and thanks to his engaged activities the concept was rolled-out first in the province Baden-Württemberg, and was followed by other regions in Germany. As of today about sixty carriages had been built and so we have established the circuit training system in about 40% of the German professional schools.

Representatives from local government supported these projects as well, praising this system and approving it for implementation in the school systems.

We have to thank Mr. Matthias Link from Heinrich-Hertz-school in Karlsruhe and his partner Mr. Stefan Schwarzwälder from Carl-Engler-school in Karlsruhe.



Two great gentlemen! In fact, I would say two pioneers.

The partner companies who collect fuses for the NH/HH-recycling system can be proud to be part of this wonderful example of a non-profitable partnership. Many thanks for their participation in the collecting system of the NH/HH-recycling association. Here are only a few of them and we have to thank them too:



VORWEG GEHEN



Literature and sources

- All pictures and contents from members of the NH/HH recycling association or from the partners from Heinrich-Hertz-school and Carl-Engler-school in Karlsruhe.

Conference: 10th International Conference on Electric Fuses and their Applications

Organized by: Dresden University of Technology
Postfach 100 920
01076 Dresden, Germany

Copyright

This work is copyrighted in its entirety. Any usage in violation of the narrow boundaries of copyright law without the prior approval of the organizer is prohibited and is punishable by law. This applies especially to copies in any form (photocopy, microfilms or any other practices) translations, as well as storing and processing with electronic media.

The organizing committee of the conference and organizer are not responsible for the opinion expressed in the papers published in this Program and Abstracts. The contents of the paper express entirely the views of the authors. All copying, reprint or reproduction requests should be addressed to the Dresden University of Technology. All rights reserved. Copyright: Dresden University of Technology.

Frankfurt am Main, Germany
September, 2015