



Connect

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December
2022



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technology in the storage area.



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The philosophy of MiniTec simply
explained

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How MiniTec integrates robots efficiently



Simply move more precisely: **Linear technology from MiniTec**

In many designs in mechanical engineering, linear motion is required in subareas so that they can fulfill their actual function.

MiniTec therefore offers a wide range of linear technology products to match the modular profile system. This ranges from individual components to adjustment units and sliding guides to ready-to-install linear axes. A common feature is the unlimited compatibility with the MiniTec modular profile system.

This ensures that the respective linear unit fits seamlessly into your design!

Whether pick & place, gantry robots, measuring equipment, feeders or handling equipment: We offer you the optimum linear guide and suitable linear unit for every application - and thus a perfectly coordinated solution that is loadable and works precisely.

When will you discover the art of simplicity?

More information can be found at:

www.minitec.de/en/produkte/linearsysteme





DEAR READERS,

Behind us is a year that feels like déjà vu. In December 2021, we thought that the restrictions caused by the pandemic were the worst thing we could imagine. And then came 24 February. A war in Europe with the known consequences. But we are gradually learning how to deal with crises. And despite all the negative omens, MiniTec can look back on a positive year; we even exceeded the goals we set. The broad positioning, not only of our products and solutions but also of our customers have safeguarded us from a large slump in sales. And so our corporate strategy also continues to prove to be successful. It is also important to us that we continue to look to the future optimistically. This is accompanied by further investments in locations, technologies, new products and markets.

This year we are again pleased about several interesting projects, for example, larger orders in the solar technology sector. For many years we have offered production components for the photovoltaic industry as well as complete production lines for this sector. Even though the basic political and economic conditions became increasingly more difficult, we held onto this sector, because we saw the need for an energy transition. After dramatic slumps in orders, things are now getting better. Once again, it is evident that it also pays to pursue long-term strategies. Our approach is similar in other areas too: We are pushing ahead with our cooperations with universities and training facilities. Next year, among other things, the first "MiniTec University Days 2023" will take place. Here we inform technicians and young engineers on site about the possibilities offered by a modular profile system in conjunction with design tools and establish contacts.

Just like this year, we will again be present at many trade fairs. And on 23 March 2023, we invite you to our "InHouse" trade fair in our main factory. Visit us, we look forward to meeting you.

We wish you and your family a happy Christmas and a good start in the new year.

Yours

Sandra Geyer-Altenkirch
Managing Director

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Robots have become a standard feature of modern-day production. They are fast, versatile and work around the clock without complaining. To be worthwhile, their integration and implementation must be suitable for the work environment and the requirements in which they are used. MiniTec goes its own way here and scores with its expertise.

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PRACTICE

Autonomous mobile robots in the MiniTec warehouse
MiniTec also opts for state-of-the-art technology in the storage area. An automated guided vehicle system has been in use for some time. It is now a fixed part of the intralogistics and assists the employees with various workflows and processes.



PRODUCTS

The Art of Simplicity – more than a slogan
MiniTec has actively put its corporate philosophy into practice from the outset. It is a motto for the design and development of all products and solutions. The objectives are to minimise machining operations, avoid unnecessary product variety, achieve the greatest possible flexibility and optimum economic efficiency.

MINITEC AT TRADE FAIRS AND EXHIBITIONS IN 2023

In the new year 2023, MiniTec will again be represented at the most important trade fairs of its industries at which it will be presenting its products and solutions.



MiniTec InHouse, Schönenberg-Kübelberg

The trade fair calendar 2023 starts with our own InHouse trade fair,

which provides a look behind the scenes at MiniTec.

23 March 2023, 09:00 - 15:00,

MiniTec company headquarters in Schönenberg-Kübelberg

werkstätten:messe

Werkstätten-Messe, Nuremberg - Workshops for the Disabled trade fair

The Werkstätten trade fair shows

the important role that workshops for the disabled has in our society and what services and visions lie behind the term inclusion. MiniTec has been specialised in workplace systems for many years and has set itself the task of contributing to integration with ergonomic workplaces.

19 to 22 April 2023, Messezentrum Nuremberg



Abenteuer & Allrad, Bad Kissingen

This trade fair focuses on individual vehicle fit out, in particular, the possibilities for campers based on the MiniTec aluminium profile

system. 8 to 11 June 2023, Off-Road site Bad Kissingen

Logistics & Automation, Hamburg

Regional trade fair for intralogistics and materials handling. 14 June 2023, Messehalle Hamburg-Schnelsen



Intersolar, Messe Munich

MiniTec will be exhibiting at the worldwide leading trade fair for the solar industry. The topics include production lines for photovoltaic

modules and laser welding technology in solar thermal energy for the industrial mass production of solar thermal absorbers.

14 to 16 June 2023, Messe Munich



112 rescue, Messe Dortmund

Trade fair for fire safety, rescue and civil defence. MiniTec will be presenting its firefighting technology industry solution for the fitout of vehicles or the equipping of buildings and workshops based on its modular system.

14 June 2023, Messe Dortmund

all about
automation
düsseldorf

all about automation, Chemnitz and Düsseldorf

The theme of the regionally focussed trade fairs for industrial automation is systems, components, software and engineering for industrial automation and industrial communication.

28 to 29 September 2023,

Messe Chemnitz

18 to 19 October 2023,

Böhler site in Düsseldorf

all about
automation
chemnitz



Motek, Stuttgart

At the international trade fair for automation in production and assembly MiniTec will be presenting solutions for assembly, handling and conveyor technology.

10 to 13 October 2023,

Messe Stuttgart

FLORIAN



Florian trade fair, Messe Dresden

MiniTec will be presenting its firefighting technology solution for industry at the trade fair for fire safety, rescue and civil defence.

12 to 14 October 2023,

Messe Dresden



For an up-to-date overview of all trade fairs visit www.minitec.de/service/messen-events

WEBINAR: A COMPARISON OF PALLET TRANSPORT SYSTEMS



MiniTec offers a wide range of conveyor technology for factory automation, material flow, materials handling and intralogistics. Pallet transport systems play an important role in these areas. They are used whenever machining, marking or testing of workpieces takes place

at defined stations. They also combine conveyor technology and the workplace and are used to set up assembly and machining lines for assemblies.

Which solution is the optimum choice for the respective use depends on different factors such as the weight of the goods to be transported, the space available, the material flow, etc. Ultimately, the product to be transported and the work process determine the best system. The agenda includes topics such as a comparison between systems,

areas of use, functional differences and suitable MiniTec products in this area.

Get an overview in our webinar on Wednesday, 25 January 2023 from 14:00 to 15:00.

Free registration: www.minitec.de/service/online-seminare.

By the way, by registering you will also be able to access the video recording of the online seminar after this date.



SAVE THE DATE



MiniTec
THE ART OF SIMPLICITY

IN | HOUSE

23. March 2023 | 9.00 to 15.00 Uhr
Schönenberg-Kübelberg

Lectures | Exchange of information
Presentations | Plant tours

Details and registration:
www.minitec.de/inhouse2023





HAND IN HAND WITH ROBBY

Robots have become a standard feature of modern-day production. They are fast, versatile and work around the clock. Falling prices and a wide range of offers are also good arguments for their use. To be worthwhile, their integration and implementation must be suitable for the work environment and the requirements. MiniTec goes its own way here and scores with its expertise.

Performance alone is not enough when it comes to using robots. While they are flexible and very efficient helpers in production, their operation must nonetheless be planned carefully and their integration and implementation ensured. Only then can they also play to their advantages. They then ensure significant performance increases with simultaneous cost reductions.

The areas of use are diverse. For example, robots are frequently integrated in the assembly. Assembling is one of the most complex tasks that a robot can do. It must not only master complicated movements, both individually and sequentially, in order to join together different components, but must also be able to pick them up and put them down.

MINITEC OFFERS ITS CUSTOMERS PRECISE-FITTING SOLUTIONS.

The metal coworker often helps with work that is time-consuming and monotonous. A modern robot arm masters a similar repertoire of repetitive tasks as the human arm. It can therefore lighten the workload of workers in many areas of the assembly

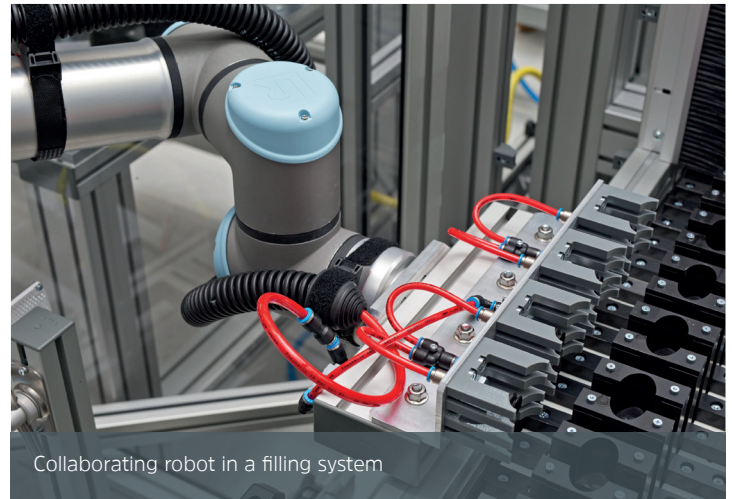
such as joining, handling, checking and adjusting through automation.

Modern assembly robots can be used flexibly, as and when needed. This makes them interesting for smaller businesses too. The assembly tools can be changed quickly. For example, the gripper can be swapped for a screw head and the robot therefore used for different tasks in production.

Flexible assembly with robots

Nowadays, flexible automation in assembly is increasingly in demand – and flexibility is after all a core property of robots. They can now even “see” and “feel” and master the logic and communication necessary for variant flexibility.

Today’s robot-assisted assembly therefore already meets all the requirements for tomorrow’s smart factory and is far more flexible and versatile than rigidly interlinked automated production.



Collaborating robot in a filling system

Handling components

Another classic area of use is the handling of components. Here robots move parts or tools to and from a specific place by feeding, removing and transferring them. Many production companies now have robots integrated in their production facilities due to their versatility, speed, precision and cost efficiency.

Pick & place with an iron hand

Robots are also an enrichment to the pick & place area: Picking up parts and placing them in a specific position and orientation somewhere else is a key discipline for robots, provided they are properly integrated and programmed. Pick & place is often used to sort products for a downstream process or to put them down in an orderly way in trays to make it easier for downstream automated machines to handle the parts. In many cases, the parts arrive by conveyor belt and are sometimes also placed back on conveyor belts. They can also assist with the order picking and packing of goods.

Automated solutions

Another area is automation solutions with industrial robots, which can improve the quality of the assembled products significantly. Human errors, which can occur as a result of fatigue during monotonous work, can be avoided by automation. The robot coworker always completes even very humdrum tasks tirelessly and in uniform quality.



MiniTec implements robotics solutions to individual requirements.

Without these sources of errors, the quality of the overall process improves. Parts can no longer be mixed up, nor can parts list items be forgotten. The robot “thinks” of everything. It is just as willing to undertake tasks in a dangerous environment, for example, where it is hot or the components to be assembled have sharp edges. Collaborating robots (cobots) – working in pairs with a human worker – are now frequently used in the assembly to improve economic efficiency. The so-called cobots of a firm can, for example, save a company costs if they carry out simple assembly tasks.

Quality testing with robots

Quality testing is a wide area of application for robots. Increasingly with cobots too, with which many manual tasks can be automated. For example, robots can move workpieces to stationary quality test sensors, or present workpieces to a human for visual inspection, and thus assist the tester while they complete other tasks. Robots can also perform tests themselves by using scanners, sensors or measuring heads.

In general, there are also many test procedures within a production line and built-in quality gates between individual processing steps. These are dealt with by robots during their handling tasks, by moving workpieces in front of a sensor or into(out of a quality test station.

Using robots, with know-how ...

The ranges of tasks carried out by robots are diverse. A considerable number of robot manufacturers have now established themselves in the market, the number of service providers who plan the integration of robots and in some cases also implement the integration, is even larger. Their approaches are often more geared to the robots that the application or task.

Here MiniTec goes its own way, which is in line with the medium-sized company's decades of experience in different disciplines. Among other things, the key competencies of MiniTec include assembly, conveying technology, handling and automation. And it is precisely these disciplines that MiniTec combines with the advantages that robots offer.

In addition, it has an ample modular system, based on aluminium profiles, linear units and components, which provides everything needed for the integration as well as any necessary additions such as protection systems.

Focussed on the application

MiniTec does not offer any off-the-peg solutions for automation with robots. Its focus is always on the customer's task. Precise-fitting solutions are developed for this and are integrated and implemented on site on the customer's premises.

There are a large number of examples of this. The latest developments include an assembly system for battery modules. Precision (the tolerances are set between very narrow limits) and speed (the cells must be bonded and welded together in a short time) are important criteria here. Accordingly, transport of the module bodies or packing housings requires a technology that ensures high process accuracy and repeatability. The MiniTec conveyor systems used here transport workpiece carriers with high precision and a simultaneously enormous speed.

A robot is used in the system for various pick & place tasks. For example, at the beginning it picks up the battery cells from a MiniTec timing belt conveyor and then places it in a waiting tray. In another process it lifts up the covers of empty trays so that they are ready to be filled with cells.

Another customer requirement was for a fully automatic filling system for simultaneous filling of multiple liquids in a single work operation. Individual stations in the modular design filling line can also be operated separately. It can therefore be used flexibly.

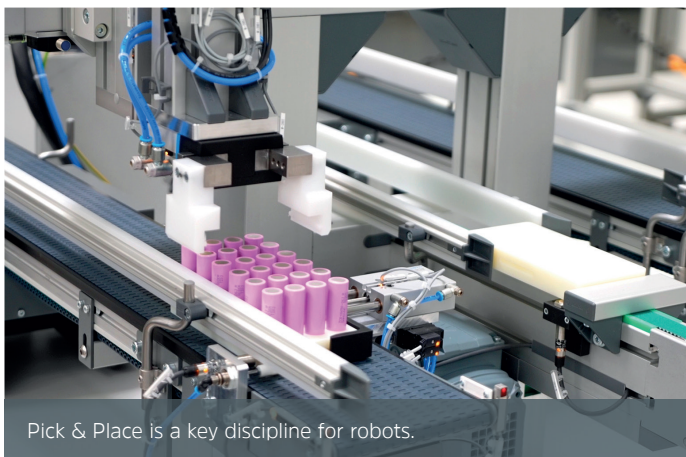
Competencies of our partners

MiniTec mainly uses Yaskawa robots. Our subsidiaries and partner companies, however, also have expertise in use of other robot types.

MiniTec Austria, for example, is specialised in the use of Epson robots and, as a system integrator, combines the MiniTec aluminium profile system and Epson industrial robots to form optimum solutions for its customers. Among other things, Scara or even 6-axes robots are used, through to perfected software, installation, analyses and reliable support.

One partner company, Alas-Kuul AS in Estonia, on the other hand has specialised in Kuka robots. Many applications have also already been implemented there.

No matter where in the world an industrial application task with integrated robotics is set, MiniTec or one of its partners is there and searches for the best solution for the potential customer.



Pick & Place is a key discipline for robots.



THREE QUESTIONS FOR PETER MÜLLER PROJECT MANAGER AT MINITEC

Mr Müller, what makes MiniTec different when it comes to the integration of robots?

We discuss the requirements with our customers in-depth first and only then do we decide what the best automation solution is. It can include a robot integration or even the use of linear gantries as an alternative. Or perhaps even a combination of these two technologies.

What are the strengths of MiniTec?

We do not only ensure seamless integration of the robots in the application. We also design and supply the necessary infrastructure, for example, conveying technology, handling, assembly support, quality assurance through to safety devices and guards. Here we can draw on our comprehensive modular system with components for these areas. Everything from a single source and it all fits together!

What should companies pay attention to when using robots?

It is important for the robots to be integrated into an overall concept. Use of a robot alone will not achieve any cycle time optimisation. Seamless integration is important. Among other things, however, safety concepts for occupational safety or even emergency concepts must also be considered. The robot can accelerate the production and at the same time it can become a problem in the event of a failure, when the production is stopped as a result.



AUTONOMOUS MOBILE ROBOTS IN THE MINITEC WAREHOUSE

MiniTec also opts for state-of-the-art technology in the storage area. An automated guided vehicle system has been in use for some time. It is fixed part of the intralogistics and assists the employees with various workflows and processes.

Automated guided vehicle (AGV) systems are now used increasingly in companies to transport goods and materials autonomously from one place to another. It is the mostly simple integration in a company's own path network and the priority person-independent transport of the goods that makes the use of automated guided vehicle systems very attractive for companies. MiniTec also uses this technology.

More flexibility through an autonomous system

The automated guide vehicle systems can be divided into two different systems: On the one hand there is the automated guided vehicle (AGV for short). These move automatically to the required areas, however, their movements are based on predefined paths. The paths are, for example, determined by floor markings, magnetic loops in the floor or even specifications in the software.

On the other hand there are the autonomous mobile robots (AMR for short). These are equipped with sufficient sensors to find their way around, even in demanding environments. There therefore do not need any fixed, predefined paths, but can move freely on the basis of a previously taught-in map. It is sufficient to set a destination position and the robot calculates its route itself. It can respond flexibly to any obstacles along the way and looks for detour routes.

For MiniTec the flexibility was the decisive reason for opting for an AMR system. After comparing several modes, the robots of Mobile Industrial Solutions (MiR 200 series) were tested more precisely. Above all, it was their good navigation and simple commissioning that were convincing, so that a robot was ordered soon after the test phase.

To acquire more experience with the system, the AGV was tested in different scenarios.

It became clear that the full potential of the robot does not develop until it interacts with the MiniTec conveyor technology. In this way, the MiR 200 found its way into the trade fair model of battery automation. Battery modules are put together here in the combination of MiniTec multi-axis handling and conveying technology. In this process, the AGV equips the system with raw parts and removes the finished product.

Productive use in the main factory

Following the successful integration of the MiR 200 in the trade fair model, its productive use is now also due to start. To this end, the MiR 250, the successor model of the MiR 200, was purchased.

The task involved a small load carrier (SLC for short), in the form of plastic containers, which are to be transported from the incoming goods department to the warehouse, in order to relieve the employees who previously had to take the SLCs to the warehouse on trolleys. To enable the robot to pick up the SLCs, it was fitted with a roller conveyor from the MiniTec modular system.



The integration of the AGV in the warehouse was very easy.

The integration of the robot in the warehouse was very simple, as it had already long since been semi-automated with conveyor technology. The existing conveyor technology therefore only had to be supplemented with a transfer point, at which the AGV can hand over the SLCs.

In the incoming goods department, the trolleys were also replaced by a short, automated roller conveyor, which serves as an SLC buffer as well as a loading point for the AGV. Due to the already integrated interfaces of the MiR 250, the robot was integrated into the existing systems and put into service by our "automation" department without any major problems.

More time for the essentials

The largest and thus most important advantage of using automated guided vehicle systems for MiniTec is that the employees now have time for more important tasks and they are relieved in the right places. After all, no value is added by the goods transport, it only incurs costs. The automation of this process is therefore an important measure within the scope of continuous improvement. After the incoming inspection, items can now be transported without interruption, which leads to a large time saving in our transport chain.

Another significant advantage is the flexible platform of the robot with the aluminium profile system. Due to the individual platform design, the AGV can be adapted to all the conveying technologies used – for example, to the RMS roller conveyor system, which is used in the warehouse.



The platforms of the AGV are flexibly adaptable with the MiniTec aluminium profile system.

The AMRs therefore integrate themselves into the processes as a type of flexible conveying technology and form a link between the existing conveying systems. Possible adaptations to changing circumstances can be implemented easily at any time. The installed sensors even enable the robot to independently open doors that it has to overcome on its way to its destination point. That makes use of the AMR even more useful for us.

A summary

It has been shown that AMRs used in combination with fixed conveyor systems offer many advantages for companies and are a very efficient and modern type of conveying technology. Due to the possibility of individual platforms with the MiniTec aluminium profile systems, the MiR robots can be continuously adapted to the circumstances and are therefore extremely flexible. For MiniTec the ideal solution does not consist of conveying technology or the use of AMRs but the well-thought out interaction of both technologies. Internal processes will also be examined in the future and further optimised by the use of AMRs in places where this makes sense.

BREATHING APPARATUS WORKSHOP FOR RAMSTEIN AIR BASE



An increasing number of fire services use the MiniTec modular system to equip buildings and workshops and to fit out vehicles. The options it provides are almost limitless. MiniTec firefighting technology is also in use on the largest American air base outside the USA.

It's like entering the USA: After passing through the registration office you suddenly enter another world – American vehicles, street names in English, American shops, cinemas and a theatre. And yet we are in Germany, around 13 kilometres from the city of Kaiserslautern: Ramstein air base is one of the USA's most important military bases in Europe. The Americans have been stationed in the Western Palatinate region for more than 70 years. The site has an area of around 1,400 hectares, almost 10,000 people work here – the air base is therefore also an important economic factor for the region.

The airfield has developed into the US Air Force's most important hub for freight and troop movements in the world. And it naturally also has its own fire service, which has to meet the highest standards and technical standards. In 2020, it was decided to remodel the existing

main fire station – fire station 1, to erect an additional vehicle depot and to fundamentally modernise the existing breathing protection workshop.

From experience, good

Working with a general contractor responsible for remodelling the fire station and the regional MiniTec sales partner for firefighting technology, W. Schmitt Feuerwehrtechnik GmbH, they quickly found what they were looking for to implement and fit out the new breathing protection workshop at MiniTec. MiniTec has many years of practical experience in the construction of breathing protection workshops and naturally also had the added advantage of the spatial proximity of its main factory in Schöenberg-Kübelberg. Many coordination meetings during the project planning could therefore be held in person at short notice. In particular, it was

the flexibility of the modular profile system, as well as the 3D visualisation that convinced the fire service during the planning phase.

Customised breathing protection workshop

The new breathing protection workshop was divided into different rooms to achieve black and white (contaminated/non-contaminated) separation. After a room with separate building entrance for the delivery of contaminated breathing equipment and the corresponding masks, they are taken into the black

FIREFIGHTING TECHNOLOGY FOR FIRE STATION 1

area for cleaning and disinfection. The equipment is then tested in the white area, repaired if necessary, managed administratively and then placed in storage. Directly next to the white room there is a separate filling

room in which the air cylinders are filled with breathable air for the next deployment.

After a two-year planning and construction phase the date finally arrived on 19 July 2022: The new breathing protection workshop was officially opened and handed over for its intended use. Christoph Stumpf, Fire Chief of fire station 1, was extremely satisfied with the project progress and working with MiniTec: "The planning and execution were implemented to my full satisfaction from the outset. The site meetings were very constructive. Ideas and wishes, down to the smallest detail, were taken into consideration technically and implemented on schedule. Cooperation with all participants was very pleasant."

The quality and functionality are right

Thorsten Müller, breathing equipment manager, is also very impressed with the high degree of practicability of the new facility: "The quality and functionality of the furniture is



Clean design: Cleaning equipment with sink



MiniTec mobile containers are used to store the cylinders for the black area.

absolutely satisfactory. Especially with the flexible trolleys in different sizes, we are able to adapt the workshop to different needs, even in a confined space. The deep drawers also offer an astonishing amount of storage space for the numerous spare parts – and thanks to the organiser inserts and external labelling, you still manage to maintain an overview."

With MiniTec, the people in Ramstein are also well-equipped for the future, says Thorsten Müller: "The good thing about the modular system is that it is possible to respond to changes quickly. If there is an opportunity to make improvements during the ongoing work process, it can either be implemented by us or MiniTec will implement it with directly available supplementary parts."



Breathing equipment manager Thorsten Müller is pleased with the new work environment.

SEMI-AUTOMATIC PACKING SYSTEM FOR BAGS

At a company in the food industry, a system in the packing area was more highly automated with MiniTec. A progress report.



The customer's high quality standards, with renowned international clientèle not only relates to the products themselves, but also to the complete manufacturing process. Against this background, the company wanted to optimise a specific workflow in the packing area and to this end brought MiniTec on board as a project partner.

Initial situation and objective

In a packaging line, the products at the end of the conveyor belt are checked by a check weigher. They then drop into an outer box. The box change and resetting of the counter had to be carried out manually by the line personnel. This process was not reliable due to the necessary intervention of the personnel, which is why additional check weighing had to take place. MiniTec was therefore commissioned to design and implement a case packer, which automates this process and should ensure correct counting.

Case packer for more reliability

In the new system, the empty outer boxes are first provided on the supply section on the left side. From here they are transported automatically to the filling position. There the finished goods are held back in a feed hopper during the box change. The feed hopper then opens so that the products drop into the box. To ensure uniform filling, the box can be gradually moved on after a predefined number of items. If it is full it is moved to the removal position on the right-hand side of the system, where there is a work platform for turning and sealing of the boxes by employees.

The ergonomics were also considered – the outer boxes are stored on a ball belt so that the personnel can turn the box as they wish. There is also a small shelf area for working and packaging materials.

Suitable for different products

In the design of the system, MiniTec paid attention to the required flexibility, because the packed products have a different size, colour and quality and different size boxes are also used. Regarding the throughput, a system performance of up to 80 bags per minute must be ensured. Depending on the size of the outer box, the timing and the step transport had to be automated via the stored program parameters.

In addition, MiniTec took care of high process reliability: The bag formats had to be transferred fault-free and without losses. To make sure that the replenishment with empty boxes on the supply section is uninterrupted, MiniTec integrated level monitoring, which ensures refilling of boxes in good time via signalling, or rather switches off the machine before there is a lack of boxes at the filling station. This can be stopped via an interface with the upstream machine. At the same time, sensors signal that a box is correctly positioned in the station ready for filling. In the event of missing or faulty boxes provided,

an acoustic signal and visual message is issued and the machine is switched off.

Trust, but verify

To make sure that the boxes always contained the exact required quantity of products, after they have been counted on falling into the hopper, a cross-check takes place at a weight monitoring station. If the weight is incorrect, a visual message is also displayed here and transport of the box to the packing point is stopped. The whole system is controlled by a central unit. Operation of the system is designed to meet ergonomic criteria – this also applies to the tooling up operations.

Productivity and process quality significantly improved

Now that the case packer has been in use for several months, the significant advantages of the new system are already evident. Incorrectly filled boxes are almost completely a thing of the past and if they do occur they are immediately identified automatically.



An ascending conveyor (top left) transports the products to a chute, via which they get into boxes.

According to the customer, the workflows are now considerably more reliable and error-free, at the same time, the automation ensures speedier, interruption-free filling and therefore higher productivity – mission accomplished with MiniTec.



The conveyor belt serves as a storage section for the empty outer boxes ...



... the filled boxes are transported away on the roller conveyor. Finally, the packed quantity in the boxes is checked again by a check weigher.



THE ART OF SIMPLICITY – MORE THAN A SLOGAN

“Everything should be made as simple as possible, but not simpler!” This postulation of Albert Einstein is the guiding principle for all activities of MiniTec. The first principle of our corporate philosophy is therefore: “The Art of Simplicity”. This is the motto for all products and solutions. The objectives are to minimise machining operations, avoid unnecessary product variety, achieve the greatest possible flexibility and optimum economic efficiency.

Reducing to what is essential is an art that requires intensive examination of the object. In many areas, simplification is demanded but is only rarely achieved. For example, many legislative texts or regulations are worded in such a complicated way that they are no longer understandable. What is simple for the experts is mostly complicated and often incomprehensible for the user. The same also applies to systems that make procurement, stock holding and error-free application difficult due to a confusing variety of products. To achieve simple solutions, the designers must examine the customer's applications intensively. The objective of simplification is always customer benefits and customer satisfaction.

Reducing product diversity

All MiniTec products and solutions follow these requirements meticulously and are strictly designed in line with the modular principle. The profile system and the linear system are complementary systems that, with a few components, have unlimited possible uses. One result of the strict adherence to the modularity principle is a reduction in the variety of products. This also reduces expensive stock holding combined with complex planning and scheduling and many possibilities for errors.

Simple design

“Simplicity” is already realised in the design of the basic profiles. The result is a small number of profiles that covers the whole range of applications. The uniform design of the profile grooves has reduced the

number of screws required to connect all profiles of the 45 and 30 series to one size – M8.

REDUCING TO WHAT IS ESSENTIAL

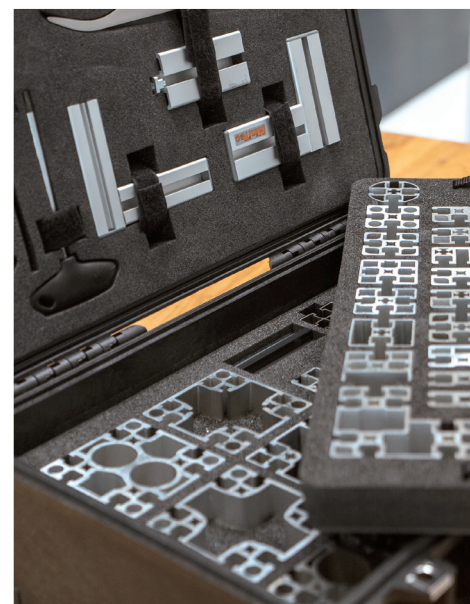
The depth of the profile grooves is also a result of the methodical search for the simplest solution. If the groove depth is too small, long screws touch the bottom of the groove, screws that are too short do not work or do not have the required thread engagement length. In this case, reliable screw fastening for the different components requires very fine gradation of the screw lengths, which requires extensive stock holding. MiniTec profiles make do with a few screw lengths to DIN standards.

Another example of the endeavour to achieve the simplest solution is the design of the external profile radii. Larger radii can have advantages with regard to the look or feel of the individual profile bars. However,

when combined with other profiles, disturbing gaps result. Sharp-edged profiles do not have this problem, but they are susceptible to damage during machining and assembly. They also require special attachment components, which unnecessarily increases the variety of products. MiniTec profiles avoid the disadvantages of both extremes through the uniform fixing of the external profile radii to 2.5 mm. Gap-free designs can therefore be achieved without special profiles or components.

Simple assembly

A classic example of brilliant simplicity is the MiniTec power-lock fastener. Consisting of only two parts, they can be used to connect all profiles with high loading capacities. Stock holding is no longer a problem, errors when selecting the right connector are excluded. Machining the profiles combined with time-consuming in-house transport is no longer required at all. The assembly also benefits, the assembler needs only two tools



The purpose of the MiniTec modular system is to reduce the number of products.

and possibly a handheld screwdriver. And: The connections are adjustable, subsequently required adaptations are therefore very easy. The connections are even ESD-compatible.

Applications with high visual standards occasionally require mitred connections. Depending on the mitre angle, the distance of the connection hole from the cut face must be determined using complicated calculations. It is difficult to measure the determined dimension precisely, however, the exact distance is absolutely necessary for a reliable connection. MiniTec has developed and patented two mitre gauges for this, one for connection – and one for butt joints. Even mitred joints can be made reliably and easily with them.

Simple design

At the same time as developing the hardware, MiniTec also developed the iCAD-Assembler design software. MiniTec was thus exemplary for a whole industry. The free planning software simplifies the interactive assembly of components.



Precise fitting: All components are matched with each other.



Ingeniously simple – the MiniTec power-lock fastener.



iCAD Assembler simplifies the interactive assembly of components

The system-neutral 3D planning tool for design, work preparation and assembly connects the components via predefined insertion points to form the complete construction. The integrated plausibility check prevents errors and is in line with our striving for “simplicity”.

The autonomous CAD tool has a comprehensive component library and interfaces with all established CAD systems.

MiniTec has developed an appropriate app for determining the deflection of profiles depending on the load, cross-section, length and fixing method. With only two inputs, the designer receives reliable data for their development. It couldn't be easier.

Simple processes

Striving for simplicity does not end with the development of products. Numerous customers trust our expertise in complete, end-to-end solutions. We have all the expertise needed for the electrics, software, control and visualisation in-house. This therefore removes the need for complicated interfaces.

SIMPLIFICATION FOR CUSTOMER BENEFITS AND CUSTOMER SATISFACTION

The internal processes are also developed according to the “simplicity” principle and are continuously optimised. All areas are digitally linked. Apart from optimum cost-efficiency, the objectives also include simple tracking and documentation of products and solutions. We can even provide customer-specific catalogues, which only contain the relevant data for the user, to make procurement even simpler for our customers.

Simple summary

There are numerous other examples of uncomplicated solutions in our portfolio: From modular linear systems to ingeniously simple inventions in our conveying technology through to intuitively programmable assistance systems. For reasons of simplification, only a few examples are given here. “Simplicity” is simply the standard at MiniTec. And less is often more.



A simple solution for high-quality designs.

WITH THE VAN ON THE LOFOTEN ARCHIPELAGO



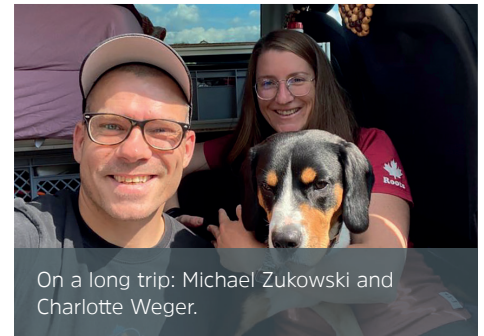
Three months of preparation and then off we go to the Lofoten archipelago with our self-converted van – that was the plan of two campers in the spring of 2022. The group of islands to the north of the polar circle in Norway had been a dream travel destination of theirs for years. With the help of a vehicle fitout of MiniTec they were able to realise this dream.

The van, an extra-long Vito, was very quickly found. The plan of the enthusiastic campers, Charlotte Weger and Michael Zukowski, was to use the van permanently as a second vehicle so that an additional camping vehicle did not have to stand around mainly unused. Once gutted, the fitout planning could begin: A comfortable bed was the greatest wish of the two after diverse camping trips on camping mats and broken air beds. And the fitout material had to be lightweight. This keeps the fuel costs lower, which are even higher in Norway than in Germany. The contact with MiniTec came about through a friend and the pair was immediately impressed: A lightweight, super stable aluminium frame, which can be precisely adapted to the interior – what could be better?

So the tight schedule for the fitout was therefore also no longer a problem. Following an individual consultation, the ready-made frame arrived by post. It only had to be assembled, screw the slatted frame onto it and then install everything. Ready.

Heading north

Perfect – at the beginning of July they left behind the heat of the German summer and headed in the direction of cool Scandinavia. 3000 kilometres to the north, three and a half weeks' time and the whole "home on wheels" with them. From the first fjord, Norway had already enthralled them with the unbelievable beauty of water as smooth as glass surrounded by steep green mountains and hillsides.



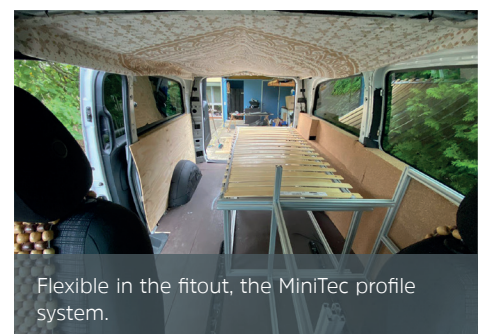
On a long trip: Michael Zukowski and Charlotte Weger.

At the top, one glacier after the other. It was simply breathtaking. They spent a night directly on the shores of a fjord, another in the national park and then directly on the sea shore. The most comfortable camping bed in the world always with them.

Every ramble on the Lofoten archipelago was a highlight. After only a short climb the campers were rewarded with the most magnificent views. It was a wonderful first trip with the self-fitted out van: "We look forward to many more. Next year we're going directly back to Norway", they have already decided.



The wonderful landscape of Scandinavia.



Flexible in the fitout, the MiniTec profile system.

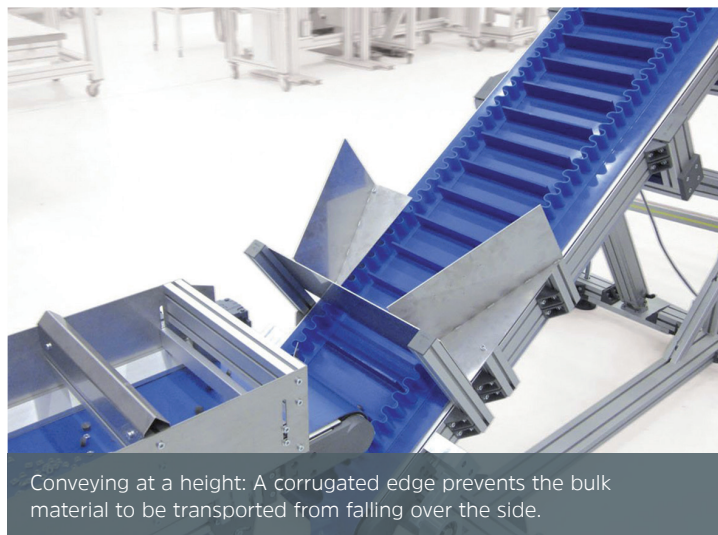
MINITEC CONVEYOR BELTS: SIMPLY FROM A TO B

Conveyor belts are a relatively simple and inexpensive transport solution. MiniTec offers a wide range of components with which such designs can be built to individual requirements.

When it comes to bringing workpieces to the right place at the right time so that they can be machined, assembled or mounted, MiniTec is a competent partner. We offer a comprehensive range of conveyor technology, with which we meet practically all material flow, materials handling and intralogistics requirements.

Conveyor belts are certainly the simplest and cheapest option here. Nevertheless, or precisely for this reason, they are often at the centre of factory automation. They link machines or machining stations or function as a buffer. Conveyor belts therefore reduce unproductive interruptions and ensure smooth and reliable material flow.

Conveyor belts tend to be suitable for lightweight products and workpieces, because then the friction between the belt and the intermediate plate is not too large. There are also certain limits with regard to the width and centre-to-centre distances.



Conveying at a height: A corrugated edge prevents the bulk material to be transported from falling over the side.



Angled conveyors are used to overcome rises.

The right conveyor belt for every task

MiniTec offers all kinds of different solutions for conveyor belts. Apart from the new mini conveyor belts introduced in the Connect 2/2022, the company has had a wide range of "classic" belt conveyors for many years. They include simple designs with a smooth PVC belt as well as angled conveyors, with which – as the name says – the transport section is angled (kinked) once or twice to overcome rises (also called "ascending conveyors"). Another variant, which is also used in combination with angled conveyors, are cleated belt conveyors. In these the transport lane is divided into multiple segments by cleats or webs. There are also folding conveyors.

Different series depending on the intended purpose

MiniTec offers conveyor belts in two different series. In series 45, the basic construction is based on a 45 x 45 profile, while in series 90 a 45 x 90 profile is used.

From the different basic components and depending on the drive, various limit values result regarding the length and width of the conveyor belt, the diameter of the take-up and drive pulleys as well as the loading capacity in terms of weight.

MiniTec conveyor belts	Series 45	Series 90
Belt width	100 – 800 mm	100 – 1200 mm
Belt length	500 – 6000 mm	800 – 6000 mm
Drum diameter	50 mm	95 mm
Nose-over Diameter	16 mm	16 mm
Maximum total load	up to approx. 70 kg (depending on speed)	up to approx. 180 kg (depending on speed)
Drives	Slip-on motor Flange motor Centre drive Drum motor on request	Slip-on motor Flange-mounted motor Drum motor on request

The different series enable different designs.

Modular system provides flexibility

Regardless of whether Series 45 or Series 90: Due to the modular design and perfectly matched components, you can put together your transport solution completely according to your requirements. Choose from extensive accessories including take-up and drive pulleys, pulley bearings, side guides, different belt types, motors and other components. Different drive variants or alternatives for fixing are available to choose from.

The simplest is the slip-on motor that is located on the drive pulley at the head end. If this is not possible for space or other reasons, drum motors, drive boxes with chain or timing belt or even a centre drive can be implemented. Otherwise, belt conveyors should generally be equipped with a pulling drive.

A wide range of pulleys is also available to choose from. A nose-over is recommended, for example, at the crossover between two conveyor belts, because it makes the “gap” between the two belts relatively small.

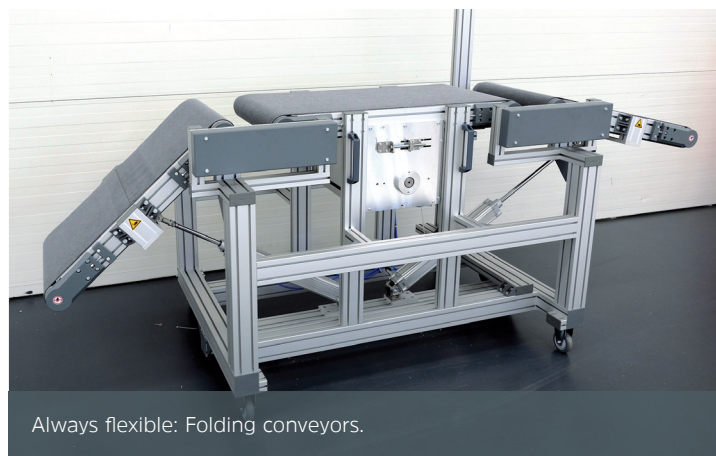
Task-specific conveyor belts

The suitable conveyor belt must be chosen depending on the transport requirements that exist. In addition to different colours, the material (PVC, PU) and the haptic quality (smooth or with “grip”) are particularly important

here. For example, nonwoven belts exist for particularly sensitive goods to be transported. Diverse special versions are also available. If rises have to be overcome, say, then belts with welded on studs are used. If bulk material is to be transported and there is a risk of it falling off at the side, belts with corrugated edges are recommended.

The suitable substructure

For the substructure, a choice can be made between a standard structure or a height-adjustable one (manual or motor driven). The latter is recommended not only to protect the health of employees, but they can also make sense if the use conditions of the conveyor change every now and again. Other variants are also possible, for example, a mobile base.



Always flexible: Folding conveyors.

Configurator for the required conveyor belt

You can use the MiniTec catalogue and the MiniTec website of course to put together your conveyor belt tailored to your requirements. This task is even more convenient if you use the configurator. This is available to you in the free iCAD-Assembler design tool as well as online on the MiniTec website. As a result, you receive a precise design drawing, including parts list, as the basis of your enquiry and your order. Thanks to the components that have been tried and tested in practice, the assembly is equally quick and easy. We can also build your conveyor belt for you to your wishes, in-house in our factory. We produce precise-fitting and tailor-made applications for your transport tasks in the shortest possible time!



COMMITTED TO SUSTAINABILITY

Sustainability has always been a topic firmly anchored in the corporate culture of MiniTec. This has now been underpinned by our voluntary participation and publication in the German sustainability code (Deutscher Nachhaltigkeitskodex, DNK).

What is meant by sustainability?

Sustainability is a development "that meets the needs of the present without compromising the ability of future generations to meet their own needs and to choose their own lifestyle."

(World Commission on Environment and Development – Brundland Report 1987). Three major topics are considered: The environment, economy and social matters.

Sustainable Development Goals (SDG)

On 1st January 2016, the United Nations (UN) proposed 17 targets for sustainable development, so-called sustainable development goals (SDG), in order to meet worldwide sustainable development on an economic, social and environmental level.

The DNK supports the setting up of a sustainability strategy and offers an entry into sustainability reporting. Regular reporting makes the company's development over

time visible. To meet the DNK criteria, users create a declaration with twenty DNK criteria and the supplementary non-financial performance indicators, selected from the Global Reporting Initiative (GRI) and the European Federation of Financial Analysts Societies (EFFAS), in a database.

This provides orientation on how to implement the CSR reporting obligation as well as the national "Business and Human Rights" action plan practically and also offers the option of reporting for the EU taxonomy. The office of the German Sustainability Code checks the DNK declarations for formal completeness and also provides qualified feedback on improvement potential.

CSR directive implementation act (CSR-RUG)

CSR stands for "Corporate Sustainability Reporting Directive" and obliges companies to provide information about their social and environmental footprint. In April 2021, to this end, the EU published its proposal for a revision of the Non-Financial Reporting Directive (NFRD), which has been applied in Germany to date in the form of the CSR Directive Implementation Act (CSR-RUG).

In future, the CSRD will expand the sustainability reporting and places sustainability on the same level as financial reporting. Data and facts are made understandable and comparable through clearly defined criteria and indicators.

This creates more transparency and makes sustainability reports easier to assess.

MINITEC REPORTS ACCORDING TO THE GERMAN SUSTAINABILITY CODE (DEUTSCHER NACHHALTIGKEITSKODEX DNK)

At the same time, it becomes clear how the actions of companies affects people, the environment and climate, as well as the influence that these aspects in turn have on the companies.

Companies must show how they are reducing their CO₂ emissions step by step, organising the changeover to the circular economy, contribute to the protection and restoration of biodiversity and ecosystems and to equal opportunities and respect for human rights. All stakeholders and interested groups are therefore

better informed on sustainability aspects. The Directive is due to apply throughout Europe from the report year 2025 for the financial year 2024.

Transparency from the outset

The DNK declaration can be used as a non-financial declaration to meet the CSR report obligation and offers practical orientation with regard to the content requirements and the process of creating non-financial declarations or rather reports.

The financial year 2021 report on the sustainable development of Minitec GmbH & Co KG can be examined publicly in a database on www.deutscher-nachhaltigkeitskodex.de. Until now, only around 800 companies have published a report. Minitec is therefore one of the first companies to report according to the DNK.



Deutscher
NACHHALTIGKEITS
Kodex

VINE-GROWING WITH PROFILE

Aluminium profiles can be used very versatilely. However, it is mainly applications in industry that are based on them. Yet there are also other – very surprising – areas of use, such as vine-growing.

Row by row, a pretty sight. Anyone who wanders through wine-growing areas enjoys the vines, which mostly grow in outstanding, beautiful places.

Anyone who takes a closer look will find that the vines grow along tautened wires. They are stretched between vine stakes. These are generally made of wood or galvanised steel. It is in the winegrower's interest for this construction to last as long as possible. After all, some vineyards are managed over decades.

Yet in practice their durability is significantly limited, because conventional vine stakes are often damaged by machine work in the vineyard. Vine stakes made of steel are produced with diverse zinc coating thicknesses, however, deformations are the rule due to the open shape of the stakes. They are also hardly torsionally stiff. This is very unfavourable, as they must withstand a large tensile force for the bracing. Another problem is that vines and grapes grow in the open cross-section of the stake.

The traditional wooden stakes are also often damaged by weathering and mechanical contact by wine-growing machines.

This caused the hobby vintner Andreas Bansemir in the Western Palatinate region to think. He is still a young newcomer to vine-growing but learned his trade on a vineyard on the German wine route.

There he did tying work and worked with the conventional wine-growing equipment for creating wire systems and diverse solutions for vine stakes and hook solutions. He also got to know their disadvantages. This led to the alternative, the WPS AB Flex vine stake system.

Rethought vine stake

The rethought vine stake made of a different material to wood or galvanised steel should enable the wires to be positioned with little effort and therefore to adjust them to the respective degree of growth of the vines, it should also be durable, lightweight, stable, slender, elegant and economical.

The MiniTec aluminium profile system offered a solution for this. The 30 x 30 profile is used as the basic element, and it was extended with hooks including square nuts. These allow the wires to be pulled in with millimetre precision and the wire heights to be adjusted. Variants are also available for the end of row stake, to remove the need for the otherwise necessary anchors and anchor wire. As with the industrial applications, the profiles can easily be cut to the required length (and can also be mitred) and screwed together with the power-lock fastener. They are absolutely weather resistant, do not deform and can be used repeatedly elsewhere. A solution that is simple and yet clever at the same time.

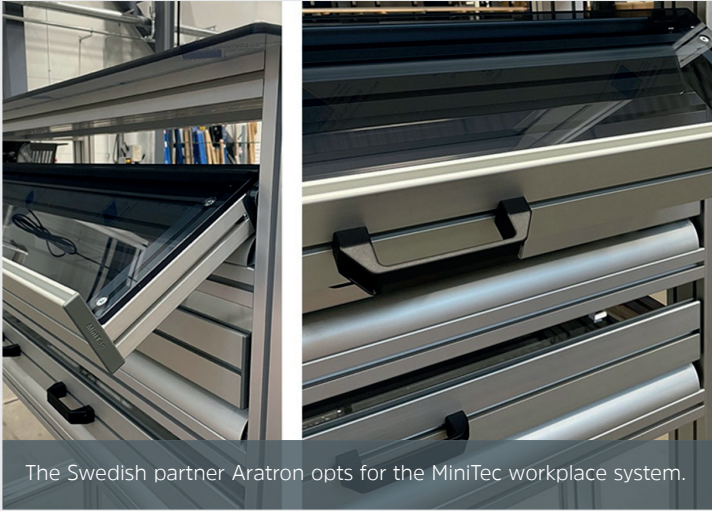


Vintner Andreas Bansemir opts for a vine stake system made of aluminium.



A pilot installation shows the advantages of the solution in practice.

NEWS FROM SWEDEN



The Swedish MiniTec partner Aratron was very active in 2022. The MiniTec portfolio was presented at the Elmia Automation trade fair in Jönköping. The focus was on the profiles and the linear system. As well as a linear gantry (x-y-z) with motors and gear unit. Another exhibit was a machine cage, based on the MiniTec protection system range.

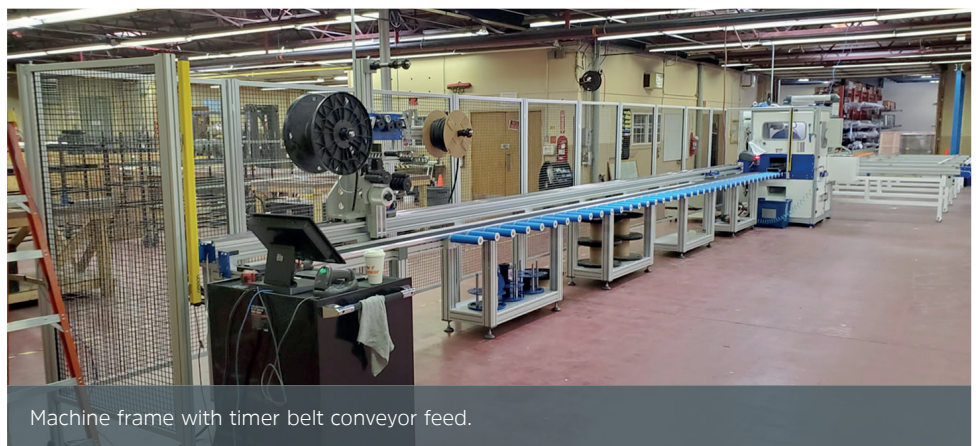
An interesting customer project was also completed: It is a workstation specially designed for a customer. They use the workstation to program electronic boxes, which are in the shelves.

USA: MINITEC FRAMING HAS NEW PROJECTS

The subsidiary MiniTec Framing is based in Farmington (US state of New York), around an hour's drive from Niagara Falls. The modern company building erected in 2018 is state-of-the-art, not only as far as workplace design is concerned but also in its machinery. The range of services of MiniTec Framing includes the design and installation of customised solutions for workplace design, machine guards, conveying technology and linear technology. A major project was completed in 2022. It included components for the new door and profile machining centre of the American DeMichele Group. Within the project, among other things, machine frames, inlet timing belt conveyors, inlet sliding arms, discharge and internal linear systems were created.



Machining centre with ball roller feed and discharge.



Machine frame with timer belt conveyor feed.

THREE WEEKS AT MINITEC ESPAÑA



Luca Luisa Siegfried with her Spanish colleague Alberto Campos at MiniTec España.

MiniTec is global. Subsidiaries and partner companies work for customers around the globe. It is important for the medium-sized company that a good exchange takes place not only on a technical level but also between the employees in the individual countries. The trainee Luca Luisa Siegfried from the German headquarters spent three weeks at MiniTec España and gained many experiences there. A report from her point of view.

The trend of employers not only looking at an applicant's grades but also placing increasing importance in their soft skills has long since been clear. In my view it is therefore always worthwhile to work constantly on improving these skills for the benefit of my career opportunities as well as for my continued personal development.

The fact that MiniTec also has a location in Spain was an ideal way for me to improve my Spanish and to see how well I can find my way around and integrate, alone in a

foreign country and in an unknown workplace. In fact, this wish was quickly realised after a short talk with my trainer. At the beginning of October I then flew to Spain for three weeks to work at MiniTec España in Madrid.

Women in skilled trades

The friendly atmosphere was noticeable from the outset and with only 40 employees I was quickly able to get to know everyone. One thing that is unfortunately still a rarity in Germany is even more unusual

in Spain: Women in skilled trades. However, this did not cause me any disadvantages, I was received with open arms, strengthened by the fact that the Spanish are culturally very warm-hearted anyway. Unlike the assumptions of many, the work is not so relaxed and interrupted by a two-hour lunch break. We started at eight and had a half-hour lunch break at 13:00 and went home at around four-thirty.

Conveyor systems in Spanish

The language barrier was not as bad as I initially feared, so that I quickly got to know the different conveyor systems in which this location has specialised.

The FMS (flexible conveyor system), RMS (roller conveyor system) and UMS (pallet circulation system) conveyor systems are also occasionally assembled at the Schönenberg-Kübelberg location in Germany, but only for weights up to 100 kg.

The team in Madrid realises significantly larger and more extensive conveyor systems with bearing loads of several tonnes used, for example, to move aeroplane engines.

Here I was now given the opportunity to get to know these systems from scratch, starting with the assembly of the different drive units, the load-bearing constructions, through to the conveyor units themselves.

Apart from an extended Spanish vocabulary and a love for the Spanish lifestyle, I also returned with an enhanced understanding of technical and mechanical workflow processes.

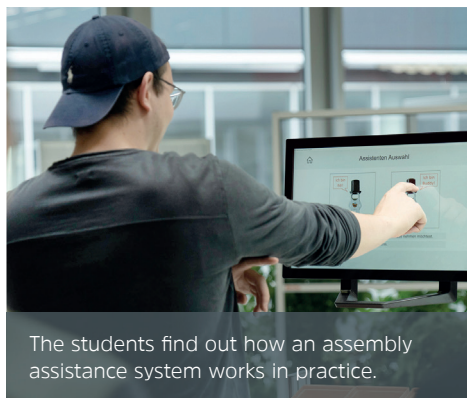
INSIGHTS INTO PRACTICE

MiniTec has been working with the vocational academy, the Akademie der Saarlwirtschaft (ASW) for many years. The high degree of practical relevance of this educational facility is decidedly valuable for our own skilled trainees. Every year, a small delegation of students visits the company headquarters in Schöenberg-Kübelberg.

The Akademie der Saarlwirtschaft (ASW) has been offering courses in business management, mechanical engineering, business information systems and business administration and engineering since 1991. The three-year bachelor (BA) degree course is characterised by its “dual” (sandwich course) concept with alternating theoretical and practical phases. For the students, the practical periods are an integral part of their course.

**“INFORMATIVE,
BUT ALSO VERY
FRIENDLY AND
PLEASANT”**

MiniTec has been working with the ASW for many years. After a two-year break caused by the coronavirus, a visit was once again scheduled: More than 20 mechanical engineering students visited MiniTec for a tour. After a short talk about the company,



The students find out how an assembly assistance system works in practice.



MiniTec Managing Director Sandra Geyer-Altenkirch explains the company's range of products and services to the student during a guided tour of the company.

the visitors were guided through the works in several groups and were therefore able to find out about the different areas of work “live”. At the end, a presentation on MiniTec SmartAssist gave further insights into the possibilities opened up by the new worker assistance system.

Out of the lecture theatre and into the companies

The summary of Jens Kihm, lecturer in work science at the ASW, was definitely positive: “The visit was once again a complete success. Extremely informative, but also very friendly and pleasant. The students were all thoroughly impressed. I personally was and am also impressed. Definitely an absolute enrichment for the “work science” lecture – not least

in the context of ergonomics and work or rather workplace design.” For Kihm, himself an ASW graduate in mechanical engineering, it was his first live visit to MiniTec, since taking over the lecture from his longstanding predecessor, Fred Homberg. A renewed visit has already been decided for the coming year!

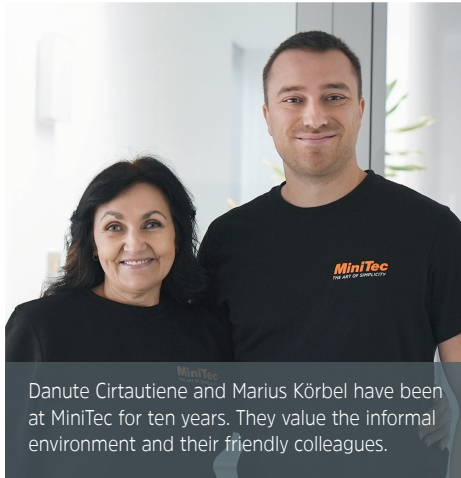


Benjamin Renno (l), head of sales provides insights into the conveying technology department.

LONG-SERVICE EMPLOYEES AT MINITEC



Timo Ringeisen has worked in the quality management department for 15 years. He looks forward to many more years.



Danute Cirtautiene and Marius Körbel have been at MiniTec for ten years. They value the informal environment and their friendly colleagues.



Sandra Wamprecht, head of department in purchasing, has been at MiniTec for 30 years.

In this quarter we are celebrating their long-service anniversaries with the following employees:

30 years: Sandra Wamprecht (purchasing)

15 years: Timo Ringeisen (quality management)

10 years: Marius Körbel (dispatch), Danute Cirtautiene (preassembly)

5 years: Marisa Brill (management accounting), Ingo Rosenthal (assembly), Norman Schehlmann (assembly), Nicole Rupp (warehouse)

We thank our employees for their many years of support and congratulate those celebrating their employment anniversaries.

Sandra Wamprecht, head of department in purchasing, has already been at MiniTec for 30 years:

I am glad to be part of an innovative, steadily growing family-run business. The team work with great colleagues still gives me pleasure, even after 30 years."

FIT & FAIR FOR THE ENVIRONMENT



Francesco Spies opted for the JobRad.

Good for nature and health: MiniTec employees can now also opt for a JobRad – and thereby protect the environment and their wallets. JobRad is an attractive concept in which the employee leases their personally favoured bicycle through

the company and can use it as they wish – whether to get to and from work or for leisure. Thanks to the benefit in kind and tax benefit, they save up to 40 percent compared to a conventional purchase. Several employees are already making use of the offer – including Francesco Spies: "I had actually thought about cycling to work instead of driving for a long time. Eleven kilometres can also be travelled on two wheels." However, without an e-bike his trip to work would be difficult, as steep gradients and forest paths have to be overcome, which is why he used

a small scooter until now. An e-bike was too expensive for him before. "On the same day that I received the information on JobRad at MiniTec, I went to a bike shop nearby, selected my e-mountain bike and since then have only cycled to work – unless I have to buy something large en route." The scheme has two advantages for him: He is doing something for the environment, saving money and has also lost a few pounds as a side effect. JobRad, an offer that is met with a great deal of interest.



IMPRINT

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Now with assistance: **MiniTec assembly workstations**

Studies have shown time and again how important ergonomics is in the workplace: employees are less likely to fall ill, and at the same time their motivation and satisfaction increase. An ergonomically optimized working environment demonstrably ensures higher performance, efficiency and processing quality.

That's why MiniTec's assembly workstation systems feature extensive options for ergonomic adaptation. These include topics such as height adjustment,

lighting, sound insulation, gripping space optimization, tool provision, logistics and material provision. And of course MiniTec SmartAssist with the helpers Edi and Buddy: Our new assistance system supports your employees interactively during assembly with the help of texts, graphics, photos or videos and thus guides them safely through the process.

**When will you discover
the art of simplicity?**



More information can be found at:
www.minitec.de/en/loesungen/montagesysteme

