

# update

Internationally  
Recognised

## **Qualifications**

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The 3rd generation  
servo brake

**A CPS that lives up  
to its name**

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A new era of energy  
generation emerging

**DIGITALIZATION  
IN VEHICLES  
SUCCESSFUL PROJECTS  
NEW SYSTEMS**

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*“The task of the teacher is to shape the digital learning process. Their new primary function is increasingly one of showing ways of learning and less and less one of simply providing instruction.”*

Volker Löbe, Project Manager for the VW Commercial Vehicle Campus Digitalization  
at the 5th LN Head Trainer Day

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Rolf Lucas-Nülle

## *“Action rather than words: Success of digitalization in practice”*

“The pace of digitalization is steadily picking up in vocational education and training as well. More and more schools, universities and businesses realize that the period of passivity is finally over. It is now time to update didactic concepts and create the necessary infrastructure conditions. This is the only way to deliver forward-looking vocational preparation.

E-learning is a key element in the process of digitalization in the education sector. Learning platforms offer much more than just a digital textbook. Rather, the programmes are becoming a pivotal element used by teachers to organize learning management for entire groups. Cloud-based learning platforms offer the opportunity to fill the voids that sometimes arise between internal and external learning centres.

While we can clearly identify the potential that exists, the crux of the matter often lies in implementation. The Lucas-Nülle Foundation therefore decided to fund a research project last year to investigate the practical integration of e-learning portals into teaching programmes. We present the findings of the research in this issue of our magazine. And, of course, we also bring you the latest developments of our own learning platform, VOCANTO.

There is no sphere that is not affected by digitalization. “Everything that can be digitalized is being digitalized,” former HP chief Carly Fiorina is quoted as saying. The work of our product development team is also guided by this motto as it continuously seeks to update all the Lucas-Nülle training systems in line with the latest Smart Factory trends. I am pleased to be able to acquaint you with some of these new developments for the first time.

Successful ongoing projects are another important area featured in this magazine. Our aim is to show you examples of cooperation that have allowed substantial progress to be made in vocational education and training at each particular site. Perhaps you too will be inspired to follow suit. As an exception we have no international coverage this time, our focus instead being on local developments.

I hope you enjoy reading this edition of LN update!”

**Rolf Lucas-Nülle**



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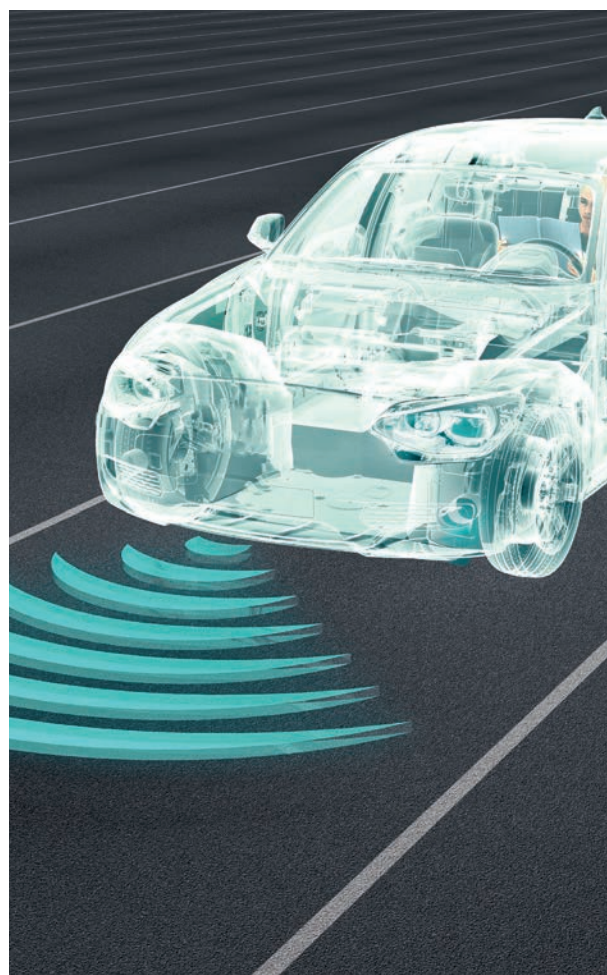
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Strong Partnership Announced:

# Deliver Internationally Recognised Qualifications

Partnering with the IMI, the internationally leading qualification supplier in the automotive industry, Lucas-Nülle is now offering a full-service package. Starting today the Lucas-Nülle brand LN Academy is offering a certification program for internationally recognized electric vehicle qualifications. This is how the manufacturer of training systems is meeting the growing demand for Electric Vehicle specialists all over the world.

## How high voltage is changing the automotive industry

As we have seen over the past couple of years, with the trend set to continue unabated, electric vehicles (EVs) and hybrid electric vehicles (HEVs) are becoming more and more widespread. However, with this trend comes huge challenges which need to be met by everyone in the industry. EVs and HEVs contain high voltage batteries and utilise high voltages to drive three phase electric motors. This technology has been widely known for a long time to industrial sectors such as electrical engineering. For those involved in automotive, however it is a huge shift in technology.

From service and repair personnel (both technical and non-technical), to the drivers of these vehicles and the police and

rescue personnel who may need to retrieve people from accident damaged vehicles, special procedures and care needs to be taken to be safe and effective while operating and maintaining EVs. Even at the end of the useful life of the vehicle, automotive recyclers need to be trained on how to dismantle and recycle vehicles safely.

## There is a growing need for skilled EV and HEV professionals

Even just a few short years ago, hybrid vehicles were limited to a few niche manufacturers and pure electric vehicles were even more rare. Now, however, every manufacturer is building or planning to build vehicles with some sort of high voltage system on board. It is fair to say that every person involved with vehicles in any way,

shape or form will encounter high voltage vehicles in the not too distant future. That is why governments, vehicle manufacturers and insurance companies probably will impose licensing or minimum training standards before any work can be done on these vehicles.

Consequentially, manufacturers are desperate to train technicians to be able to maintain these vehicles. They need to ensure that their customers have a positive experience when a vehicle experience inevitable failure. Only then will they continue on as customers and not go elsewhere. It is going to require a huge effort to ensure that everyone is correctly trained and qualified to operate and work on EV and HEV.

### Lucas-Nülle is partnering with the qualification world leader IMI

The Institute of the Motor Industry (IMI) is the only dedicated awarding body that is able to offer international automotive qualifications. The world leader in electric vehicle qualifications can cover all people that might come into contact with high voltage vehicles. That includes drivers and non-technical service personnel, repair technicians and something that has curiously piqued interest amongst customers – qualifications for rescue personnel.

Because of this, Lucas-Nülle have teamed up with the IMI to offer a complete solution when it comes to electric vehicle qualifications. Lucas-Nülle is providing the suitable training equipment to prepare the students for the IMI qualification.

### A single programme that covers the entire EV and HEV qualification process

Using Lucas-Nülle training systems the students get critical practical skills to be safe on high voltage vehicles. All these multi-media courses are fully aligned to the various IMI EV qualifications. In a word: The entire qualification process can now be delivered by Lucas-Nülle in a single package.

That includes the IMI centre approval, all the training and other steps necessary to undertake the qualifications. This will make it easier than ever to train and qualify people to the highest standards. Representatives from both organisations recently met together at IMI headquarters in London to sign an MOU and seal the cooperation.

### Internal tests for quality assurance

Lucas-Nülle product managers and trainers were recently trained by IMI Quality Assurance staff and completed the qualifications themselves. Using the LN training and assessment material resulted with all employees gaining the symbolical Level 3 qualifications. Training hardware and eLearning is currently being developed to deliver the Level 4 – working inside the high voltage battery. It is expected to be finished soon. Both the LN and the IMI quality assurance team were happy with the results. “The test results of this ground-breaking project totally lived up to our expectations”, says Daniel Brown, “we are now looking forward to the successful implementation with the customers.”

## Interview:

**Daniel Brown, Manager of the LN Academy, is moving the idea of international qualification forward. He explains the partnership:**

“High voltage electric vehicle qualifications are really the topic of the moment and are set to be for the next five years, possibly longer. We looked at the various standards for electric vehicles around the world and the IMI is the only one which offers International certification. It has been our major focus to ensure that we can help training providers make EV training as smooth as possible. We take out the hassle of delivering high quality qualifications from the IMI.”

**Regarding the benefit for customers he points out:**

“I cannot explain enough how important this is for our international customers, who have people currently working on these vehicles. Even when their country doesn't have a training standard for EV they are now able to offer an up to date, industry relevant, international qualification. This type of partnership is a first for LN and IMI and we are already looking forward to continuing. Long term we are going to cover light vehicle technician qualifications, which is another, desperately needed qualification around the world.” ■



A symbiosis that is  
upgrading skills  
education in India





When Dr. Swati Mujumdar decided to kick start two skill development universities in India, it was a bold decision. Not only did she want to build up a disruptive education system – to be successful she also needed a rethink of Indian parents when it comes to skilling!

Skill education is traditionally considered to be a forced choice for students in India when they end up getting no admission to conventional degree programs. It is so much looked down upon that parents of Indian girls do not prefer marrying their daughters to someone who has taken up any vocational education. But thanks to some aggressive initiatives taken by the governments, skill education is starting to get the due respect at all levels.

#### How Skills Universities are changing the mindset

At the forefront of this initiative the Symbiosis Skills Universities (SSU) are promoting skills education in India. Under the leadership of Dr. Swati Mujumdar the organisation decided to foray into skill development universities. At SSUs, the focus is not only to enhance machine operating or technical skills of graduates but also their creative thinking and problem-solving skills.

Symbiosis is a leading educational group of India. Thousands of students are studying in its conventional

educational institutions across the country. You might say that it is this experiment of SSUs that has brought about a disruption in the higher education today.

#### How Skills Universities are changing the mindset

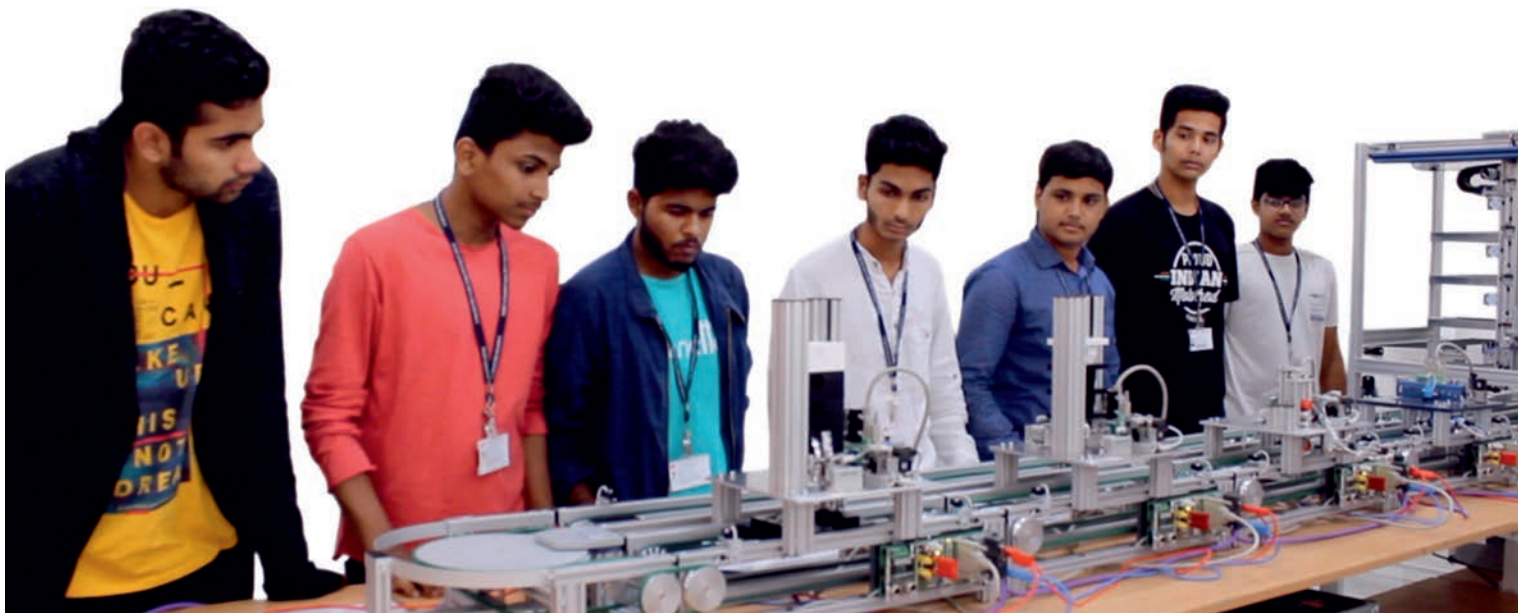
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#### How Lucas-Nülle helps focussing on hands-on training

The unique SSU teaching pedagogy involves minimum 70% teaching through experiential learning – practical, hands-on and skill sessions. Students get to learn by doing and working on formative assignments in every course of a program. Since Symbiosis believes in outcome-based teaching, the hands-on training approach of Lucas-Nülle Training Systems is just right. Using these labs, students can get the much-coveted industry skills.

As well at the Symbiosis University Indore as at Symbiosis University Pune, Lucas-Nülle installed multiple labs including the topics Automotive Technology, Hybrid and Electric Vehicles or Industrial Automation. The German training equipment provider has also been training teachers from both universities. That also enables SSU to open its training portfolio. Using Lucas-Nülle labs, also working professionals are now trained at the Skills Universities.



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*Featured Interview with Dr. Swati Mujumdar:*

*Dr. Swati Mujumdar, as Pro-Chancellor of the Symbiosis Skill Universities, is blending skill education with the higher education system. This way SSUs can help India to reap benefits of its demographic dividends.*

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*How did you come up with the concept of Symbiosis Skills Universities?*

Skill development is an important driver for industrial and economic growth of our country. For crystalizing „Make in India“ and „Skill India“ vision of our Hon'ble. Prime Minister, a large pool of skilled workforce is required to be developed. Our country has a demographic dividend, which makes it the youngest country in the world. We can harness this young generation by providing them skills and work.

*So, how did you go about it?*

We studied various models of skill development and vocational education before we developed an innovative model of Skill Development University. During our research, we encountered two major problems: Students hesitated to enrol themselves in skill development courses as they do not find vertical mobility, i.e. all the way from

*Dr. Swati Mujumdar,  
Pro-Chancellor,  
Symbiosis Skill Universities, India*



certificate to degree programs in skill education. The second reason was social acceptability.

To address these problems, we have established a Skill Development University which will provide a range of skill-based courses at all levels in line with the industry needs. These were the reasons which germinated the idea of a skills university. Today we have Symbiosis Skills & Open University in the city of Pune as well as Symbiosis University of Applied Sciences in Indore.

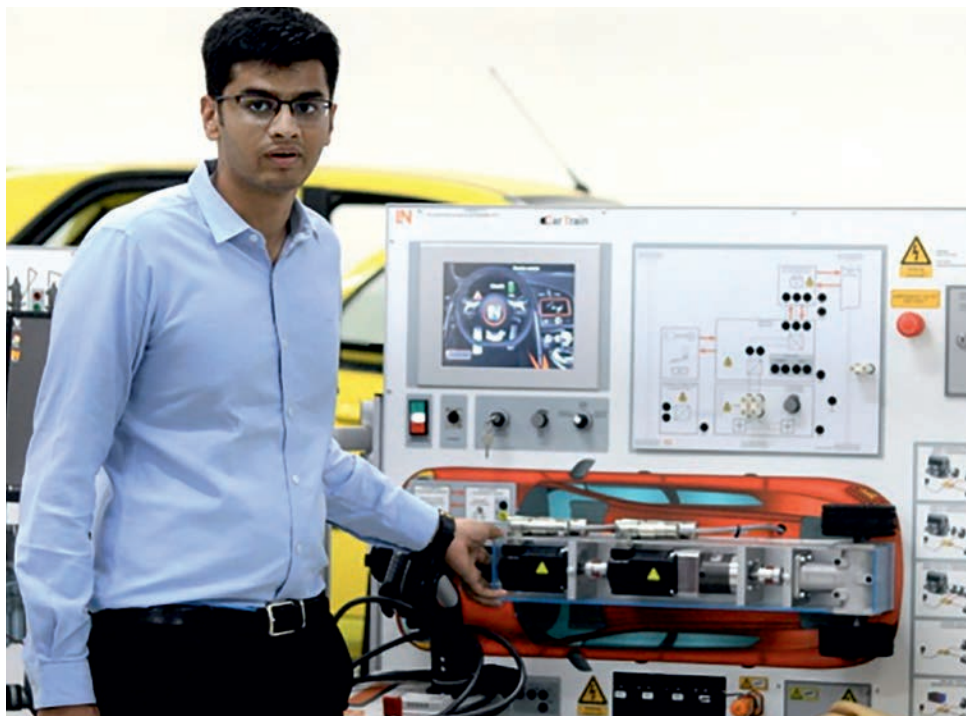
*How is Symbiosis Skills and Open University different from other conventional Universities?*

The main idea of setting up Symbiosis Skills and Open University (SSOU) is to create 'industry ready' youth. The students of SSU can be gainfully employed upon completion of their courses. All programs offered by this University have been mapped with the job roles in the industry and the industry





**WATCH  
VIDEO**



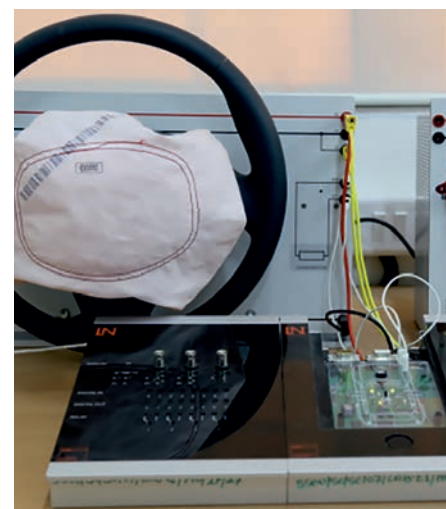
has helped to develop the curricula. The focus is on providing hands on training to the students with 70% experimental learning including practical, skills and laboratory sessions. The students are exposed to latest cutting-edge technologies. The specialized skill training labs and centres of excellence on the university campus were set up by various industry partners. Coupled with this, the students are also sent for industry internships every year, to ensure exercises form an integral part of the course curriculum.

*What are the different types of programmes SSOU will offer?*

SSOU provides certificate, diploma and degree programs in high growth sectors of Automotive, Construction, Mechatronics, Retail, Architecture, Urban Development, Ports and Terminal Management and Beauty and Wellness. The University also plans to have a Department of Open, Distance Learning and Continuing Education to reach the unreached.

*What are the salient features of SSOU?*

The largest campus with state-of-the-art infrastructure has labs, workshops and specialised machinery for skilled training. It also contains centres of excellence, studios for broadcasting online lectures and other facilities to provide quality education and practical experience to students. A school of interdisciplinary science provides life coping skills, communications skills, soft skills, language training to students which help to create confident personalities. SSOU has partnered with top global industries and foreign universities to provide relevant skill-based education and practical training to students. ■





# Research into e-learning success factors

The Lucas-Nülle Foundation teamed up with the Institute of Electronic Business in Berlin to develop strategies for potential applications of digital learning platforms.





## How can digital learning systems be successfully integrated into vocational teaching?

To try and answer this question, six vocational school classes used VOCANTO for a year. The Institute of Electronic Business, led by Professor Thomas Schildhauer, provided scientific support for the Lucas-Nülle Foundation's pilot project.

**The study confirms:** Germany's education system has some catching up to do in terms of digitalization. Although both students and teachers are highly motivated, there is a lack of necessary infrastructure in buildings as well as in the education system. This means that the majority (94%) of vocational teachers have to enhance their digital skills autonomously and feel left alone when it comes to digitalization (98%). Moreover, parents often complain about the lack or poor quality of hardware in schools.

**The aim of the study** however was not just to gain an insight into the status quo of digitalization, but rather to specify framework conditions, stakeholders and spheres of activity. The results are structured in (1) six potential uses of VOCANTO as well as (2) three strategies for long-term use of digital learning systems and (3) seven guidelines for successful integration into teaching.

### Six potential uses of VOCANTO

- (1) Visualization
- (2) Individual pace of learning and individual support
- (3) Interesting and varied lessons
- (4) Use outside school
- (5) Development of digital literacy
- (6) Impetus (for the digitalization of a school)

#### Key insight:

The use of a digital learning system supports teachers in their role as flexible problem solvers and enables them to give more of their time and attention to the skills of individual learners.

### Three strategies for long-term use of digital learning systems

- (1) Hybrid use of e-learning
- (2) Highly individualized lessons
- (3) Interconnected use for collaborative learning

#### Key message - Scenario (1):

Purely individual learning leads to reduced motivation; its use must be selective. This requires the teacher to be flexible in shaping the lesson structure and content.

#### Key message - Scenario (2):

Individual learning success can be boosted significantly with VOCANTO. However, it depends on the learner's ambition. The teacher is required to be a motivator.

#### Key message - Scenario (3):

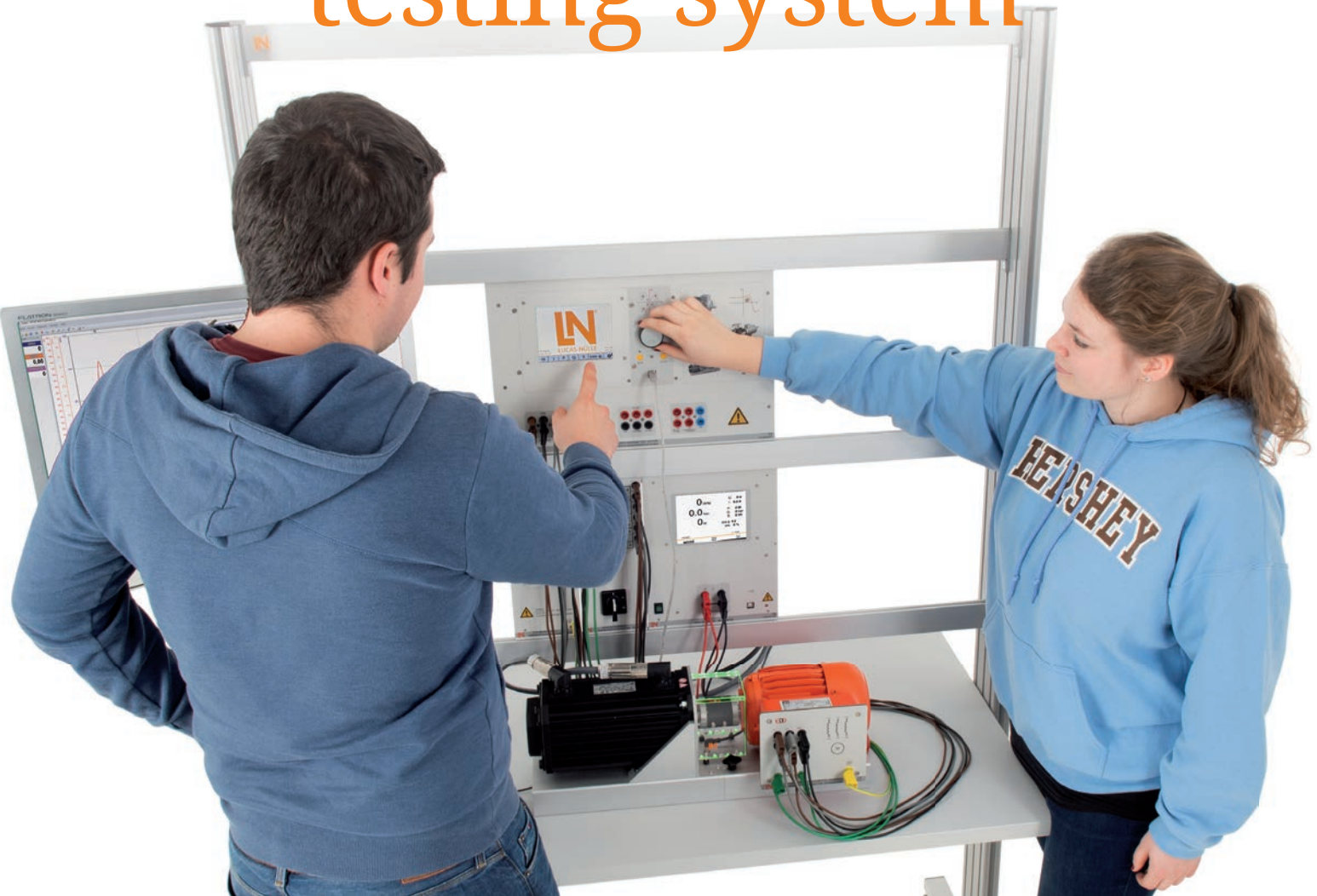
Being connected in networks is commonplace for students. Interconnected teaching materials will therefore also make learning more commonplace. The teacher remains the group work facilitator, the "Game Master".

### Seven guidelines for successful integration into teaching:

- (1) The method is not about changing the method
- (2) Optimal support: setup of training and support systems
- (3) An excellent digital infrastructure is the basis for the success of digital learning systems
- (4) Actively communicate its potential and its advantages: development of marketing and sales strategies
- (5) Teachers are and will remain in charge of shaping the lesson structure and content – not everything changes with digitalization
- (6) Teacher attention and support is essential, particularly in the use of digital media
- (7) "Bring your own device" – the use of personal devices to promote digitalization in schools



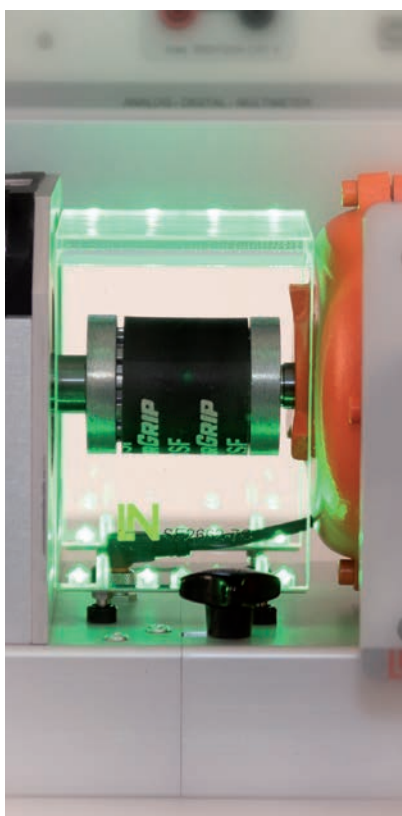
# The third-generation servo-machine testing system



Lucas-Nülle has now given an all-rounder and classic product an update. New functions make the tried and tested “servo brake” even better.

In an age of rapid technical innovation, 20 years sounds like an eternity, but that is how long the servo-machine test stand has been providing reliable service. It was put on the market as the servo driving and braking system in 1998. Also known as the servo brake, this all-rounder is now used in more than 50 Lucas-Nülle training systems.

But even a running system can sometimes be optimized. Product Manager Ralf Linnertz has done just that. The third generation, called the servo-machine testing system, is now available together with an ActiveServo software update. Besides enhanced functions, the new system’s most impressive feature is its even greater level of safety.



# The specific advantages:

## **SAFE:**

The comprehensive safety concept extends to all shaft covers. It features improved hand protection thanks to flush-closing covers. Integrated lights indicate that setup has been carried out correctly. Another important feature is that the supply voltage of the machines under test is disconnected as soon as a shaft cover is removed.

## **DIGITALIZED:**

The motors will from now on be fitted with an electronic rating plate. Relevant machine data is thus automatically transferred and scaling is preset in the ActiveServo program. This ensures that users get to the relevant learning content more quickly.

## **USER-FRIENDLY:**

A 5.7-inch colour touch display simplifies operation and provides a clear display of the readings. The innovative cooling system and modified servo control make the machine testing system much quieter.

## **FLEXIBLE SOFTWARE SOLUTION:**

The new version of the software facilitates improved operation. It is also available for the previous system. In addition, a built-in Soft PLC for SCADA is already being developed. This will further simplify handling.

## **100 PER CENT COMPATIBLE:**

Planning certainty for existing training systems: the third generation of the servo-machine testing system remains compatible with the entire range of Lucas-Nülle machines. ■



# An interdisciplinary approach that serves as a good example

In Riobamba, in the geographical heart of Ecuador, "ESPOCH" Polytechnic University is investing in the future of interconnected technology. The university is pursuing a pioneering educational programme with a new didactic concept. The path embarked upon with the new laboratories will serve as a good example for the whole of Latin America.





## Advanced technology training

Riobamba is situated in a basin in the Andes at an altitude of almost 2800 metres. The views are certainly impressive, with no fewer than six volcanoes – some of them active – surrounding the city. Agriculture in the surrounding regions continues to be an important economic factor as half of Ecuador is supplied with food via the Riobamba transport hub. The Andean city also boasts good infrastructure as well as a level of safety and security that is among the best in the country.

Then there is also Riobamba's technologically advanced side, as evidenced for a number of years by the technical university that is based here. The **Escuela Superior Politécnica de Chimborazo (ESPOCH)** is investing in state-of-the-art Lucas-Nülle equipment. At the same time, the university is currently carrying out a revision of basic didactic principles – and is demonstrating far-sightedness in the process.



## Structural change for an interconnected future

Under the direction of Byron Ernesto Vaca Barahona (PhD Eng), ESPOCH is placing greater emphasis on practical-orientated and interdisciplinary training. To this end, the university has set up several state-of-the-art laboratories covering the Smart Factory, Automotive Technology and Renewable Energies. The new, didactically tried and tested equipment allows the students to be given ideal preparation for the structural changes taking place in an increasingly interconnected world. To facilitate all this, Principal (rectorado) Vaca Barahona and the Deans (decano) of the individual institutes have initiated a visionary process of transformation. Just like with the technology, the students in Riobamba are also set to become increasingly interconnected in future. To this end, the new ESPOCH laboratories also transcend the boundaries of the individual institutes. Students from several disciplines learn together here. Also, the new equipment increases the practical focus of teaching. Hands-on training lets students look at theoretical aspects in the context of realistic scenarios.



## The Smart Factory – an example of the interdisciplinary approach

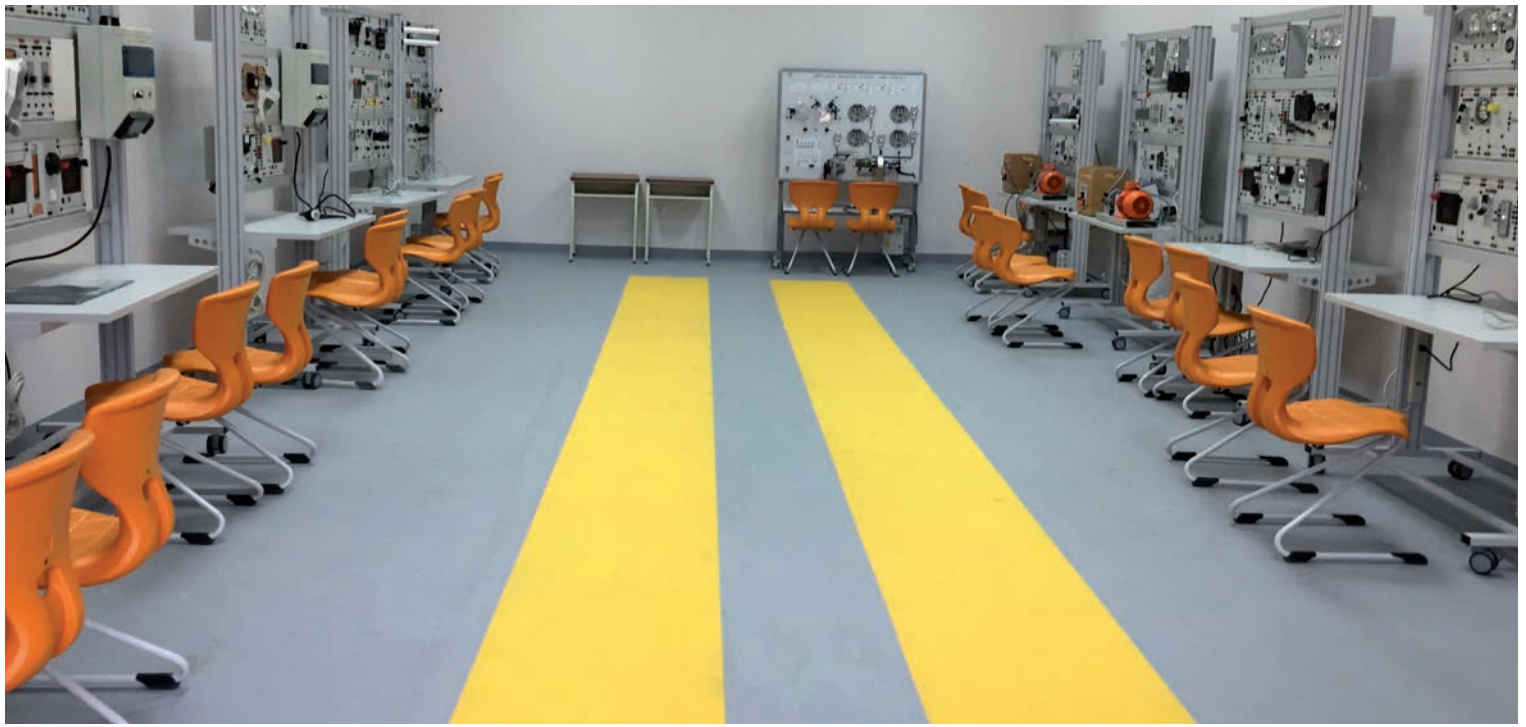
How this multidisciplinary approach across institutes works in practice can be seen in the Smart Factory laboratory equipped by Lucas-Nülle. The Smart Factory that has been put together here for didactic purposes includes equipment covering the topics of automation, robotics and interconnection via a CPS. Thanks to the integrated ERP system, the laboratory is also of interest to students without a technical background. This ERP software interconnects the entire product life cycle in industry, from ordering to production and delivery through to complaints. It means that every area of a company comes into contact with this system.

That is precisely why ESPOCH has also made the Smart Factory laboratory accessible to students who are not part of the Institute of Information Technology and Electrical Engineering to which the laboratory is actually linked. Students from different spheres ranging from business management to electrical engineering and process control can work together on projects here. The laboratory transforms the Smart Factory from a theoretical idea into an object that can actually be operated by all the users.

## Strong focus on the fusion of mechanical and electrical engineering

ESPOCH has implemented virtually the same concept in the new Automotive Technology laboratory of the Institute of Mechanical Engineering and Automotive Technology (Facultad de Mecánica) and in the Renewable Energy laboratory of the Institute of Natural Sciences. The example of Automotive Technology clearly demonstrates another advantage of the new training concept. Just like in the Smart Factory, the areas of mechanical and electrical engineering are increasingly merging in the motor vehicle. The electronic handbrake is just one example of the many areas in which electronics has now replaced direct mechanical action. Electrotechnical topics especially can be better illustrated and taught in laboratories. With ESPOCH clearly looking to the future, the laboratory has a special focus on Hybrid and All Electric Vehicles. Here, too, the university has its finger on the pulse of the times and has recognized that safe training in the use of high-voltage technology is only possible in a laboratory setting.





## International qualifications the next step

Another element in the university's progressive trajectory is the establishment of ESPOCH as the first IMI-certified educational institution in Latin America. To this end, the university is currently undergoing a special process stipulated by Britain's Institute of the Motor Industry (IMI). The aim of this process is to give the students qualifications that will particularly distinguish them in the international education market.

The list of measures does not stop there though. For example, the ESPOCH trainers also receive comprehensive training to enable them to provide the best possible teaching in the new laboratories. In addition, the didactic concept includes a multilingual aspect. The Blended Learning courses allow students to view the content in Spanish and, simultaneously, in English, German or Portuguese if they so wish. It is the broad focus of the new, progressive approach that makes ESPOCH stand out. Few institutions in Latin America can compare themselves to this initiative. ■





# Orange opponent . . .

In Louisville and Budapest, competitors in SkillsUSA and EuroSkills demonstrated their ability on Lucas-Nülle training systems in 2018.

## EuroSkills in Budapest

**A total of 530 trainees from 27 countries met in Hungary's capital at the end of September. The young employees competed for the title of European champion in 20 different vocational disciplines.**

*"The feedback we received confirms that Lucas-Nülle is taking HVAC and refrigeration training forward," , affirms Lang.*

One of the tasks the HVAC and refrigeration trainees were set was to analyze faults on a split-system air conditioner. At this station, they were faced with an orange "opponent": the fault simulator of Lucas-Nülle's split air-conditioning training system.

"The fault simulator on this training system is totally new; the HVAC and refrigeration market has never seen anything like it before," says Frank Lang, a Lucas-Nülle expert in this field. "Using interactive software, we connect selected faults which the competitors then have to find." While the young technicians were busy racking their brains, the judges too were visibly impressed by this system.



# ... in the final

The innovative equipment allows the organizers to integrate new topics such as High Voltage in Vehicles into the competition for young people starting out in their careers. At the same time, the fault simulation function integrated into many Lucas-Nülle systems simplifies their incorporation into the structure of the competitions.

## SkillsUSA in Louisville

The final of the largest vocational skills competition in the USA took place in Kentucky in June. A total of 335,000 “students” are involved in SkillsUSA – including all the preliminary rounds.



Lucas-Nülle played an active part in the 2018 competition as the first German manufacturer of automotive technology training systems. The reason being that HV technology can be safely included in the competition thanks to Lucas-Nülle's CarTrain "Diagnostics and maintenance of a high-voltage battery".

*"High voltage is dangerous, sure. That is why many skills competitions have previously shied away from this important automotive topic,"* says Daniel Brown from the LN Academy, explaining: *"The competitors are completely safe using our system. This won over the organizers of SkillsUSA."*

Brown has therefore received numerous follow-up inquiries since June. He lists a couple of examples: *"Many US states want to use the system at their respective state competitions, while in Germany we were represented at the federal skills competition organized by German motor trade body ZDK in November."*

WorldSkills competitors could therefore encounter the colour orange more often in future.





A large American flag is positioned in the background, with the blue field and white stars visible in the upper left and the red and white stripes in the lower left. The flag appears to be waving.

# Successful in the States

An enthusiastic response at SkillsUSA, growing demand in the area of hybrid and all-electric vehicles, and more and more colleges and universities opting for Lucas-Nülle laboratories: Lucas-Nuelle Inc., based in Williamsburg, Virginia, has every reason to be pleased. We spoke to Gerald Schex, Sales Director, about the reasons for this success and about current trends in education and training in the USA.



Mr Schex, Lucas-Nuelle's systems will be in action again at SkillsUSA 2019. What is the significance of this partnership in terms of your activities in the USA?

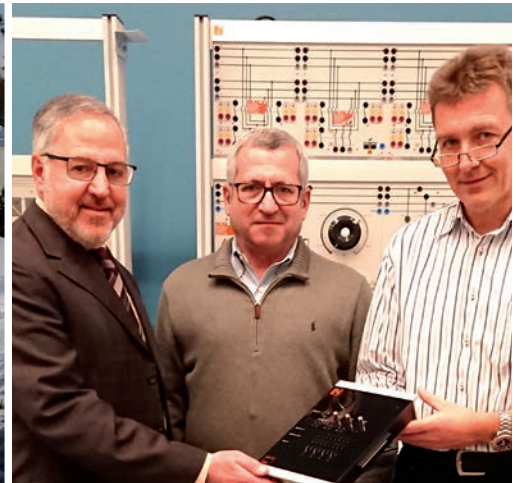
For all CTE programs and community colleges, SkillsUSA represents the benchmark in terms of technological developments and current trends in vocational training. The fact that we offer state-of-the-art products in the area of hybrid and all-electric vehicles speaks for itself. After all, hybrid and EV are the most innovative areas of automotive technology. We are seeing that both politicians and the car manufacturers have recognized the signs of the times. The registration figures for electric vehicles are increasing worldwide. And of course this trend is accompanied by a strong demand for qualified employees.

### And why is Lucas-Nuelle the answer?

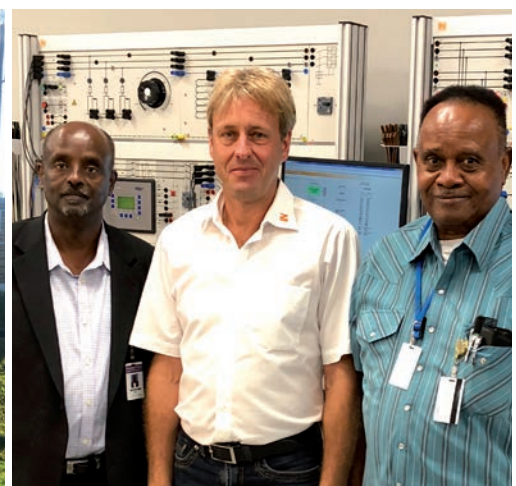
Hybrid and all-electric vehicles will complete the trend towards electronics becoming the main component in motor vehicles. In this area in particular, Lucas-Nuelle has been pioneering training and development for a number of years. For example, our "Light Duty Hybrid/Electric Vehicle Specialist" ASE L3 Trainer without doubt sets new standards. The HV battery in particular has long been regarded by the automotive industry as a "black box". Now more and more manufacturers are choosing to repair the batteries themselves. This presents new challenges and requires a special system understanding.



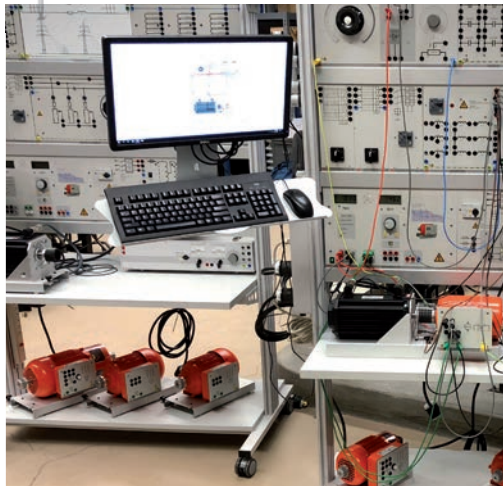
**New York State**  
Herkimer County Community College  
Power Engineering



**Texas**  
Prairie View A&M University  
Power Engineering







The aim must ultimately be to ensure that proper procedures are followed when working with high voltages and that safety is always the top priority. Our brand-new CarTrain System for diagnosis and maintenance of HV batteries provides very specific training covering both aspects. It focuses on digitally networked battery management in a traction battery and on the corresponding components.

As we know, Lucas-Nülle's success is not confined to automotive technology. Topics such as power engineering and drive technology are in demand at colleges and universities. How does Lucas-Nülle sway the decision-makers at these institutions?

Our training systems meet the new core requirements in these areas too. Taking power engineering for example: smart grid management with renewable energies is the topic du jour here. Only on this technological basis can energy be used in an economically efficient and environmentally compatible way. Lucas-Nülle training systems allow students to be given the ideal preparation for these developments. We offer a complete Smart Grid learning programme for power engineering, covering everything from generation to transmission, distribution and storage. Topics such as protection systems, renewable

energies, smart metering and SCADA are also integrated into the Smart Grid Laboratory.

**And what about drive technology? What is the situation there?**

At the moment, the big topic is power electronics – switching and converting high levels of electrical power. Motors convert the electrical energy to mechanical energy and generators convert mechanical energy to electrical energy. Today this is done using semiconductor components like diodes, thyristors and IGBTs. The Lucas-Nülle training systems are designed to allow students and trainees to learn about virtually all kinds of electrical circuits and drives used in industrial, commercial and residential settings, and to do so in a practically relevant way that fully meets all training requirements. Another crucial advantage of the Lucas-Nülle training equipment is that it is used both in training and research. SCADA is important here too.

**Finally, looking ahead, what trends do you see emerging in the coming years and how is Lucas-Nülle going to respond to them?**

The trend is quite clearly towards digitalization across all areas of technology. Lucas-Nülle has been offering different programmes and training systems with a strong focus on



## California

Glendale Community College  
Automotive Technology

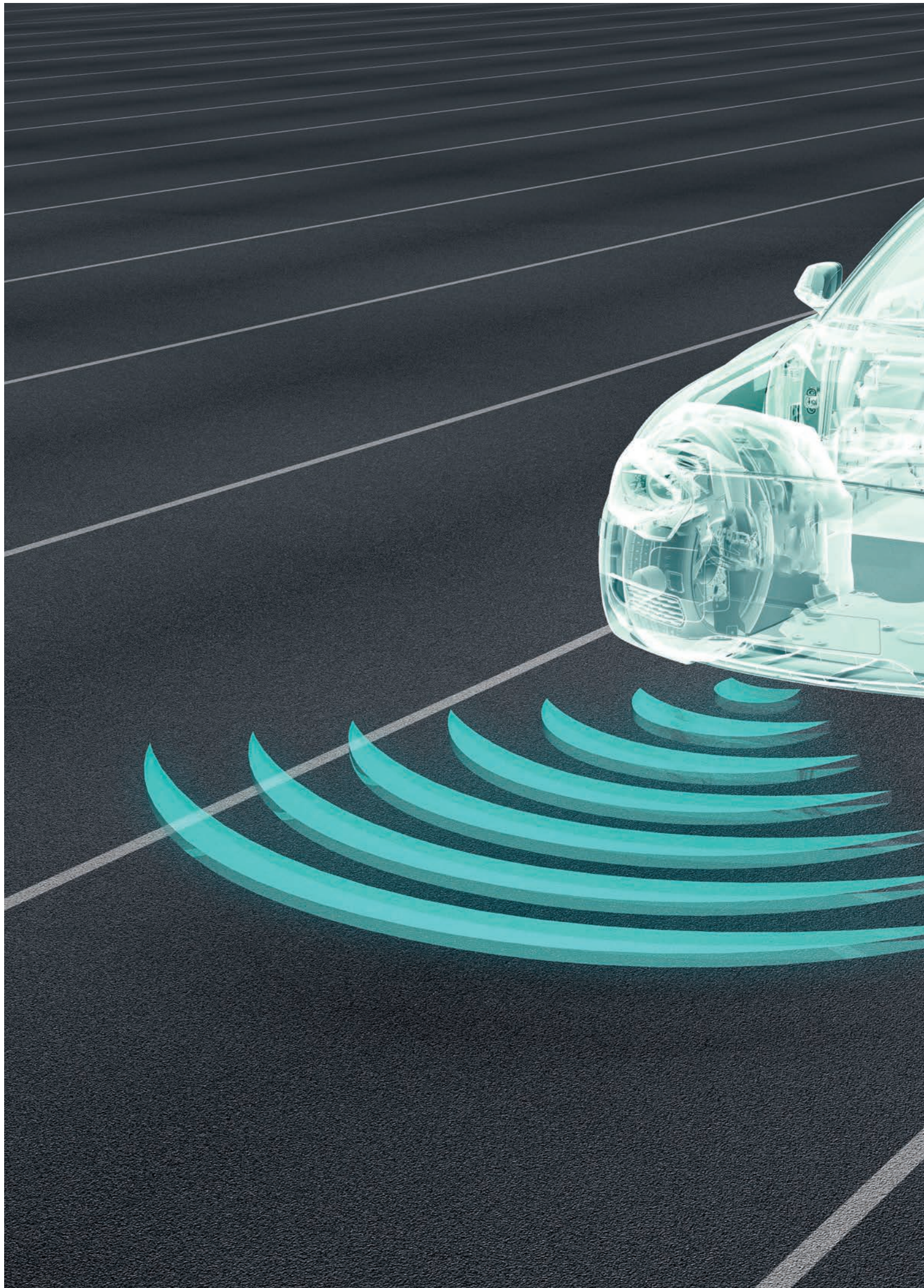


digitalization and e-learning for many years. For example, we have the UniTrain system, our computer-based training and experiment system. The multimedia courses allow students and trainees to gain a hands-on understanding of the theoretical aspects. It's the epitome of blended learning. This clearly motivates the learners, allowing them to develop their skills and competence. Plus it is a completely self-sufficient system that can be used anywhere and anytime.

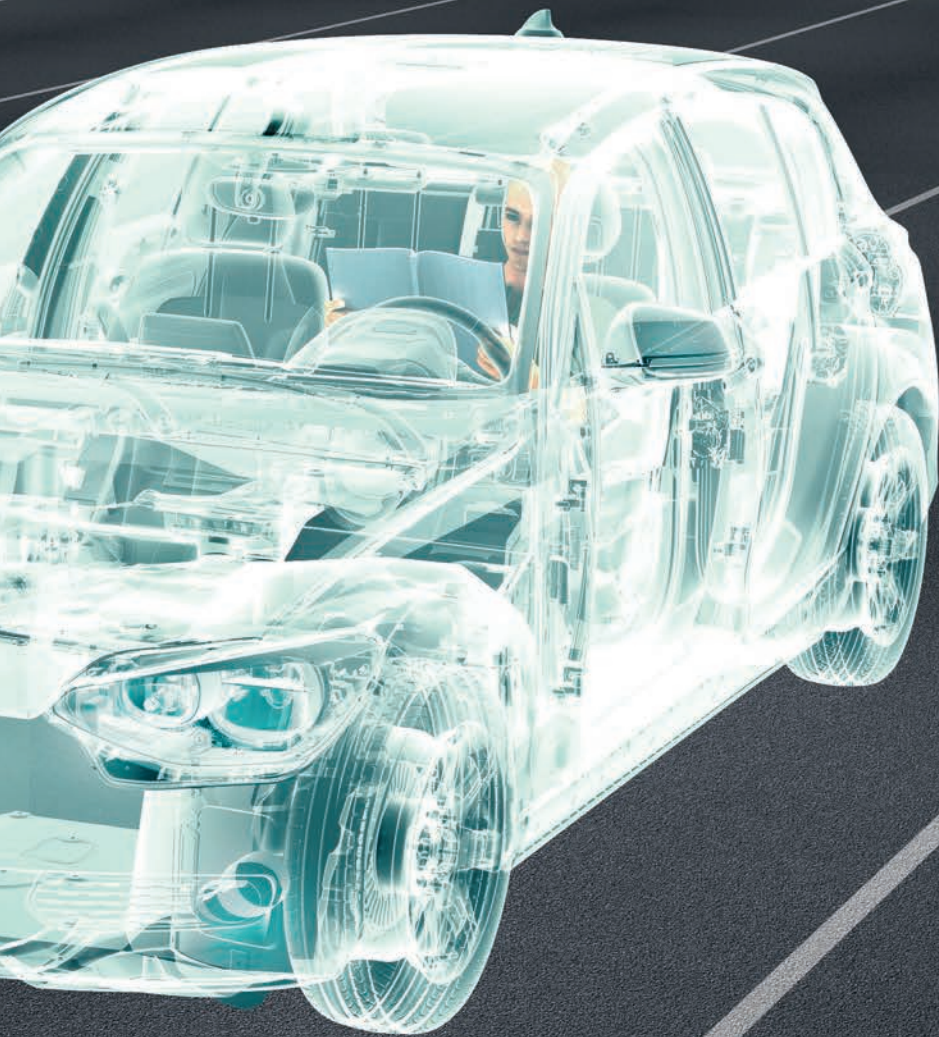
Cloud-based learning is a hot topic at the moment. With VOCANTO, Lucas-Nülle now offers a new and modern content and learning management system. VOCANTO helps give students and trainees a better understanding of complex textbook content. Our e-learning platform is clearly structured and uses 3D models to illustrate all kinds of complex technology in particularly simple ways. We ensure that students and trainees gain an understanding of the relevant systems and processes very quickly. This also leads to better test and work results. At the end of the day, isn't that what we are all aiming for in vocational education? ■











48 volts, CAN-FD and autonomous driving:

# Digitalization in vehicles

For more than 40 years the 12 volt on-board power system was synonymous with cars. Now the 48 volt on-board power system, introduced just a few years ago, represents the next generation.



The trend is clear: In the course of digitalization, the automotive industry, and by extension vocational training, must look at tried and tested vehicle components in a new light. Besides the on-board power system, there are many other examples as well, such as the CAN-FD bus system, new driver assistance systems or the programming of control units via Ethernet. Our development department examined these industrial innovations very closely and developed suitable solutions for vocational training. The training solutions are based on our UniTrain experiment system. They realistically and safely show diagnostics and maintenance of the new technologies – the ideal preparation for digitalization and interconnection.

### **UniTrain CAN-FD: the improved CAN bus in the classroom**

To this day, the CAN bus is doing a good job in terms of digital interconnection in our vehicles. However, in many respects the serial bus system has reached its limits. The logical development is the CAN-FD. The new bus protocol meets the requirements associated with higher data rates and ever more

technical functions. “Flexible data rates” have been rapidly becoming more widespread since they were introduced to the market. Knowledge of the protocol and performing measurements on the system provide the basis for maintaining new automotive systems; and Lucas-Nülle facilitates this in a practically relevant way.

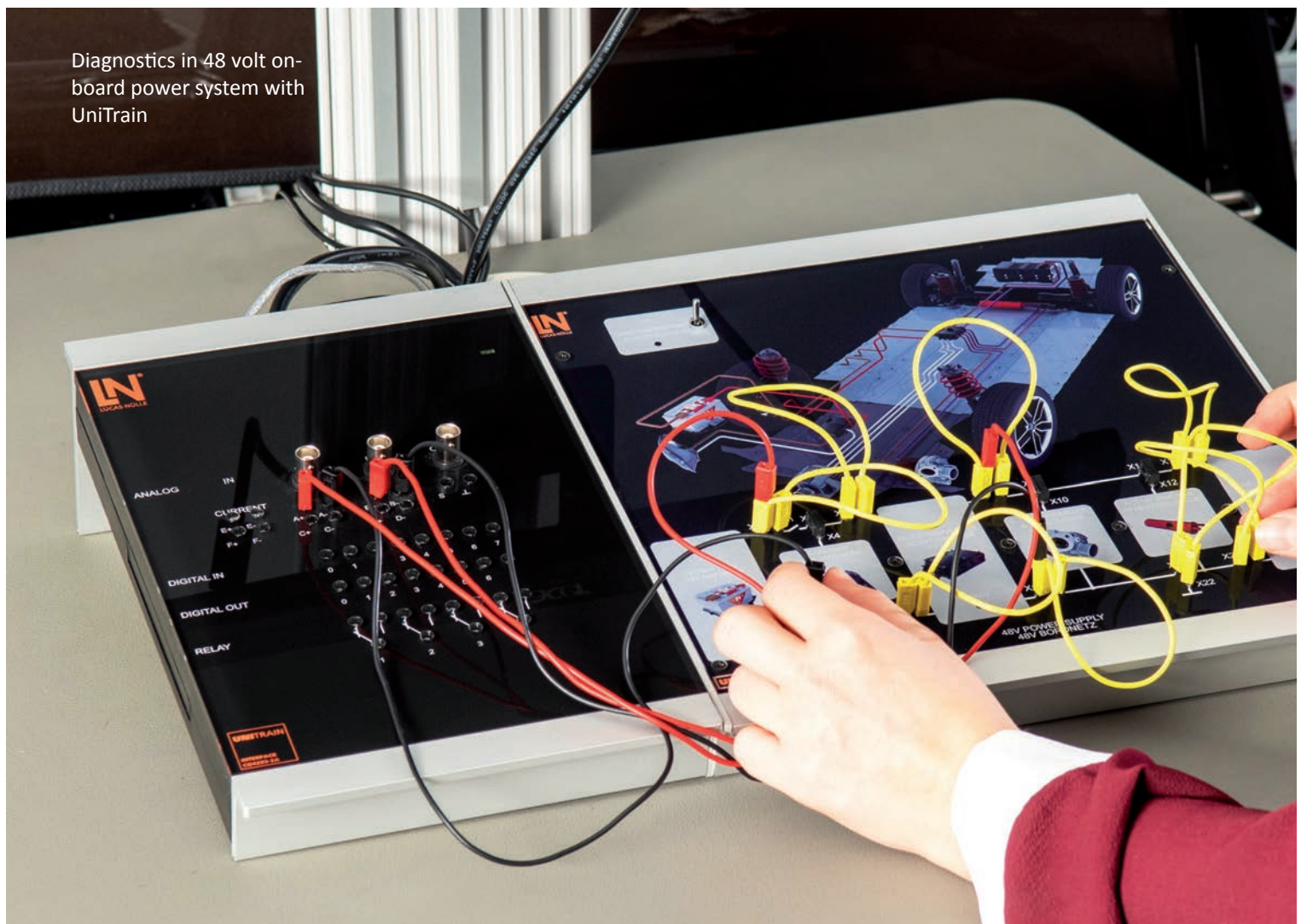
### **UniTrain 48 volt on-board power system: safe lessons with more voltage**

Higher voltage is rather useful. The 48 volt on-board power system is a key technology that opens many doors, so to speak. Lower currents make hybridization without HV possible. At the same time, the system’s thinner cable harnesses make it more lightweight. Furthermore, the extra voltage opens up performance options with the e-booster. Working with the 48 volt on-board power system will provide an important grounding for modern vehicle diagnostics and maintenance. The safety of lessons with the higher voltages is guaranteed by the tried and tested UniTrain System.

### **Outlook: assistance systems paving the way for autonomous driving; multi-functional vehicle cameras.**

They can recognize white lines and multicoloured road signs as well as numbers and symbols. That makes them convenient aids which assist us in tricky situations. Rear view cameras guide drivers when parking, camera recognition of road signs facilitates speed control via the navigation system.

Modern vehicles are already capable of controlling the speed themselves thanks to predictive speed control systems. Driver assistance technology shows a clear trend towards autonomous driving. It is therefore important for budding automotive professionals to gain an understanding of driver assistance systems. Our development department is going to present additional UniTrain systems in 2019 that will enable you to integrate the topics into your teaching programme. ■





# A new era of energy generation emerging

New and old forms of energy generation are found right here together. The T2-Campus in Genk is situated in the Thor Park – a new, regional development project on the site of the former Waterschei mine. An old winding tower serves as an impressive monument to bygone coal-mining times. Today however the steel structure overlooks an area that has transformed into a modern technology, energy and innovation hub. Here the T2-Campus is one of the places offering comprehensive education. In the topic of power engineering training, the planners alongside project developer Andre Jodogne and product innovator Tom Nijsen opted for Lucas-Nülle's Smart Grid laboratory.

## **The T2-Campus: a place of learning that reaches beyond boundaries**

Talent and Technology – or short T2 – are the two central elements of the Campus that in turn is an important cornerstone of the park named after the Nordic deity. In an open glass construction, the city of Genk and the regional technical institutes, as well as training providers VDAB and Syntra Limburg, have created a central education and training venue. Here students from technical schools, workers undergoing basic or further vocational training and university students undertaking master's degree courses meet in the same learning space. While the Thor Park as a whole is an expression of the innovative path being taken by a region undergoing structural change, the story at the heart of the T2-Campus is one of successful cooperation in education and training. "We have managed to achieve a new level of quality thanks to three institutions joining forces and combining what was previously six places of learning into a single

center," André Jodogne says. The result has seen the new campus developing into an attractive place of learning that reaches beyond the boundaries of the three institutions.

## **The Campus relies on Lucas-Nülle for the core topic of energy**

Across different institutions based in the industrial park the topic of energy and power engineering is given special focus. One such example is energy research institute "EnergyVille" who calls it home. It is therefore vital that this area is also covered by the T2-Campus. The equipment of the centrally located Lucas-Nülle Smart Grid Laboratory is the hub for the different topics. "In the Smart Grid, users can see how a wide range of electrical engineering and electronics subdisciplines go into making up the overall picture of modern energy management," says Tom Nijsen, who is primarily responsible for the topic of New Energy here. "The Smart Grid topic is innovative, we can't get any closer to the real application than by using the equipment of our new Lucas-Nülle



At the new T2-Campus in Genk, a motivated team offers technophile students – from schools to universities – power engineering training with Lucas-Nülle.





The minds behind the project:  
André Jodogne (left) and  
Tom Nijsen.

appeal of the new systems, “plus the Lucas-Nülle equipment offers in-depth, digital learning content. For us, it means that we don’t have to spend years going through the laborious process of developing this material ourselves.”

## Modular design facilitates flexible use

The Lucas-Nülle Smart Grid Laboratory has several components that allow students to either work on specific topics or learn about the background of flexible grid management. It covers all the topics of power generation, transmission and consumption management. This includes modern technologies such as battery storage equipment, smart metering or renewable energies as well as different transmission

lines, conventional types of power stations or pumped storage plants. The SCADA Power Engineering Lab Software facilitates intelligent control of the laboratories as well as analysis of the Smart Grid by means of Soft PLC. Working with SCADA in particular makes the hardware attractive for university users too, enhancing the laboratory’s flexibility in how it can be used by learners at the T2-Campus.

## Trainers are enthusiastic

In the few weeks since the opening of the laboratory, the local team of instructors has already trained over 100 future trainers on the equipment. The feedback from the various institutes has been very positive. “We had training specialists here who were particularly interested in the role of the individual components within the overall system,” Tom Nijsen says, adding that “the university users, on the other hand, found the simulation of the interaction between all the

energy input sources very helpful.” Technical secondary school students also use the equipment to learn the basics in the field of wind energy or photovoltaics. And in future, too, there will be no shortage of demand. On peak days the new Campus is already visited by over 1,000 students and trainees – and that number is only set to increase. ■



Clean windows instead of black bricks: Even the architecture at Thor Park symbolizes technological change.



*“The possibilities for using the equipment really are very extensive,” says Jodogne. “The trainers can gather authentic data here in real time and on the basis of experiments, which they can then build upon in their lessons.”*

Students from different institutions can use the new smart grid lab simultaneously.





# Cyber-physical conveyor belt:

A CPS that lives up to its name



**IN THE CYBER-PHYSICAL CONVEYOR SYSTEM (CPC)** In the era of digitalization, the term ‘cyber-physical’ sometimes mutates into an advertising expression. In an effort to develop training solutions for the automated economy, systems are marketed as cyber-physical which do not adequately correspond to the concept behind the term. Because creating a cyber-physical system (CPS) involves more than simply connecting an existing machine to a PLC.

In a cyber-physical conveyor system (CPC), the control hardware is a fully integrated element. This means that the sensors supply the data directly to the controller, which in turn directly controls the actuators. Only then does the CPC become an actual CPS that can be sensibly integrated into a larger network – like the Lucas-Nülle Smart Training Factory.

# 6 reasons

why the cyber-physical conveyor belt (CPC) provides  
the ideal basis for your Smart Factory training

1

## **OPEN INTERFACES:**

It makes sense to begin CPS training on a single segment. But a detailed understanding of the Smart Factory can only be gained on a complex overall system. The integrated CPC controller has open interfaces that allow additional sensors and actuators to be connected and thus expand the CPC. You can also add other technologies, for example RFID systems or IO-Link.

2

## **EXPANDABLE WITH OTHER SYSTEMS:**

The integrated controller makes it possible to use the conveyor system as the basis on which other processing stations can be superimposed. You can therefore use the CPC to create cyber-physical systems with different tasks. Transform the CPC into different production segments with distinct functions and processes, gradually increasing the degree of complexity of the training.

3

The CPC gives you flexibility in teaching the **BASICS OF DIFFERENT CONTROL SYSTEMS:** Users can control the belt by programming a Siemens PLC or, alternatively, use a microcontroller, a Siemens LOGO or the Lucas-Nülle PLC (UniTrain). These then take over control of the belt together with sensors and actuators.

4

## **CONFIGURING THE SYSTEM SO THAT IT RECOGNIZES WORKSTATIONS AUTOMATICALLY**

and then immediately executes the right process.

5

## **UNDERSTANDING COMMUNICATION AND NETWORKS:**

The system makes it clear why we are integrating a CPS into a network. By means of data transfer, we can see which sensors have which readings, anywhere and anytime. This gives us a picture of the system's current status so we can learn from the data and improve production efficiency in the future.

6

## **CONTROLLING THE CPS VIA AN MES:**

The MES is an essential part of any Smart Factory training. It triggers the processes in the individual cyber physical systems and thus directs the entire production process. By integrating the CPC with an MES, users take the step from a CPS to a fully interconnected Smart Factory complete with ERP system and Webshop connection.





# Morocco



Digitalization is enhancing the status of automotive technology

## More and more of the kingdom's universities are teaching automotive technology

Automotive technology is in vogue at universities in the Kingdom of Morocco. New production facilities are generating increased demand for skilled workers. At the same time, the requirements that have to be met by automotive mechatronics technicians and engineers are growing all the time as a result of increasing vehicle electrification and digitalization. For this reason, more and more of the country's universities are now beginning to offer courses in automotive technology as well. Sultan Slimane

University in Beni-Mellal as well as ENSET in Rabat and ENSA in Kentira are all cooperating with Lucas-Nülle for this purpose. New automotive technology laboratories and training systems now integrate modern automotive technology into the teaching programmes at these universities. The trend is clear: the Kingdom of Morocco is reacting to the profound changes in automotive technology by enhancing the subject's status within the national education system.



## The lab will offer the chance to do a master's in automotive technology

The new bachelor's degree course in automotive mechatronics offered by the "Ecole Supérieure de Technologie" at "Sultan Moulay Slimane University" in Beni-Mellal is a prime example of this development. Situated in Morocco's interior, the university built a completely new automotive technology laboratory last year. The new training systems available there cover virtually the full spectrum of vehicle electronics and diagnostics.

As a result, a modern centre for state-of-the-art automotive training has been created in Beni-Mellal, covering not just mechanical and electrical engineering, but also every aspect of modern, digitalized vehicles. At the same time as introducing the new technology from Germany, the university has also modified its in-house educational concept. Practical hands-on training that goes beyond theory now forms an integral part of learning in the laboratory.

In a second project phase, Sultan Moulay Slimane University wants to expand its automotive equipment by adding the topic of hybrid and all-electric vehicles. Here too the Moroccans want to continue their

cooperation with Lucas-Nülle. The university also plans, for the first time, to develop a master's degree course in automotive technology based on the foundation that is being put in place just now.

## New jobs in the Rabat region are a major factor in the new developments

There is no lack of demand for qualified automotive mechatronics technicians and engineers. The planned enhancement of the status of automotive technology within the national educational



*"We are delighted to have equipped our institution with Lucas-Nülle systems. They allow our students to master new technologies in automotive vocational education and training and gain qualifications that meet the new labour market requirements."*

Professor Abdelkhalek Oussama, Principal of the Ecole Supérieure de Technologie in Beni-Mellal.

programme is no coincidence either. The need for skilled workers has increased greatly in the North African kingdom over recent years. For example, in Kentira, a city on the Atlantic coast to the north of Rabat, Peugeot parent PSA is in the process of building a new production plant. In this north-western region of the country alone, over 1000 new skilled workers will be required in the near future, including hundreds of engineers.

Consequently, the local engineering colleges – ENSA in Kentira and ENSET in nearby Rabat – have recently added automotive technology to the courses they offer. In a way that closely mirrors developments in Beni-Mellal, the colleges’

committees identified the need in the area of automotive electronics and diagnostics. And here too, they have found the right partner in Lucas-Nülle for the development of the new institutes.

### Simultaneously the focus is on further training

However, current requirements cannot be met through student training alone. The new institutes thus also have another role to fulfil – ongoing training and development of the existing workforce in the automotive sector. Many of the institutes are in the process of

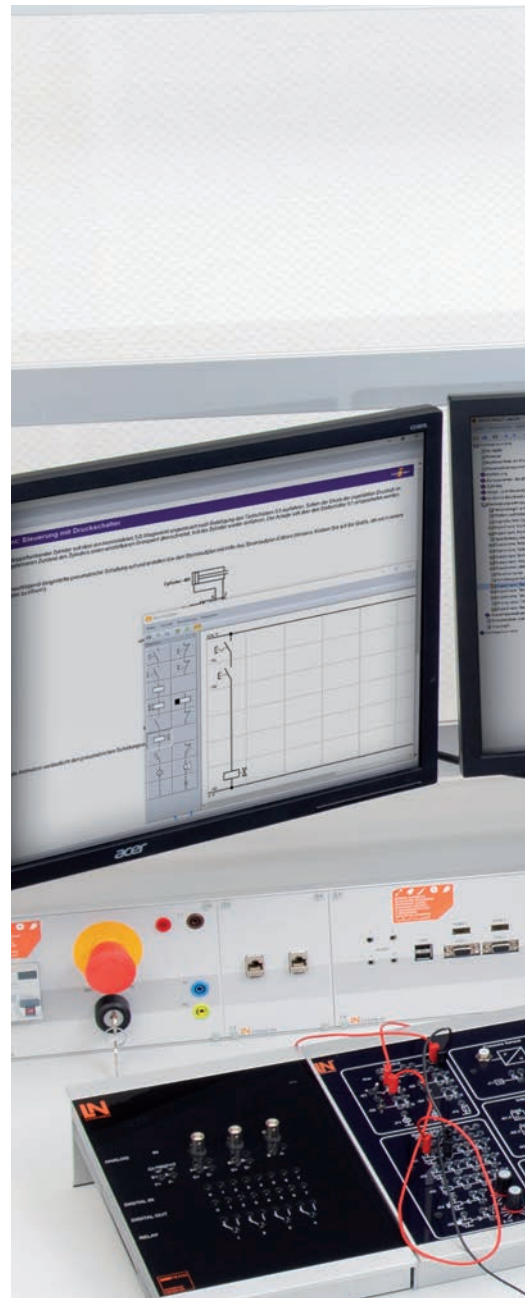
concluding training contracts with the region’s industrial companies. The fact that the systems in the new laboratories are modular in structure fits in well with these new plans. It means that all the systems can also be used individually, regardless of the laboratory’s primary designation. This allows training to be provided in very specific areas as well. While students use the laboratories over a longer term in accordance with a set programme, employees are able to use them to get practically relevant further training in specific technical areas over a shorter period of time.





More possibilities, a high-quality design and a completely new UniTrain System on the subject of Manual Pneumatics – we have improved basic Pneumatics training for 2019.

This will allow you to make the learning process even more authentic and lay a solid foundation for working in the Smart Factory.



### New components and high-quality design for the Electropneumatics UniTrain System

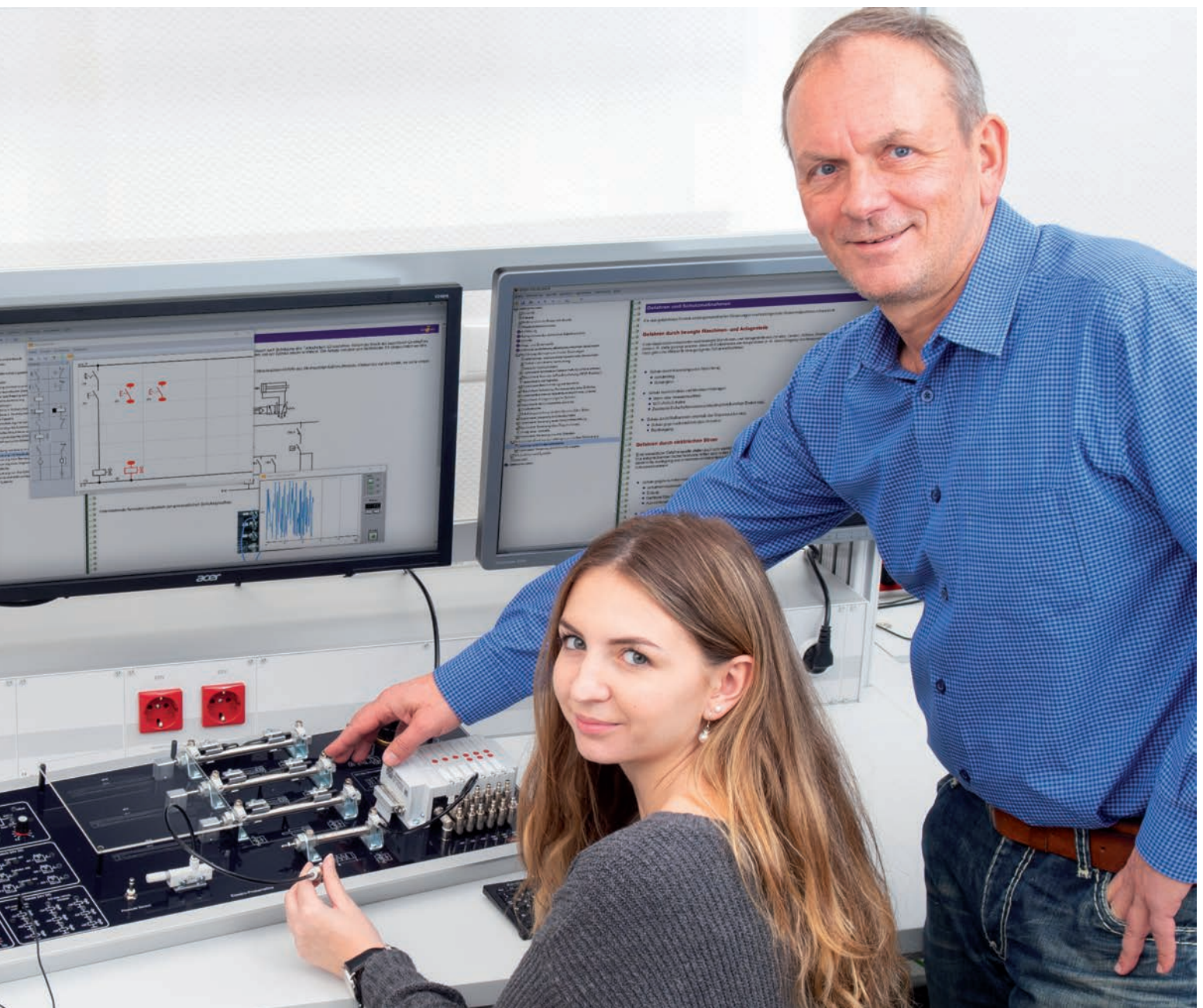
Following a complete revision of the “Electropneumatics” course, the board is now fully equipped with original AVENTICS components. As a result, the learning experience with the UniTrain experiment system reflects industry practice even more closely. At the same time, all the previous learning content is still included, for example the double-acting cylinder function or the basic circuit with AND/OR links.

### New course focuses on manual pneumatics

Not every user manages to get the hang of electropneumatics straight away. For this reason, our development team have designed a UniTrain course that focuses on manual pneumatics.

It bears the simple title “Pneumatics” and facilitates a comprehensive introduction to control systems starting from the basics. Circuit diagram software that can be integrated specifically into the training software allows reading, creating and planning to be taught

with the “manual” board as well. UniTrain’s experimental learning approach can be used to ensure a solid understanding of pneumatic control and thus build important basic skills for automation. ■



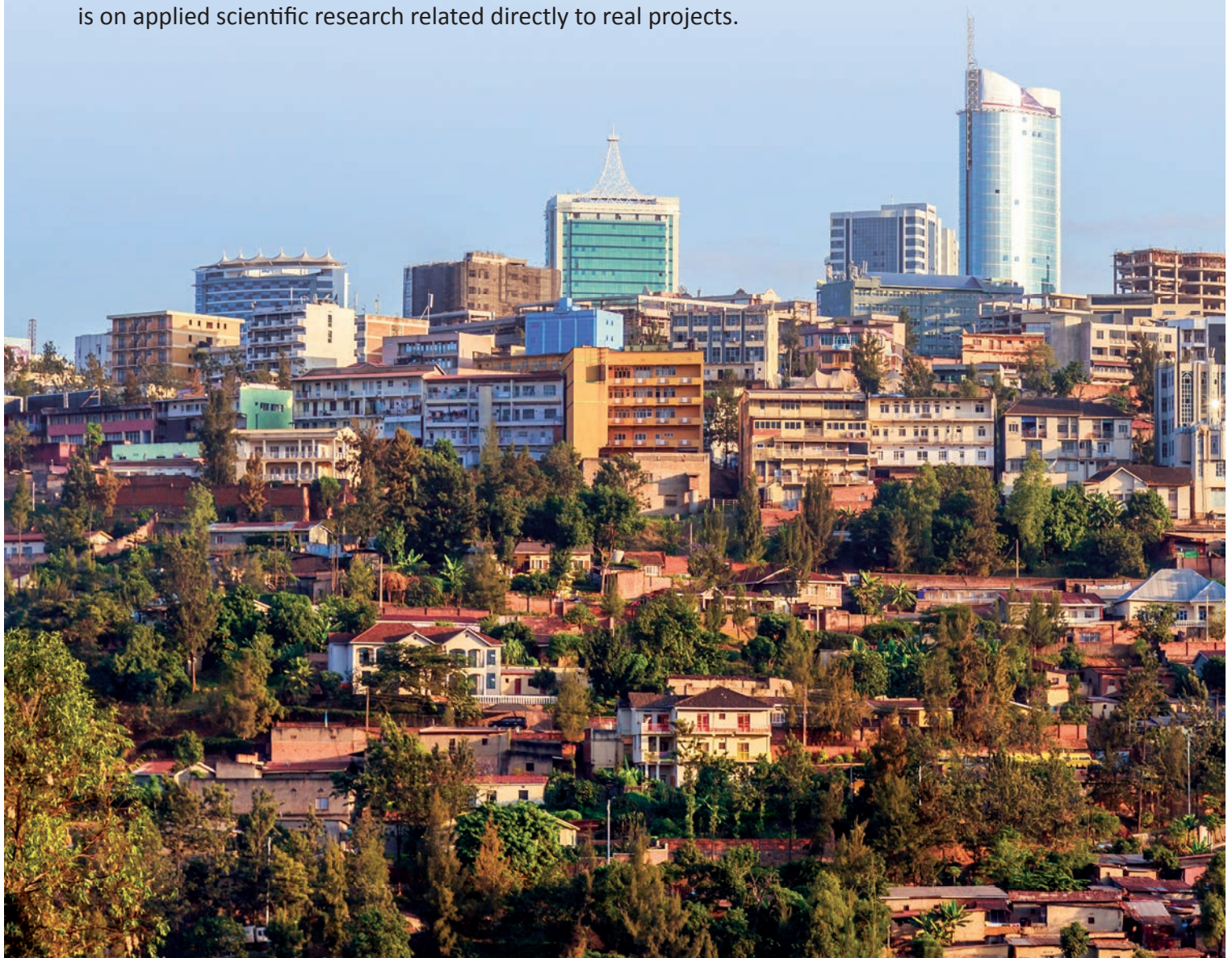
# Building basic skills in pneumatics



# Applied science from Rwanda:

A centre for prospective doctoral students from all over East Africa

It is one of the first of its kind: the “African Center of Excellence in Energy for Sustainable Development” (ACEESD) is a transnational centre for engineer and doctoral training that was set up in 2018. The focus at the University of Rwanda is on applied scientific research related directly to real projects.







### THE REGIONAL ENERGY MARKET NEEDS INDIVIDUAL SOLUTIONS

Energy use in East Africa is growing, not just in Rwanda but also in countries like Tanzania, Uganda and Kenya. In the final analysis, practically the entire region is faced with rapidly growing energy consumption. However, the local infrastructure is rather specific, which means that, more often than not, specific solutions are called for.

From an engineer's point of view, it's an exciting market. In many places, stand-alone solutions are the only option. The individual systems must work independently of national grids. That doesn't make them any less complex though. On the contrary, any well-functioning microgrid is a challenge in itself.

### APPLIED SCIENCE DIRECTLY FOR THE REGION

It is precisely at this interface between a challenging infrastructure and the research interests of budding engineers where the World Bank-funded "African Center of Excellence in Energy for Sustainable Development" (ACEESD) comes in. Young power engineers from seven East African countries are studying at the new institute, which is affiliated to the University of Rwanda.

Their shared ambition is to obtain an engineering degree and doctorate that will make them stand out in the international education market. What is truly revolutionary about the ACEESD's approach is not so much its multinational approach as the research interests of its young scientists. The institute's work addresses the aforementioned infrastructure challenges in the region. And the target is ambitious. The ACEESD wants to identify stand-alone solutions that can meet local energy needs in the long term.

### POSSIBLE SOLUTIONS ARE SIMULATED IN LUCAS-NÜLLE'S SMART GRID LABORATORY

In their search for these solutions, the students must above all be able to draw up accurate predictions. Lucas-Nülle's power engineering laboratories provide them with the tools to do this. The systems from Germany allow them to simulate the role of individual energy producers in the grid on the one hand and to plan complex networks such as smart and microgrids using the SCADA practice software on the other.

This aids the search for stand-alone solutions. Just like a jigsaw puzzle, the energy producers can be arranged and fitted together in a local microgrid to create an overall solution of the right size. The modular design of the systems allows the budding engineers and doctoral students to simulate different scenarios. By using a trial and error approach, they can test which energy system works best in the particular local conditions.





# Power is triangular

**The SybaLab RANGE OF LABORATORY EQUIPMENT has been extended to include system tables with triangular profiles featuring integrated power supply components.**

The clever thing here is that the table legs form the power supply duct. This saves space and ensures adequate depth of work surfaces. As usual with SybaLab, you can adjust the table to suit your laboratory. Using the power supply duct configurator on our website, simply enter the required power supply equipment to get the optimal furniture system for your labs.

By the way: You can even select a lab table colour to match your laboratory. ■



## More system access for better e-learning

A frequent failing of e-learning is that it is too rigidly linked to lessons. Many platforms are based on self-contained LMS programs that ignore the reality of trainers' day-to-day work. The VOCANTO learning platform is available with an ULTIMATE licence that offers comprehensive system access. With this licence, users can create their own learning content and even animations. With ULTIMATE, even the platform's structure can be adapted for a particular institution. The platform thus gives teachers and trainers more freedom to customize learning content and methods.

VOCANTO is the learning platform for training and development from Lucas-Nülle. The main features of the cloud-based service are learning management – including exam preparation according to the 'six phases' principle – and digitally optimized content. Textbook theory is visualized using 3D animations and videos while gamification and tests ensure a strong interactive component. The connection of learning centres in VOCANTO also offers the potential to better coordinate teaching at different locations. A free basic version is available at [VOCANTO.com](https://www.vocanto.com).



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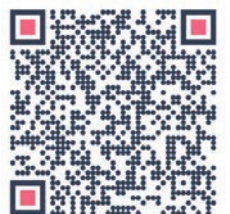


# ULTIMATE

## E-Learning

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- accessibility
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