



# 'mo

COVER STORY:

## INTEGRATION WITH SUBSTANCE

FROM CONCEPT TO IMPLEMENTATION

- MOVING TO THE IIOT WITH NEXOFOX

MAGAZINE OF **MOTOR TECHNOLOGY**

MORE THAN MOTORS

# CONTENT

TRADE SHOW ATTENDANCE	
2023 .....	4
EDITORIAL	
Uwe Lorenz – Managing Director Dunkermotoren GmbH .....	6
NEWS	
Our Catalogues - Dunkermotoren, MAE & EGS Automation .....	7
Website re-design for improved user experience .....	8
New features in the Dunkermotoren online Configurator and Shop .....	8
HeDu day of training collaboration between Hectronic & Dunkermotoren .....	9
Dunkermotoren and Siemens develop new trade show prototype together .....	10
Connecting Ethernet into EtherCAT network with EoE .....	11
Trade show review - Spring 2022 .....	12
The Lifestyle & Cleaning segment .....	13
NEXOFOX	
Dunkermotoren has its eye on digitalization with the nexofox brand - an interview with KEM Konstruktion magazine .....	16
The digital twin in the eyes of nexofox .....	20
Service catalog- software & support from motor configuration to the cloud .....	22
Dunkermotoren launches nexofox MotionCode .....	24
Easy condition monitoring with Smart Diagnostics from nexofox .....	25
The nexofox BGE 5510 dPro makes every motor a smart motor .....	26
nexofox - part of an open ecosystem .....	27
The GEBHARDT Intralogistics Group and Dunkermotoren win the "Implementation Award 2022" - a press release of the Open Industry 4.0 Alliance .....	30
FACTS & FIGURES .....	32

# CONTENT

INSIGHTS	
Sustainability - our drive is the preservation of our ecosystem .....	33
Only the best for our customers - Improved order processing methods at Dunkermotoren .....	35
ENGINEERING	
Interview: Application Engineering - a new department at Dunkermotoren .....	37
NEW MEMBER OF THE DUNKER FAMILY: EGS AUTOMATION	
Interview with Robert Eby, Managing Director EGS Automation .....	39
Cost-effective automation in the metal and plastics industry .....	42
Smart Robotics .....	44
EGS Automation releases new program of SUMO automation systems .....	46
Highly automated production of several million connectors .....	46
LOCATIONS	
Donaueschingen – Source of the Danube and home of our subsidiary EGS Automation .....	50
PRODUCTS	
A new label for all housings - easy to read and now with QR code .....	52
BG 75 joins the dPro family .....	52
Strong, stronger, BG 95x120 dPro .....	53
Some of the Tricks other Manufacturers use .....	54
Dunkermotoren presents a stock program for stepper motors .....	56
Stepper motors with attached controller .....	56
MAE presents the high-speed BL 89 SI AC motor .....	57
A new blower series for more efficiency .....	57
IMPRINT .....	59



# TRADE SHOWS

## TRADE SHOW ATTENDANCE 2023

<b>MD&amp;M WEST</b>	
Anaheim, USA .....	07.02. – 09.02.2023
<b>ALL ABOUT AUTOMATION</b>	
Friedrichshafen, Germany .....	07.03. – 08.03.2023
<b>SMART FACTORY &amp; AUTOMATION WORLD</b>	
Seoul, Korea .....	08.03. – 10.03.2023
<b>HMI</b>	
Hanover, Germany .....	17.04. – 21.04.2023
<b>LOGIMAT</b>	
Stuttgart, Germany .....	25.04. – 27.04.2023
<b>AGRISHOW</b>	
Ribeirão Preto – São Paulo, Brazil .....	01.05. – 05.05.2023
<b>ROBOTIC SUMMIT</b>	
Boston, USA .....	10.05. – 11.05.2023
<b>AUTOMATE</b>	
Detroit, USA .....	22.05. – 25.05.2023
<b>SPS ITALIA</b>	
Parma, Italy .....	23.05. – 25.05.2023
<b>SMART AUTOMATION</b>	
Linz, Österreich .....	23.05. – 25.05.2023
<b>AGRITECHNICA</b>	
Hanover, Germany .....	12.11. – 18.11.2023
<b>SPS NUREMBERG</b>	
Nuremberg, Germany .....	14.11. – 16.11.2023



# EDITORIAL

Dear readers,

we proudly present you a new issue of our drive technology magazine "mo". For the sixth year in a row, this magazine offers you an insight into the biggest highlights and product innovations

This issue offers much more than just a look into the world of Dunkermotoren. Our sister company MAE, with whom we work with side-by-side and share development ideas from many departments, also has many updates to share. This year, we are also devoting special attention to our subsidiary EGS Automation in Donaueschingen, which has been part of Dunkermotoren since its acquisition in March 2021. We look forward to introducing you to their history and products.

After the launch of nexofox in October 2021, we would like to give you a proper introduction to the services of our IIoT brand and the many benefits this service provides. You'll receive a preview of how to take your automation processes into the future with the Industrial Internet of Things.

Prepare yourself for some interesting articles; perhaps a SUMO automation system from EGS will soon help you with product handling or a nexofox digital twin will be used to reduce downtime of essential equipment. I hope you enjoy reading this issue.

Your Uwe Lorenz,  
Managing Director Dunkermotoren GmbH



# NEWS

## OUR CATALOGUES - DUNKERMOTOREN, MAE & EGS AUTOMATION

### DUNKERMOTOREN MAIN CATALOGUE

The Dunkermotoren main catalogue provides a clear overview of our entire product portfolio. Simply structured and presented with all important specification data, you will find all relevant information for your drive solution and the selection of a new drive combination.

Order your personal Dunkermotoren catalogue in print easily on our website or send an e-mail with the desired number of catalogues to [sales.dunkermotoren@ametec.com](mailto:sales.dunkermotoren@ametec.com)

GO TO THE CATALOGUE:



### MAE MAIN CATALOGUE

Are you familiar with the product portfolio of our sister company MAE?

In addition to a wide range of universal or brushless blowers, the stepper motors and other AC and DC motor versions perfectly complement the Dunkermotoren product portfolio. The products can be combined with our gearboxes, encoders, and brakes via the innovative modular system.

GO TO THE CATALOGUE:



### SUMO AUTOMATION SYSTEMS FROM EGS

EGS Automation, the robot specialist out of Donaueschingen, has been part of Dunkermotoren since March 2021. In addition to their standardized SUMO automation systems, the EGS product portfolio also include individual turnkey solutions for automating manufacturing and machining processes as well as entire process chains in the plastics and metal industries. These are well designed, field-tested, and customized machines that can be used in a variety of applications in almost any industry. By replacing pneumatic cylinders with more efficient Dunkermotoren motors, energy savings of up to 70% can also be realized.

GO TO THE CATALOGUE:



## WEBSITE RE-DESIGN FOR IMPROVED USER EXPERIENCE

At Dunkermotoren, it's not just our products that are being optimized to provide customers with the perfect solution. After an initial facelift in 2020, the company website has now been completely redesigned and updated. The new layout provides users with a more intuitive and faster navigation to access the information they need.

The content has also been updated for this re-design. The industry pages, for example, now provide an up-to-date overview of the wide range of applications that can be easily automated with Dunkermotoren solutions. In addition, the new website clearly highlights how our subsidiary EGS Automation, our sister company MAE, and the own nexofox brand contribute to the Dunkermotoren product and service portfolio.



## NEW FEATURES IN THE DUNKERMOTOREN ON- LINE CONFIGURATOR AND SHOP

Since 2019, the Online Configurator has been used millions of times and has established itself as a valuable support tool for customers and prospective customers to configure complete drive solutions. Thanks to the integrated shop functionality, it offers customers with an existing login the opportunity to view their order history, check current prices and real-time availability, and order the required drive components directly.

The configurator is constantly being further developed. This year, the following features have been updated:

### » Product range expanded to include stepper motors from MAE

Since 2022, numerous stepper motors from our sister company MAE can also be configured in the online shop and be combined with Dunkermotoren gears, brakes and encoders.

Motor	
<input type="checkbox"/>	DC Brusstype
<input type="checkbox"/>	DC Brushless
<input type="checkbox"/>	Smart DC Brushless
<input type="checkbox"/>	AC Dreh- / Wechselstrom
<input checked="" type="checkbox"/>	Schrittmotoren
<input type="checkbox"/>	DC Brushless für MICRO-DRIVE
<input type="checkbox"/>	AC Jalousiemotoren

Motor Baureihe	
ST	
ST 17X14	
ST 17X16	
ST 17X20	
ST 34X37	

## NEWS

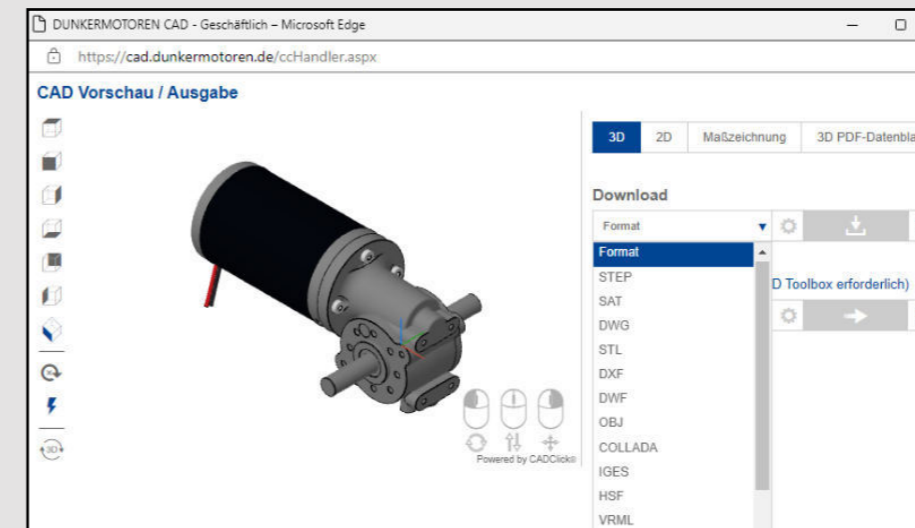
### » Indication of IP protection class in drive specification

After configuring the desired parameters, the available IP protection classes of the selected components and complete drive solution is now indicated next to the specifications.

Produktdetails	
<b>Antrieb</b>	
Nenn Drehzahl	233 1/min
Nenn Drehmoment	3.89 Nm
Maximales Moment durch Getriebe begrenzt	41.31 Nm
Anhaltenmoment	41.31 Nm
Drehmomentkonstante	0.78 Nm/A
Steigung der Drehzahl-Drehmoment Kennlinie	1.683 × 10 <sup>2</sup> Nm/rpm
Ausgangswelle Durchmesser	12 mm
Ausgangswelle Länge	25 mm
UL Kennzeichnung	Nein
CE Kennzeichnung	Nein
Schutzart exkl. Abtriebsseite	IP50
Gewicht	2.42 kg

### » Extended availability of 3D models and 2D drawings

After several updates, 3D models and 2D drawings for about 143,000 drive combinations can now be generated directly in the configurator and downloaded in many desired file formats.



TRY OUR CONFIGURATOR:  
<https://www.dunkermotoren.com/en/configuration/>



## HEDU DAY OF TRAINING COLLABORATION WITH HECTRONIC & DUNKER- MOTOREN

Cooperation between Hectronic and Dunkermotoren enables collaborative educational activities for trainees of both companies for more than 10 years now and carries out joint projects and events as a team - for example the annual HeDu training day.

This training day was held once again on May 5th, 2022, after a two year break due to COVID-19. It offered insight into a wide variety of professions for around 600 young professionals and students. In addition to the two organizing companies, various schools, universities and numerous other companies and employers from the area surrounding Bonndorf were represented to give prospective graduates an idea of their potential future professions. Dunkermotoren's subsidiary EGS Automation, located in Donaueschingen, was also present for the first time this year and offered an overview in the field of industrial automation and robotics.

Learn more about the HeDu training collaboration on our Instagram channel.



## DUNKERMOTOREN AND SIEMENS DEVELOP NEW TRADE SHOW PROTOTYPE TOGETHER

Dunkermotoren has been a product partner of Siemens for the SIMATIC MICRO-DRIVE systems for many years. Recently, Dunkermotoren have been working closer with Siemens to develop PROFINET, the manufacturer independent Industrial Ethernet interface technology, even further. Thus, it made sense to join forces and demonstrate our developments together with a joint trade show prototype model.

The model demonstrates the synchronous operation of 4 axes moving a symbolized measuring tip with constant distance over a rotationally and linearly

movable plastic profile. This is made possible with two BG 66 **dPro** PN motors for the measuring tip and two BG 75 **dPro** PN motors for the moving plastic profile. The **dPro** PN motors integrate certified PROFINET interfaces and support the PROFIdrive drive profile in application classes 1 and 4. Thus, a wide range of devices can be used seamlessly via the TIA Portal.

Another special feature of the trade show model is the combination of a physical model with a virtual image. With the help of the SIMIT and NX MCD simulation software, it was possible to build the model 100% remotely from the home office, starting with the initial concept design and moving on to programming and virtual commissioning. Thanks to the digital test phase, it was possible to build the physical model and program the controller without any issues. The virtual image can be controlled on a

separate computer as an identical simulation of the real model, thus replicating effects on the real model. As far as the controller is concerned, there is no difference between the digital and real-life models.

The model had its Premiere at LogiMAT 2022 and was the highlight of the Dunkermotoren booth. Assure yourself of the strong partnership between Dunkermotoren and Siemens.

Check out the video:



## NEWS CONNECTING ETHERNET INTO ETHERCAT NETWORK WITH EOE

Industrial Ethernet has become an indispensable part of automation. In addition to PROFINET and Ethernet/IP, Dunkermotoren also supports the Industrial Ethernet protocol EtherCAT. The advantages of EtherCAT include increased speed, reduced data traffic, and precise data due to distributed clocks. As an added bonus, EtherCAT also comes with comparably lower hardware costs. With EtherCAT, you have an excellent real-time Ethernet for controlling BG(E) **dPro** EC motors. Compared to other Ethernet-based bus systems, an EtherCAT master optimizes communication specifically for the topology of the network. New devices, such as a PC for adapting motor controls or analyzing motor data, can thus not be introduced easily into an existing network.

This is where EoE comes in:

With EoE (Ethernet over EtherCAT), an Ethernet network can be connected to an EtherCAT network. The master can then "tunnel" the Ethernet protocol over the EtherCAT protocol. This means that the Ethernet protocol is packaged into the EtherCAT protocol and sent from the EtherCAT network to a specific Ethernet node via a switch port.

The advantages of EoE are that the real-time capability of the EtherCAT network is not violated and the data traffic remains collision-free and

# Ethernet over

# EtherCAT®



fully duplex. Furthermore, certain devices can be addressed directly via their respective MAC address. This gives the customer the possibility to implement internet technologies such as a web server in his EtherCAT network.

For Dunkermotoren in detail, this means that a motor from Dunkermotoren can be accessed via Drive Assistant 5 without violating the existing topology with the defined master. This enables the customer to perform condition monitoring, analyze the motor or make remote adjustments. EoE makes all IIoT features conceivable in an EtherCAT network. EoE is available for all Dunkermotoren **dPro** motors and external electronics with Industrial Ethernet firmware version 24.01.0 or newer.



# NEWS

## TRADE SHOW REVIEW – SPRING 2022

After a two-year break, this year was finally time for in-person trade shows again!

Like many other exhibitors, we had been anticipating our return for a long time and were eager to see how the fairs would operate in 2022. This is especially true after Agritechnica, the first trade fair of the year, was cancelled – followed by other postponements. Thus, we were the more than pleased when All About Automation in Friedrichshafen opened our 2022 trade show calendar on April 5th.

Other tradeshows were not far behind. The MD&M West show in Anaheim, California also followed in April as well as the Agrishow, which was our first show in Brazil. In May we continued with InterClean in Amsterdam, the Smart Industries show in Paris, the sps Italia in Parma, and the Hannover Fair. The LogiMAT in Stuttgart, which was the first trade show in 2020 cancelled due to the COVID-19 pandemic, as well as the Automate Show in Detroit at the beginning of June were the last two events of our trade fair marathon.

A special highlight was the cooperation with the Open Industry 4.0 Alliance at the Hannover Fair, where our nexofox team represented us personally at their booth. With a presentation of a demonstrator on our own booth, we in turn were able to show what smart implementation means.

Our team really enjoyed welcoming our customers and partners live and in-person at our booth.



## THE LIFESTYLE & CLEANING SEGMENT

MAE has been providing compact and powerful drive solutions for the cleaning market for many years. From the brush in walk-behind or ride-on scrubber-driers to the suction for industrial wet and dry vacuum cleaners or the fan for air cleaners or hand dryers, MAE offers efficient solutions made in Europe. Thanks to the close cooperation with Dunkermotoren, the hub gears previously used for AGVs in the intralogistics segment can also be used for cleaning robots.

MAE's years of experience in the cleaning market and Dunkermotoren's expertise in robotics can now also revolutionize the cleaning market with smart applications. For example, Cleanfix Reinigungs-systeme AG, in cooperation with Dunkermotoren, was able to realize a smart scrubber-dryer robot that cleans large areas completely autonomously.



Find out more about the RA660 Navi cleaning robot on our website.

# SEGMENTS – LIFESTYLE AND CLEANING

## FLOOR SCRUBBER/ SCRUBBER DRYERS

Scrubber dryers are used wherever large to very large areas require fast, thorough and hygienic cleaning.

Robust and efficient MAE blowers offer solutions for various designs such as walk-behind and ride-on units or autonomously driving machines for the suction function. For the cleaning brushes Dunkermotoren offers efficient motor solutions.

The state-of-the-art drives from Dunkermotoren are used as traction drive, possible also in combination with a hub gear.

## WET AND DRY VACUUM CLEANERS

For wet and dry vacuum cleaners, MAE offers a wide range of blower motors for superior suction power and low energy consumption.

## HAND DRYERS

For modern hand dryers, the compact MAE blowers are excellent.

## KITCHEN EQUIPMENT

MAE motors are particularly valued for their reliability and powerful performance in a small space, in modern commercial kitchen equipment such as mixers, coffee grinders and in the catering industry.



CANopen

EtherCAT

EtherNet/IP

PIV

PROFIT

## OUR VALUE PROPOSITION:

- Customized solutions
- Robust design and long life-time
- High-efficient Thru-Flow or ByPass blowers in AC and DC, based on universal motors or brushless motors
- Best-in-class energy efficiency system according to the new ecodesign directive
- Compact brushless and brushed motors and hub gears for smallest installation space
- Innovative, energy-efficient DC concepts (IE 5) for battery applications

nexofix®

## VACUUM CLEANER

In vacuum cleaners for commercial cleaning and residential use, the efficient and quiet MAE blowers and motors have proven themselves in the most diverse vacuum cleaner technologies. Vacuum cleaner nozzles with MAE technology offer the highest cleaning power.

## WHIRLPOOL

Pure relax in the whirlpool thanks to quiet and proven MAE blowers.

## AIR CLEANER

Clean air in production areas is important for employees. With MAE blowers, the air is cleaned reliably.



## DUNKERMOTOREN HAS ITS EYE ON DIGITALIZATION WITH THE NEXOFOX BRAND

AN INTERVIEW WITH KEM KONSTRUKTION MAGAZINE



MOTOR CONTROL AND DATA COLLECTION ARE NOW VERY EASY

Digitalization promises added value for system operators and component manufacturers, especially in conjunction with the Industrial Internet of Things (IIoT). However, to offer services such as predictive maintenance, it should be easy to collect the data also. This is not as easy as it sounds. Dunkermotoren is addressing this issue and now offers with nexofox software solutions that make it very easy to implement drive control and data collection, as Markus Weishaar, Director of IIoT & Services, explains in an interview with KEM Konstruktion.

Interview: Johannes Gillar and Michael Corban, Editor-in-Chief, KEM Konstruktion

KEM Konstruktion: Dunkermotoren bundles its range of solutions for smart motors under the nexofox brand – what is the objective behind this decision?

Markus Weishaar: Digitalization starts now - our customers want to take off. Nexofox offers support

for exactly this area, from motor configuration and programming to field IIoT communication to device cloud and smartphone apps with intelligent solutions and services. Our BLDC motors can be configured, even without programming knowledge, programmed and monitored with the nexofox offering – directly from the desktop. In this way, the user can manage configurations, firmware, and MotionCode very easily without having to be on site. Nevertheless, it is ensured that motors and systems receive the necessary attention, and that all information is available quickly and easily in case that the worst happen.

KEM Konstruktion: Does this make the manufacturer of electric motors interchangeable?

Markus Weishaar: Not in the short term - the drives are still the decisive machine elements. Software and IIoT complement these, for example with remote functionalities and decentralized control topologies. In perspective, however, it is certainly true that the greater progress will be made particularly in this area. This was precisely the reason for us to combine our range of forward-looking software solutions under the nexofox brand and to create an universal solution offering - covering everything from the use and networking of smart motors to the robot and automation systems of our subsidiary EGS Automation.

Digital services facilitate commissioning and operation

KEM Konstruktion: Can the nexofox portfolio also be used for motors from third-party manufacturers?

Markus Weishaar: This is an option - our control electronics can certainly also control other motors. However, the initial goal is to make it easier for our customers to use them - by making it very easy to implement IIoT functionalities via nexofox. With nexofox, we want to offer digital services for our motors and support customers in operating the motor as well as collecting available data and making it available in automated form in higher-level systems.

For example, a service technician can not only see whether the engine is working properly in real-time, but the data made available can also be used to set up digital services. One of the most interesting topics here is certainly predictive maintenance, but with nexofox we are also laying the foundations for applications that go well beyond this. There are no limits to the variety of ideas that can be developed - but no one must worry about how to read the digital data from the motor, because we can make them available in a comprehensible way. This allows our electric motors to be integrated into digital tools and support targeted interaction with machines in the sense of Industry 4.0.

Control programming becomes easier - especially in distributed systems

KEM Konstruktion: With nexofox, you are targeting both control programming and aspects of the IIoT - does the IIoT topic dominate?

Markus Weishaar: For us, both topics are equally important, and both belong together. In addition to the IIoT, we also see great short-term opportunities in control technology and the question of how "simple" drive control can be implemented, especially in distributed systems. However, great synergies

can be achieved when combining both topics.

KEM Konstruktion: Can you give an example to make this tangible?

Markus Weishaar: Yes – just think of smaller machines or devices, such as a strapping machine. These usually have 4 to 5 axes, which can already be completely programmed on our motors, each axis separately or as a network. This no longer requires a higher-level control system. However, you can still dial in via a laptop and diagnose the machine. All of this can also be easily transferred to AGVs, for example, or to machines and systems with limited complexity in general. Regarding the control architectures, we are completely flexible - for example, everything can be programmed on the motor, so that the PLC can be omitted. Things get interesting when distributed systems, in accordance to IEC 61499, run MotionCode over several linked motors or where EDGE software is also part of the control system - and can thus map the process logic. The topic of safety is also covered - we can already offer Safe Torque Off (STO) today, and in the future Safe Speed and other features will be added.

If you then add the topic of IIoT and imagine a service case for an AGV, for example, it is sufficient for the service technician to scan the QR code on the motor and he receives all the information about the drive system from the cloud on his mobile device. The scenario can then be extended as desired in the direction of predictive maintenance.



OPENNESS IS OUR GOAL

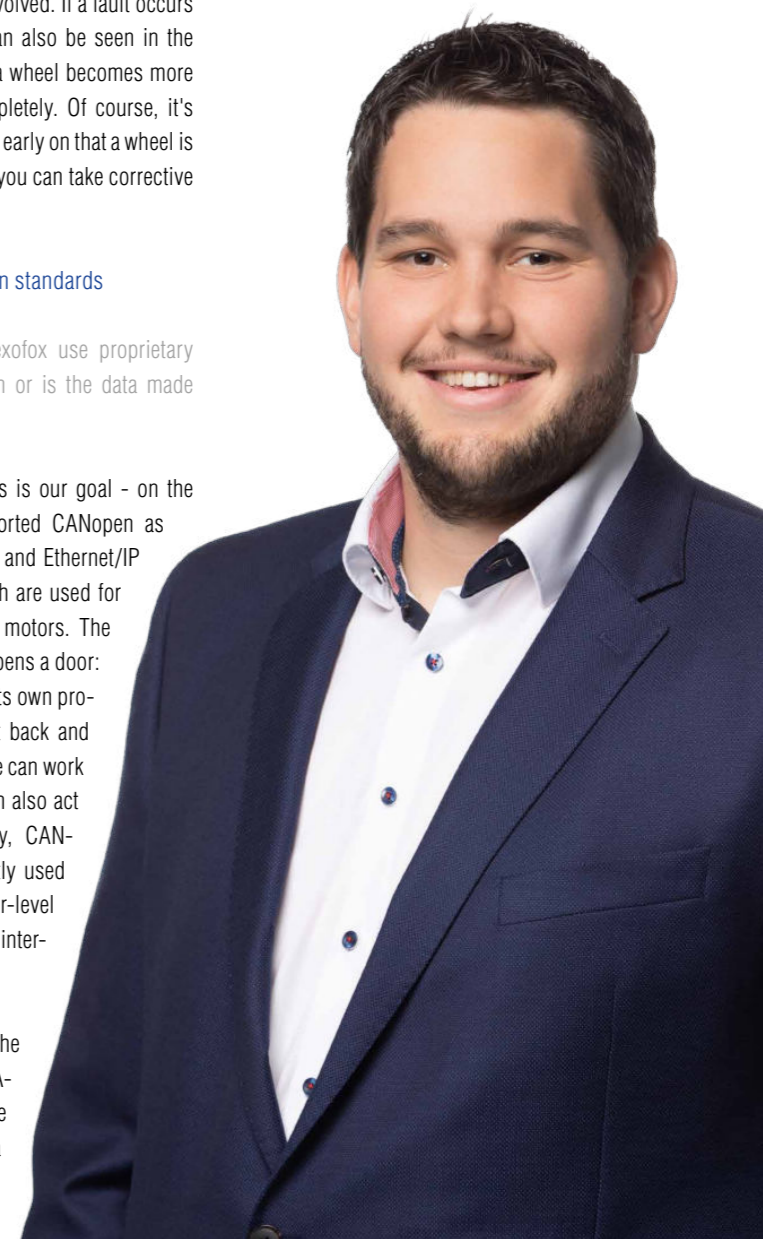
Here, we are not predominantly concerned about the electric motor, as our brushless motors are maintenance-free. However, each motor is part of a drive unit, and in many cases a gearbox and other mechanical components are also involved. If a fault occurs anywhere in the unit, this can also be seen in the motor data - for example, if a wheel becomes more sluggish or even stops completely. Of course, it's helpful to be able to recognize early on that a wheel is becoming more sluggish, so you can take corrective action before it fails.

Communication prefers open standards

KEM Konstruktion: Does nexofox use proprietary interfaces for communication or is the data made available in open formats?

Markus Weishaar: Openness is our goal - on the control side, we have supported CANopen as well as PROFINET, EtherCAT and Ethernet/IP for a long time already, which are used for communication between the motors. The MotionCode on the motors opens a door: Either it is given each motor its own program or commands are sent back and forth between them where one can work as a master, or all motors can also act as equal partners. Currently, CANopen or PROFINET are mostly used for communication to higher-level process logic, but the other interfaces are also used here.

In the IIoT area, we fetch the data from our motors via CANopen and PROFINET. The collected data is then read via



# NEXOFOX

a software adapter on EDGE and made available in MQTT format. Here we make sure that everything is OI4-compliant according to the specifications of the Open Industry 4.0 Alliance and thus all integration options are open. The customer can then collect the information via the OI4 MQTT bus or we can add our cloud adapter on top to transfer everything to the cloud. Here, we also deliberately rely on the Asset Administration Shell (AAS) and thus, once again, quite clearly on open standards. We are not the navel of the world - but our engines should be very easy to integrate into various ecosystems via the nexofox solutions.

### Getting more out of sensor data

KEM Konstruktion: You mentioned that disturbances in the driveline - such as a sluggish wheel - also show up in the engine data. How much sensor technology does that ultimately require, and which ones do you use?

Markus Weishaar: Specifically, we can record the phase currents as well as speeds, positions, position deviations or even the temperature. Likewise, the error registers can be read out. As you can see, there is already a range of data available. We are also in the process of carrying out tests with the recording of vibrations to be able to draw conclusions about the drive train by means of analytics. With an understanding of physics and mathematics - or machine learning, AI, and data science - a lot of information can be extracted. Incidentally, this is also one of the reasons why we are very active in terms of openness in the direction of various ecosystems - whether it is MindSphere World, the IDTA, or the Open Industry 4.0 Alliance, which we joined at the end of 2019. Only if all participants of these ecosystems speak the same language, will the need for complex integration be avoided, and opportunities of digitization be explored further. That's why cross-manufacturer collaboration is also emerging more and more.

KEM Konstruktion: Does this mean that the digital twin is also gaining in importance?

Markus Weishaar: Yes, because it allows users to store the basic drive data as a digital twin in such a way that it can be retrieved and used for further tasks. Specifically, for example, information on the CO<sub>2</sub> footprint, which is then included into the figures for the whole machine. This can include values configured during the manufacturing of the motor as well as those from operation. Making such data easily available is becoming increasingly important.

### Security is mandatory

KEM Konstruktion: How does nexofox deal with the issue of IT security?

Markus Weishaar: You can't offer software solutions today without taking IT security into account - IT security is mandatory for us. We already take this into account when developing our solutions and use common security mechanisms - for example, to detect anomalies. In addition, our EDGE software also offers appropriate access protection, and we are planning to be certified in accordance with IEC 27001.

KEM Konstruktion: In parallel to the drives from Dunkermotoren, you are also expanding the nexofox product range addressing robots and systems from EGS Automation - what are the next steps here?

Markus Weishaar: Of course, we are gradually building up know-how that we can also apply to the EGS Automation portfolio. There will be an initial demo by the end of the year, which will show that we can support digitization not only at the individual motor level, but also at the machine and plant level. In the end, however, it is always a question of the specific application, which is why we are currently investigating this together with some EGS pilot customers.

” ONLY IF ALL PARTICIPANTS OF THESE ECOSYSTEMS SPEAK THE SAME LANGUAGE, WILL THE NEED FOR COMPLEX INTEGRATION BE AVOIDED, AND OPPORTUNITIES OF DIGITIZATION BE EXPLORED FURTHER.



# NEXOFOX

## THE DIGITAL TWIN IN THE EYES OF NEXOFOX

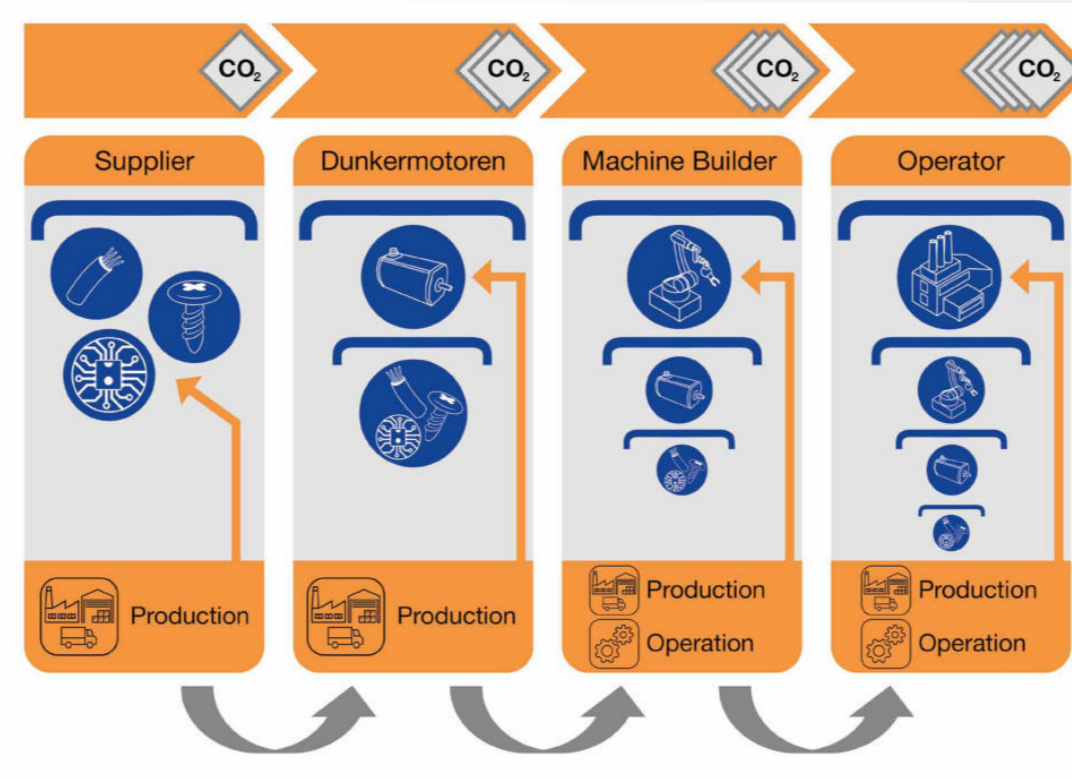
### THE USE OF THE DIGITAL TWIN TO STRENGTHEN SUSTAINABILITY

In the world of Industrial IoT the term digital twin has been gaining popularity for some time. We at Dunkermotoren | nexofox are also working intensively on this topic to offer our customers added value with the availability of our digital twin. In addition, we see an opportunity to use the digital twin to further push the topic of sustainability at Dunkermotoren, which is becoming increasingly important for us.

The term digital twin has become a modern buzzword in recent months. The ongoing presence within marketing activities has led to various views around the idea of the digital twin. Although there is no uniform definition so far, every institution, company, or person should create a unified understanding of the term within their own sphere of influence. We understand the digital twin as an information pool of the respective associated physical motor. For us, the digital twin is not a virtual digital image of a motor that simulates reality, but a universally applicable tool that is characterized by its universal use. We share this view with the Open Industry 4.0 Alliance and the IDTA. The central focus of this association is the Asset Administration Shell (AAS), which we are actively helping to design and develop within the Open Industry 4.0 Alliance. The administration shell enables a wide variety of assets to be integrated directly with each other via models and submodels.

Furthermore, the digital twin enables our customers to access all motor-relevant information via a central structure. This provides our customers with documents, such as the correct assembly instructions, the appropriate software for commissioning, or the Webshop link for ordering spare parts. Another advantage associated with the use of the digital twin is the provision of all relevant documents in one central storage location. The digital information provided will further expand in the future. Thus, production information such as materials used, live information during operation, or information regarding an optimized use of the motor could be provided.

In principle, however, there is almost no limit. Due to the possibility of completely integrating different management shells into each other, the central access location does not change, even with different components. Within our digital twin, further nexofox digital services, such as the diagnostic tool, can be integrated. The more promising added value that comes with our understanding of the digital twin is the creation of significantly higher transparency. This transparency can be achieved, for example, by providing data such as the amount of CO<sub>2</sub> emitted during manufacturing, or the origin of the materials used within our motors. Based on this data, we can support our customers on the path toward complete documentation of their end products - key words: supply chain law and full material declaration. Minimizing the use of resources and raw materials, thereby minimizing the impact on our environment, is our goal. Under the umbrella of sustainability, we want to support our customers in this important task. With our digital twin, we want to contribu-



te to an optimized and resource-saving use of our highly efficient motor solutions. The data required for sustainable and environmentally friendly motor operation will be made available to our customers easily and quickly through the AAS setup. With the nexofox brand, Dunkermotoren is working to monitor the CO<sub>2</sub> footprint of the respective motors within the digital twin. For this reason, data on the material origin is also digitally disclosed and made available in addition to the CO<sub>2</sub> collected from the manufacturing process.

For us, the information just described represents only a part of the relevant data on the topic of sus-

amount of energy without sacrificing performance. These recommendations are then made available to our customers. However, it is up to the customer to decide whether to use such an optimization. A possible expansion stage could be that these fine adjustments are carried out by the software automatically and dependent on the current load on the motor. By combining the digital twin, motors from Dunkermotoren and additional nexofox services, we can offer our customers an even better complete package that goes far beyond the actual motor technology. One of the greatest side effects is the more efficient use of existing resources, thereby reducing the burden on our environment.

We are convinced that our customers, like ourselves, will be even more concerned with sustainability in the future. One indication of this is the new CSRD (Corporate Sustainability Reporting Directive), which will become mandatory for large companies regardless of their legal status beginning in fiscal year 2023. By integrating the sustainability features in our digital twin, we will be able to support our customers in preparing their sustainability report. The information required for this will be easy to access and can be retrieved any time. Together with the Asset Administration Shell of the Open Industry 4.0 Alliance, we are paving the way for transparent and sustainable use of our smart motors in your individual automation application.

tainability. Further information, such as the power consumption of an individual motor during use or the cumulative value over an entire fleet, is also part of a holistic sustainability approach. This basic level of data collection can be extended at any time upon customer request with additional software services from nexofox. Providing suggestions for optimizing the current motor operation is another development we will work on in the future. These optimizations will be based on the actual usage data and work towards ensuring a more sustainable and resource-saving operation of our motors. Intelligent algorithms will be used to determine, for example, which motor setting consumes the smallest possible



### Trainings

#### » MotionCode Programming for Beginners

Learn to use our programming interface and the available options offered by MotionCode. This one-day program will show you the basics and allow you to create your own MotionCodes. (max. 5 participants)

#### » Motor Design and Selection for Machine Builders

Learn how our drive solutions work with your products and applications all in one day. At the end of this course, you will be able to independently dimension and select your drive components from our broad product portfolio. (max. 5 participants)

#### » Configuration of Smart Motors - Working with Drive Assistant

This one-day session will teach you how to use our Drive Assistant software and use it effectively to configure and analyze our motors in the field. You will understand all the possibilities this tool offers. (max. 5 participants)

### Support

#### » Phone Support

- » Feel free to contact our helpful support team with any questions you may have about connecting, operating, or programming our drive solutions.
- » The first 90 minutes are included for each support case; further support is charged based on additional time required (150€/h). We are also happy to offer you individualized hourly support packages starting at 5 hours.

#### » On-site support - for commissioning and fault analysis

We are happy to support you on site with the commissioning and fault analysis of our motors. We can provide you with individual offers best suited for your situation.

#### » Service contracts

If you don't want to request assistance for individual cases, we can also offer prioritized support packages for all your service needs. Mutually, we can develop a customized service contract with flat hourly rates and defined response times.

### Parameterization & Programming

#### » Plug & Play - configured controllers delivered to you

- » We would be happy to configure and ship out individual drives according to your specifications and individualized controls.
- » Our experts can work with you to determine the most suitable controller settings for your application and deliver the drives ex works with pre-determined values.

#### » MotionCode-Programming - nexofox

- » Save time, costs, and installation space in your application with MotionCode. We would be happy to support you with programming the software directly to our motors.
- » We can provide you with a customized offer suitable for your project size.

### IIoT » nexofox

#### » IIoT Workshop

We are here to support you in the mutual development of solutions for your path to the Industrial Internet of Things.

#### » EDGE-Programming

» We would be happy to develop customized dock-based EDGE software for you. This tool will connect our smart motors to your cloud-based solution or enable deeper analyses of motor data locally

#### » Condition Monitoring

» We can provide you with the necessary technology and service to monitor the condition of your drives locally and remotely. Gain valuable data for further analysis.

#### » You need an individual offer suitable for your requirements?

**Contact our team from nexofox.**

#### » Predictive Maintenance & Motor as a Service

Do you already have tomorrow's topics in mind? We do - and that is why we are already advising you on these topics today.

# NEXOFOX

## SERVICE CATALOG - SOFTWARE & SUPPORT FROM MOTOR CONFIGURATION TO THE CLOUD

Dunkermotoren launches nexofox MotionCode

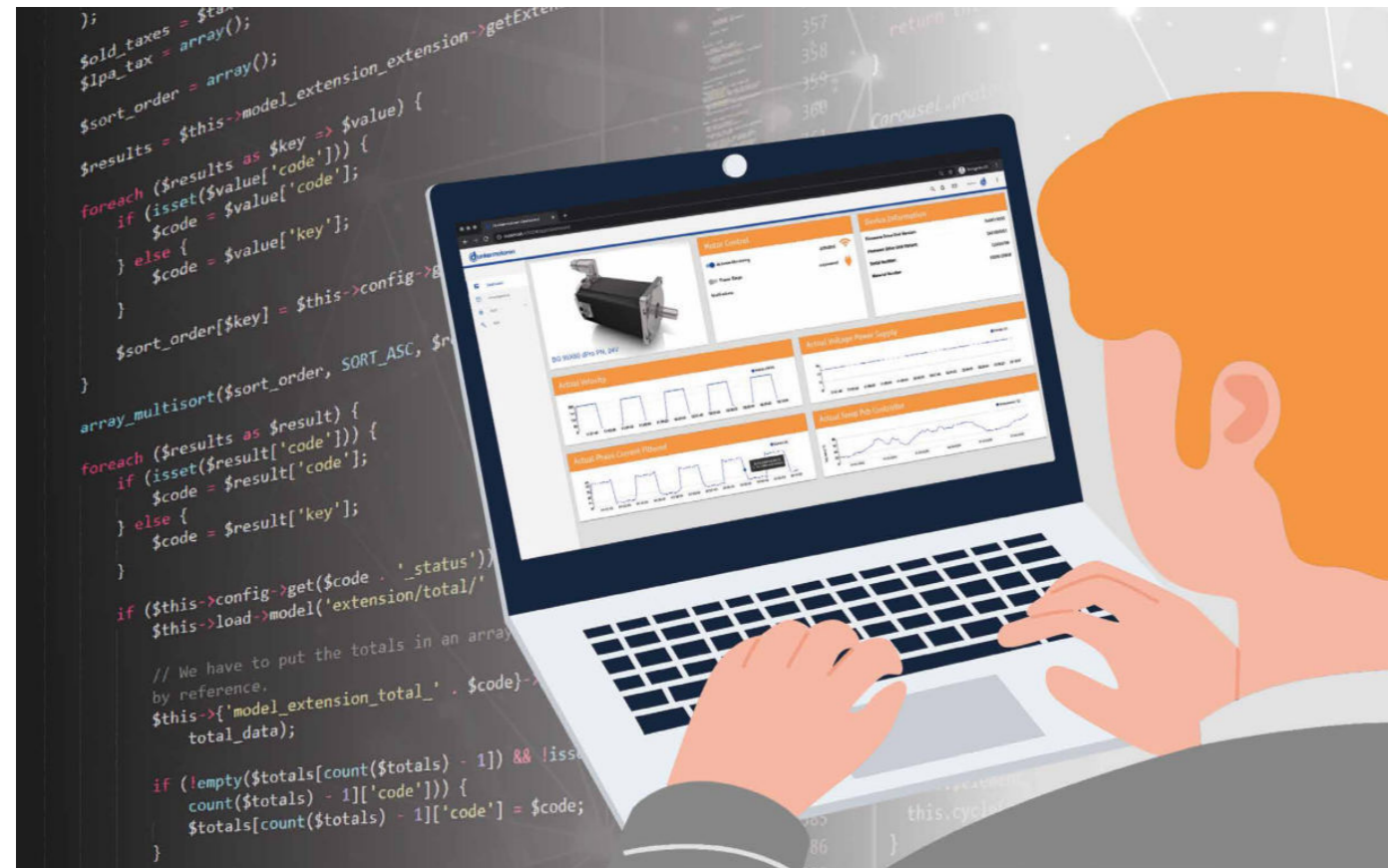
The ongoing development in digitalization offers automation technologies with a wide range of new possibilities and approaches for the realization of automating processes. The keywords are decentrali-

zation, modularity, and flexibility. Dunkermotoren, a pioneer and world market leader of integrated smart BLDC motors, has now released the final version of the nexofox MotionCode, the perfect tool to make new automation solutions a reality.

MotionCode is designed to be decentralized from the ground up. Each motor can be programmed with its own individual MotionCode, if required. The drives are easily programmed in C using our Eclipse based development environment. This can be downloaded for free directly from our homepage. MotionCode gets the necessary flexibility from its open interface, which can be used to connect

several motors to form a module, or to exchange information with other automation components such as an HMI or the Drive Assistant 5.

There are no more limits to your creativity – from individual, independently operating motors to completely decentralized software architectures. Get started and download the MotionCode environment from our homepage. You don't have much programming experience yet? No problem! Dunkermotoren | nexofox will be happy to assist you as a competent service provider and implement your applications in MotionCode for you.



Smart Diagnostic Starter Package	Smart Diagnostic S	Smart Diagnostic M	Smart Diagnostic L	Smart Diagnostic Enterprise
<ul style="list-style-type: none"> <li>» 2 connected motors</li> <li>» Including 2 motors for rent</li> <li>» EDGE Gateway on request</li> <li>» Unlimited data for 3-month trial</li> </ul>	<ul style="list-style-type: none"> <li>» Up to 50 connected motors</li> <li>» 150 MB high frequency data</li> <li>» EDGE Gateway on request</li> <li>» Yearly subscription</li> </ul>	<ul style="list-style-type: none"> <li>» Up to 100 connected motors</li> <li>» 250 MB high frequency data</li> <li>» EDGE Gateway on request</li> <li>» Yearly subscription</li> </ul>	<ul style="list-style-type: none"> <li>» Up to 500 connected motors</li> <li>» 750 MB high frequency data</li> <li>» EDGE Gateway on request</li> <li>» Yearly subscription</li> </ul>	<ul style="list-style-type: none"> <li>» <b>Contact</b> our sales team to get an <b>individual offer</b> for your individual Smart Diagnostic Package</li> </ul>

## EASY CONDITION MONITORING WITH SMART DIAGNOSTICS FROM NEXOFOX

With MotionCode, nexofox successfully entered the IIoT market in early 2022. In addition to the development of a wide variety of individual MotionCode for specific customer requirements, several projects have already been successfully implemented with lead customers. Within these projects, important IIoT cornerstones were implemented, such as end-to-end connectivity from the engine to the cloud via EDGE, a secure onboarding of assets, or user management.

In Q3 2022, nexofox's first completely cloud-based product was launched. With the release of SmartDiagnostics, customers of the core Dunkermotoren brand will for the first time be able to request the status of connected motors completely remotely, without much effort and from anywhere. The most important parameters and current operating intervals will be visualized and easily read on screen. Thanks to condition monitoring based on fault registers, the transparency of motor operation will also be significantly increased. All that is needed to use SmartDiagnostics is a Dunkermotoren motor solution and a functioning Internet connection.

Dunkermotoren customers can look forward to the timely continuous development of this service. By the 4th quarter, the first enhancements of SmartDiagnostics are expected to be activated.

In addition to the features listed above, Dunkermotoren and nexofox customers will benefit from further advantages. All nexofox software products are developed according to the AAS approach and the Industrial Digital Twin Association (IDTA). This means they meet the requirements of the Open Industry 4.0 Alliance and give customers the ability to easily integrate nexofox's software products into their own or an existing IIoT ecosystem. In addition to the ease of integration, it eliminates the requirement for motor-specific IIoT expertise (e.g., on building connectivity or analyzing motor data). Instead, machine builders can focus entirely on providing their own customers with a universal IIoT solution. By using SmartDiagnostics, nexofox offers optimal conditions for improving the economic and environmental efficiency of your application.

In addition, a wide range of SmartDiagnostics modules are already available today. You can choose between a starter package or different versions of standard packages to build tailor-made customized solution.



# NEXOFOX

## THE NEXOFOX BGE 5510 **dPro** MAKES EVERY MOTOR A SMART MOTOR

Under the nexofox umbrella, the BGE 5510 **dPro** external electronics can be used for all motors no matter the manufacturer. The nexofox electronics supports all common communication interfaces including CANOpen, PROFINET, EtherCAT, and Ethernet/IP as well as safety functions like STO.

Furthermore, all nexofox features can be used for any type and brand of BLDC and DC motors, thus turning any motor into a smart motor. Standard nexofox features include **MotionCode** as a free programming tool and IIoT functionalities such as cloud-based condition monitoring with **SmartDiagnostics**. This allows extensive applications to be implemented directly on the controllers themselves. One example is **ZeroPLC**, where the name says it all - the entire application is implemented directly on the BGE 5510 **dPro** with **MotionCode**, which reduces bus traffic and, in some applications, makes a separate PLC redundant – thus, **ZeroPLC** often also means zero cost.

A look into the near future promises even more - both on the software and hardware side. In the software department, extensions for **SmartDiagnostics** are already set to be released, such as the interaction between controller and Smartphone App or even a remote oscilloscope. The expansion

of the **MotionCode** development environment to include more and more new features, which will make programming even easier, is also being driven forward steadily. In terms of hardware, the BGE 5560 **dPro** with a power range of up to 60 A continuous current, as well as suitable module solutions for both controllers have already been announced and are scheduled to be launched as early as 2023. This way, an even broader power and application spectrum can be covered in the future.

In addition to pure hardware and software, nexofox also provides the necessary support for the commissioning or tuning of all motors on the BGE 5510. More service features include training courses around the parameterization of the controllers and instructions for proper implementation of **MotionCode**.

Think of nexofox the next time you plan to continue your journey into the future of automation technology and see how the BGE 5510 **dPro** can help you reach your goals.



## NEXOFOX - PART OF AN OPEN ECOSYSTEM

Industry 4.0 and the "Industrial Internet of Things" represent the next evolutionary stage of automation. While the third industrial revolution was about automating individual machines - which was still easily solved by individual manufacturers - the current development is about networking and automating complete factories or even global corporations. In contrast to classic automation, this can no longer be achieved by individual manufacturers. For this reason, open cross-manufacturer ecosystems are becoming increasingly important. Dunkermotoren | nexofox recognized this early on and has been developing its IIoT solutions together with strong partners within industrial ecosystems from the very beginning. We hope you are curious to see how Dunkermotoren | nexofox gets involved in the different ecosystems and alliances.

### OI 4

The Open Industry 4.0 Alliance is an open ecosystem of a wide variety of manufacturers that has set its sights on applying existing standards in the field of automation and establishing common approaches to solutions. The spectrum of the alliance ranges from individual component manufacturers to machine and plant builders, integration companies, and large software houses, all of which are pulling together to make the vision of Industry 4.0 a reality. The OI 4

organization sees itself as an implementation alliance and not a standardization body. Dunkermotoren has been a member since 2019 and is active in a wide variety of areas within OI 4. To see a clearer image of the interests of its target markets and work more closely with them, Dunkermotoren | nexofox is participating in the industry-oriented workgroups Intralogistics and Mechanical Engineering, among others. These workgroups are concerned with the elaboration and presentation of various real-life use cases and how these can be realized along the entire value chain. In addition to its participation in the two mentioned workgroups, the drive technology manufacturer is proud to have been able to lead its own workgroup the "Component Supplier" since January 2022. In addition to the industry-oriented workgroups, which develop the requirements for technical implementations, there are various technical workgroups within the OI 4. On the one hand, they can take up the developed requirements and implement them technically and, on the other hand, fill the various layers of the OI 4 real-world architecture. In this area, Dunkermotoren | nexofox is actively involved in the design of the Open Operator Cloud and Open EDGE Computing. More information will follow later.

### OI 4 - Workgroup Components Supplier

This workgroup led by Dunkermotoren | nexofox is specifically concerned with the role of smart components, such as the motors, within an ecosystem. The aim of the group is to develop generally applicable approaches and use cases for the integration

of smart components across the value chain. Among other things, this involves looking for the best design of digital services for easy integration into existing systems or evaluating which developments can deliver the greatest added value. Interesting approaches include reducing the carbon footprint, predictive maintenance, and the digital twin.

### OI 4 - Open EDGE Computing (OEC) Workgroup

This workgroup identifies ways in which assets from different vendors can be connected and interact with each other over EDGE technology. In addition, the group is concerned with building an ecosystem on the EDGE and providing information to various sub-models of the OI4 administration shell, also called AAS (Asset Administration Shell).

### OI 4 - Open Operator Cloud (OOC) Workgroup

In the Open Operator Cloud workgroup, use cases originating from the industry-oriented workgroups (e.g., Components Supplier) are transferred into technical concepts. The implementation is always based on the AAS and made available to members as a reference guideline. In addition to supporting members in entering a new subject area and helping them to adapt use case to their own plants, the reference implementation provides a basic framework for specific implementations. In addition to these technical concepts, work in close collaboration with the above-mentioned OEC workgroup on an end-to-end data provision process is encouraged.



## PART OF AN OPEN ECOSYSTEM

### Administration Shell / Asset Administration Shell (AAS)

The administration shell enables cross-vendor interoperability for non-smart and smart products, thus achieving an end-to-end value chain. On the one hand, the management shell supports mapping of the entire lifecycle of an asset. On the other hand, the administration shell integrates each asset into the Industry 4.0 communication world and makes it uniquely addressable and identifiable within this network.

### IDTA

With increasing maturity, the digital twin is becoming more and more tangible and thus also more crucial for the industry and for Dunkermotoren | nexofox. For this reason, Dunkermotoren has joined the "Industrial Digital Twin Association" this year. The IDTA makes an important contribution to the construction, modeling, and standardization of the digital twin and relies, just like the OI 4, on the administration shell (AAS) defined by the standards of Industry 4.0 and the Fraunhofer Institute. The IDTA thus perfectly complements the work of Dunkermotoren | nexofox in the OI 4. Here, the technological foundations for the construct of the digital twin are set and standardized, so that it can be referenced to them in real-life projects in OI 4. For Dunkermotoren | nexofox, the step towards joining and participating in the IDTA was a logical step to further integrate the AAS in its developments. Dunkermotoren | nexofox now has the opportunity to contribute in the advancement of standardized sub-models for drive systems, for example.

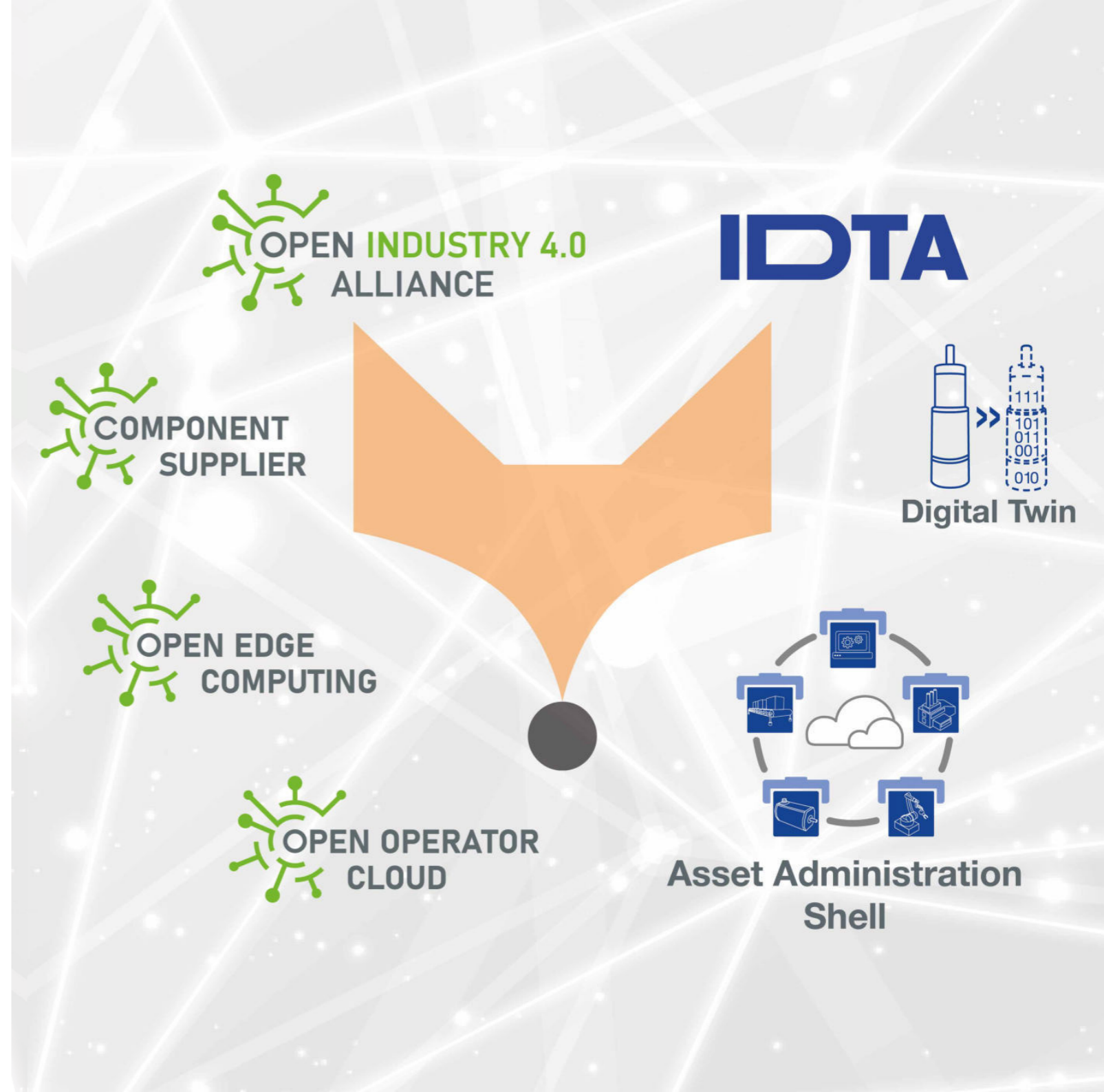
### Digital Twin

The Dunkermotoren | nexofox digital twin is based on the administration shell (AAS) principles and goes far beyond just a pure digital image of a motor. The drive technology specialist sees the digital twin as a universally applicable tool, which is specifically characterized by its manufacturer independence. The advantages for our customers are clear:

- » Standardized interfaces make it very easy to integrate the digital twin into existing ecosystems in addition to the stand-alone solution.
- » Even the most diverse assets can be easily integrated with each other through models and submodels.
- » The central access structure gives customers easy access to motor-relevant information and/or data anytime and anywhere.
- » The possibility to integrate further nexofox services also expands the scope of information and data provided.
- » Sustainable and resource-saving use of Dunkermotoren motors and the materials used through optimizations with the digital twin.

### OI4 - Implementation projects

Within OI4, the first partnership projects have already been realized. Together with GEBHARDT Intralogistics Group, an integration project was implemented at GEBHARDT's main site in Sinsheim according to the alliance's best practices. Learn more in the article on the next page.



# NEXOFOX

## THE GEBHARDT INTRALOGISTICS GROUP AND DUNKERMOTOREN WIN THE "IMPLEMENTATION AWARD 2022"

### A PRESS RELEASE OF THE OPEN INDUSTRY 4.0 ALLIANCE

Aim of the project at GEBHARDT's headquarters in Sinsheim is predictive maintenance and prevention of downtime in warehouse operations

The Open Industry 4.0 Alliance awards the GEBHARDT Intralogistics Group and Dunkermotoren with the "Implementation Award 2022" for an integration project according to the Alliance's best practices at GEBHARDT's headquarters in Sinsheim. This is the second Implementation Award after the Dutch company Duurzaamheidsfabriek won in the 2021 fall season, for their sustainable model factory for the process industry. Once again, the teams set up the architecture in GEBHARDT's fully operational main warehouse in less than three months. However, these projects do not immediately come to an end with receiving the Implementation Award. More partners are joining constantly and establishing, in this case, an intralogistics platform that puts standard-compliant best practices for Industry 4.0 to work. The beneficiaries of such projects are companies that can now join the alliance and adopt a standardized and field-tested off-the-shelf-solution.

High-readiness warehouses are one of the key elements in Industry 4.0. The critical components are units that operate the warehouse in an automated way. This project was set up jointly by GEBHARDT and Dunkermotoren, and initially intended to check the condition of Dunkermotoren components in GEBHARDT shuttles and enable early intervention in case of anomalies.

"Our panel was very impressed by the fast implementation in GEBHARDT Intralogistic's live warehouse," explains Ekrem Yigitdöl, Managing Director of the Open Industry 4.0 Alliance. "This is not just a show case or a pilot application. Moreover, the implementation is comprehensive with many collaborating partners and across multiple layers, which we call OI4 Process Houses. For example, standardized practices were implemented in the Asset Onboarding, Condition Monitoring, Process Twin, Product Twin, Enterprise Logistic and Cross Enterprise Process Houses. With this, we as an Alliance are once again demonstrating that we can implement standards in a practical and market-oriented way."

#### Implementation of the Asset Administration Shell

"This project allowed us to take on the role of our end users and, with the alliance architecture, establish an even more general level of abstraction than our own Galileo IoT® platform," says Yannick Maier, Product Manager Digital Products and Services at GEBHARDT Intralogistics Group. "We were concerned with an alliance-compliant integration according to the Asset Administration Shell which specifically defines Digital Twins. Our various shut-

tles in the warehouse are integrated physically and - via their digital twins virtually - into the overarching cloud architecture of the alliance. The goal is predictive maintenance and avoidance of downtime in warehouse operations."

"At Dunkermotoren, as a Tier 2 supplier and member of the alliance, we focused on the alliance architecture from the very beginning," explains Markus Weishaar, Director IIoT & Services at Dunkermotoren. "At the Hannover fair, we showed an example of how we can access one of our motors in the GEBHARDT shuttles live in their warehouse via tablet and show the condition data visually. This demonstration shows that this monitoring feature is not just a demo programmed for trade fair purposes which only works in specific conditions, but a viable solution ready to be implemented. At GEBHARDT, the visualization of the standardized condition data provided via the AAS takes place directly in Galileo IoT® without having to integrate separate dashboards."

The alliance members Captron, Bizerba, ifm, Pepperl + Fuchs, Phoenix Contact, Sick, and SAP are planned to join the project, further expanding its scope in weighing, sensing, energy consumption, image processing and cloud integration.





# FACTS & FIGURES



Expansion of Solar Energy System



270 Tons CO<sub>2</sub> Savings  
Through Replacement of Heating Oil with Renewable Energies

ISO 14001

ISO 50001



Sustainable Trade Fair Construction

Charging Infrastructure for Electric Cars



## SUSTAINABILITY - OUR DRIVE IS THE PRESERVATION OF OUR ECOSYSTEM

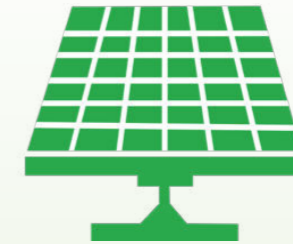
Protecting this planet and its ecosystem is of utmost importance as this is our home and the only one available to us. An environmentally conscious lifestyle and the careful use of available resources are essential for the preservation of our ecosystem. What each one of us has already integrated into our everyday lives through small habit changes is perhaps even more so important for companies. Here, the savings potential of climate-damaging emissions is often many times higher than that of private households.

At Dunkermotoren, protecting our environment has always been an integral part of our corporate philosophy. Environmental and energy management are engrained at the highest levels, as confirmed by regular audits for our ISO 14001 and 50001 certifications. However, our drive to protect the ecosystem is not about obtaining certificates, but our conviction to do the right thing. We work every day to reduce our CO<sub>2</sub> emissions - for ourselves and for future generations.

ISO 14001

ISO 50001

In reducing negative environmental impacts, the call to switch to renewable energy is getting louder and louder. This is on Dunkermotoren's agenda every day. Our job bike program and accessible battery charging facilities on company premises have been available to our employees for many years. As one of the largest employers in the region with a high proportion of local employees, this is a popular benefit that helps to save around 3.7 tons of CO<sub>2</sub> annually. All it takes is for 40 employees within a 6 km radius to replace their cars with bicycles on just a quarter of their working days.



At Dunkermotoren, we take our influence on the region seriously and therefore focus on proximity when it comes to energy generation. Among other things, we are working hard to expand our solar energy system to constantly increase the proportion of our energy usage covered by our own electricity. As for our heat energy requirements, we have already successfully replaced heating oil with renewable energies years ago. As a manufacturer, Dunkermotoren is able to cover 30% of its thermal energy requirements itself thanks to heat recovery from cooling of machines and server systems as well as air compressors. The remaining demand is covered by the adjacent local heating network operator solarcomplex, who relies exclusively on renewable sources



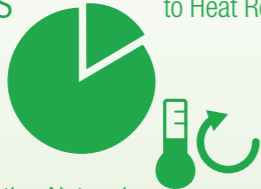
for energy generation. In the summer months, when the recovered thermal energy exceeds the company's own demand, Dunkermotoren in turn feeds the excess thermal energy into the adjacent local heating network. This enables the majority of the 150 residential buildings to be supplied with heat. The almost complete replacement of heating oil with renewable energies saves 270 tons of CO<sub>2</sub> annually.

But when it comes to reducing negative environmental impacts, switching to renewable energy sources alone is not enough. Special attention should be paid to the amount of energy required itself. Where less energy is needed, less energy must be provided. In turn, every kilowatt hour of thermal energy saved can be delivered to adjacent residents and businesses.

As a drive technology manufacturer with in-house production, Dunkermotoren has considerable energy requirements for compressed air generation. Since 2021, a new air compressor station has enabled savings of around 220,000 KWh of energy per year and thus also 160 tons of CO<sub>2</sub>. As if that were not enough, we have been able to save another 52,000 KWh per year, true to the old „Hochschwarzwald proverb "small



Thermal Energy Covered 100% with Renewable Energies



30% Covered thanks to Heat Recovery

70% Covered by Adjacent Local Heating Network

52.000 KWh Energy Savings

Thanks to New Air Compressor Station



220.000 KWh Energy Savings

Through Optimized Use of Compressed Air

## INSIGHTS

livestock also makes manure", simply with the help of small optimizations in the daily use of compressed air. In total, this saving corresponds to the annual energy requirements of almost 80 three-person households, which was accomplished just by using compressed air more efficiently.

vehicles, giveaways made of sustainable materials, as well as the elimination of disposable packaging and the provision of digital product brochures realize an environmentally friendly overall concept for our trade show presence.

From energy savings in parts manufacturing to heat recovery and the expansion of sustainable energy generation processes, we have already done a lot to reduce our carbon footprint. And yet, we are only at the beginning of a change that we urgently need to preserve what we live on every day - our natural environment.



We have already done a lot to preserve our ecosystem on our company premises and in the region. But our impact on the environment does not end at the next town sign. Dunkermotoren is well aware of this. As an exhibitor at almost 15 trade fairs worldwide each year, we rely on sustainable trade fair construction. With the support of our regional trade fair constructor artistic „Werbewelten“, our stand concepts have been completely modular for several years and are therefore used repeatedly for our trade fairs in Europe. The modularity allows an individual adaptation per stand size and type. Reusable and sustainable materials and long-lasting LED lights are therefore a must. Printing is done with environmentally friendly ink. Efficient fleet planning, low-emission



Another planned milestone in this direction for Dunkermotoren is e-mobility.

In a new project, our environmental experts are working on implementing a charging infrastructure for electric cars on the company premises and in parking lots in the surrounding area. Nothing will then stand in the way of converting the company fleet to electric cars - and, of course, they will be fueled with green electricity, ideally from their own energy generation.



## INSIGHTS

ONLY THE BEST  
FOR OUR CUSTOMERSIMPROVED ORDER PROCESSING  
METHODS AT DUNKERMOTOREN

In recent years, markets have changed like never before. Leading up to the spread of the COVID-19 virus and the outbreak of the Ukraine war, supply chains were becoming steadily more complex and globally connected. The events over the past two years have led to many disruptions in supply chains leading to material shortages, significantly impacting reliability, and losing transparency of delivery status. At the same time, expectations for shorter delivery times, high flexibility, and delivery reliability have remained.

Dunkermotoren has recognized these developments. To be able to offer its customers the transparency and flexibility they need right now, a project was launched in 2020 to process orders more quickly, reliably, and transparently to communicate all information to the customer in a timely manner.

## A company in transition

Over the years, Dunkermotoren has experienced strong growth. We have entered new markets, which required new suppliers and interfaces which have been implemented with our plants in China and Serbia, as well as the close collaboration with our sister company MAE in Italy. To ensure smooth order processing, certain affected procedures needed to

be adapted to meet the requirements of latest changes. At the same time, procurement dependencies on single local suppliers must be reduced to avoid delays in the future.

## Initial situation

The former "Customer Order Fulfillment" department was established in years with short delivery times and reliable material supply. The order managers worked according to a defined customer schedule and planned production according to those customer requirements no matter the product requested. However, the interrupted supply chains and resulting material bottlenecks require a precise and production-oriented planning of the orders, which takes the suppliers' forecasts into account in great detail. In the past, because each order manager scheduled his own customer's orders on each production line, changes in material availability were only detected shortly before the planned production date. This information had to then be distributed to the customer by the so-called production manager via the internal sales department, and orders had to be rescheduled.

The order processing project  
- goal and implementation

In short, to be able to offer customers reliable confirmations, a fast and transparent flow of information is necessary. In 2020, Dunkermotoren started thinking about how to realize these requirements with the current challenges - from order entry to delivery of goods and shipping. An important part of this con-

versation is the reduction of interfaces between the customer to the production line.

Our workshops included employees from all areas involved with order processing, task management, and manufacturing responsibilities to create a more future-oriented processing structure.

Optimized structure for greater  
transparency and flexibility

After two years of analysis and planning, the result is an efficient and flexible process with an optimized combination of tasks. "We have combined the knowledge of an order manager with that of a production controller and now have a better feeling for the actual situation on our production lines when planning orders" says Gerd Dreher, Manager Supply Chain Order Planning at Dunkermotoren.

Thanks to the new process structure, the order managers now work more closely along the value stream and no longer across the entire product portfolio. Each Project Manager is assigned to a production line and knows the delivery forecasts for materials required for that line. Changes in delivery times are now detected earlier.

For our customers, this means that their orders are now scheduled by a product specialist, who ensures a clear allocation based on available delivery forecasts. Changes due to delayed material availability are detected earlier, and planning can be adjusted accordingly. Using this information, Dunkermotoren can give its customers the news more quickly, whether good or bad.



# INSIGHTS

Our Customer Service Agents will remain the primary contact person for our customers. They will check all their assigned customer group's orders for compliance with confirmed delivery dates and then coordinate and communicate this information quickly and effectively.

## CONCLUSION

Order processing at Dunkermotoren is now closely aligned with our production flow. The correlated reduction in interfaces leads to greater transparency, flexibility, and speed in order fulfillment, all benefits which the drive technology specialist can pass on to its customers. Planned delivery dates can be met more reliably (on-time delivery) and potential bottlenecks can be identified earlier. Markus Valentin, Vice President Global Supply Chain of the AMETEK Advanced Motion Solutions Division, is certain that the challenges of the last two years would not have been manageable without the adjustments to the order fulfillment process.

**MARKUS VALENTIN**  
DIVISION VICE PRESIDENT  
GLOBAL SUPPLY CHAIN  
ADVANCED MOTION SOLUTIONS



"Without the adjustments in the order fulfillment process, the challenges of the last two years would not have been manageable"

**GERD DREHER**  
MANAGER SUPPLY CHAIN  
ORDER PLANNING



"The new process structure gives us a better feeling for the actual situation on our production lines. We become more transparent and effective, and can inform our customers faster about good or even bad news on confirmed orders."

**HEIKE DREHER**  
DIRECTOR MARKETING  
PROCESSES & INSIDE SALES



"When restructuring around the order fulfillment processes, it was important for us to involve the whole team from the beginning. The planning and implementation took place in numerous workshops, in which all employees of the contributing areas were involved."

**JULIAN BACHERT**  
TEAM LEADER  
PRODUCTION PLANNING



"In current times, it is definitely crucial that we plan around the new structure - with one specialist per product line, who knows the forecasts of our suppliers and allocates and schedules materials effectively across all customer orders. This allows us to better meet confirmed delivery dates."

**CAROLIN VETTER**  
TEAM LEADER  
CUSTOMER SERVICE



"Creating customer proximity and transparency was one of our main goals for this project. We were only able to achieve this with the new improved structures and areas of responsibility."

## INTERVIEW: APPLICATION ENGINEERING – A NEW DEPARTMENT AT DUNKERMOTOREN

"mo grabbed Daniel Grießer, Head of the new Application Engineering department, and asked him a few questions about the new department and his role.

Mr. Grießer, you have been working at Dunkermotoren for 13 years now. Through your bachelor's degree and the work in the Research & Development department, you have a broad knowledge of Dunkermotoren and MAE.

Through your master's degree and experience in Key Account Management at Dunkermotoren, you are familiar with customer requirements and the diverse application possibilities of the joint product portfolio.

Now you are managing the new Application Engineering team, which is a part of Dunkermotoren's sales department. What does the Application Engineering stand for and how do you see it interfacing with the customers?

We stand for competent and holistic consulting of the Dunkermotoren and MAE product portfolio. We are familiar with the internal processes of the various departments and therefore know where issues from customer projects need to be



### DANIEL GRIESSER

#### Career History:

- » 2009-2012  
Studies at Dunkermotoren, Specialization in electrical engineering
- » 2012-2014  
Hardware Electronics Engineer / R&D  
Participation in the development of the Motor Control Platform (MCP)
- » 2014-2016  
MBA studies at the University of Applied Sciences Konstanz - Specialization Mechanical Engineering and International Sales Management
- » 2016-2021  
Key Account Manager Industrial Automation / Sales
- » Seit 2021  
Manager of Application Engineering /AEng

addressed so that they can be implemented in a targeted manner throughout the entire organization. Our goal is to offer customers tailored motor solutions per their individual application requirements using our huge modular system.

What are the main tasks of the Application Engineering?

On the one hand, we advise customers, either directly or in cooperation with the responsible sales managers, on the Dunkermotoren and MAE product portfolio and work out the suitable motor solution together with the customer. The advice

can be given over the phone, in writing, or in person at the customer's site. In this case, we make use of our broad modular system. On the other hand, we coordinate the sampling for our customers or the implementation of new combinations together with the Products & Systems and Research & Development departments. Whenever necessary, we request new components for the product line, via the so called "Engineering Change Requests".



# ENGINEERING

Application Engineering thus sees itself as the interface between technology or product development and sales. With your previous knowledge from working in both areas, you can certainly make a valuable contribution to the cooperation between the various departments. Which departments do your colleagues in Application Engineering come from and what qualifies them to work in this field?

As an application engineer, you need experience with customer requirements as well as products and applications. On one hand, we have the so-called Central Application Engineers directly at the Bonndorf headquarters, who contribute exactly what their name implies. Each of them has his or her work focus on a specific product area. This allows us to learn from one another. Together with the Regional Application Engineers in France, Italy, Brazil, and Asia, we form a global team of experts. We exchange ideas on current topics, products, and projects at least once a month. This helps us develop our understanding of different possible solutions together.

How do our customers benefit from you and your global team?

The Dunkermotoren and MAE product portfolio, including nexofox services, is constantly becoming more complex due to advances in technology. This makes it increasingly difficult for customers to independently design the appropriate motor solution and functionalities. This means it becomes more and more necessary to provide detailed explanations of offered products due to the countless new available configurations.

We as application engineers help customers globally and support the entire sales team in finding the right motor solution for any application.

We also advise customers on the various options, risks, and advantages of different technologies available on the market. As our team is made up of colleagues from various locations, we are also able to respond much better to local particularities and have a better view of any country-specific requirements and guidelines that may apply. Working in different time zones within the team is challenging from time to time. However, we can offer our customers greater flexibility and faster response times. Experience has shown that our approach is very well received by customers. In most projects, we are involved at a very early stage. This allows us to include our input and expertise to the motor selection, which benefits the customer in later phases.

Until 2021, you were a Key Account Manager for our customers in the field of industrial automation - the task as a manager will certainly present you with new challenges. Please give us an insight.

Indeed. In the past, the applications I was responsible for were exclusively from large customers with a focus on the "Food & Beverage" market. In the new department, I am tangent to all segments, applications, and products of Dunkermotoren and MAE. This makes the work very exciting and diverse. Every day brings new insights. In addition, I am constantly learning a lot of new things about customers, applications and, of course, about our products. Further, there are also various new topics around leadership &

coaching I am confronted with, as well as priorities and escalation management with a view to the "big picture". I like the exciting new challenges in which I can constantly develop myself and learn something new every day.

In conclusion: Let's look into the future - where is the journey going?

I think we have had a great start with the new department and are heading in the right direction. We continue to work on our offering of motor designs via the Dunkermotoren and MAE portfolio. In addition, there are now additional topics including services in connection with nexofox, such as condition monitoring or predictive maintenance.

Furthermore, we are currently working on a platform which can effectively compare all competitive developments and link them to our own portfolio. This will enable us to make an essential contribution to the specification and implementation of future sales and product strategies.

Thank you very much for the interview.

## NEW MEMBER OF THE DUNKER FAMILY: EGS AUTOMATION

INTERVIEW WITH ROBERT EBY, MANAGING DIRECTOR EGS AUTOMATION

Mr. Eby, EGS Automation is your life's work. You founded the company in 1996. Tell us about your company's beginnings and milestones.

Robert Eby: The company was founded in 1996. In the early days, we were involved in conventional automation projects, but we switched to robotic automation in 1999. I designed and built the first standard device (Sumo Multiplex) myself, and then showed it at the Metav trade show in Düsseldorf in the spring of 2000. Since then, we have continued to develop in the field of robotic automation and have launched more than 2000 industrial robots on the market to date. We have taken on the most diverse challenges of the market and have developed into a company of around fifty people. Our experience and the decisive know-how can offer customers innovative, customer-specific, but also standardized automation solutions for the most diverse areas and production steps.

Please tell us more about your automation solutions. What kind of products and services does the EGS Automation portfolio include?

Robert Eby: We can offer our customers a wide range of different robotic solutions. On one hand, our SUMO standard automation offers tried-and-true reliable solutions that can be used for a wide range of applications in the metal and plastics industries. From the compact SUMO Duplex palletizing system to the flexible SUMO Fotoplex with 2D and 3D position detection for feeding disordered workpieces, we can rely on our sophisticated standard automation for countless requirements.

On the other hand, we offer individual turn-key solutions with which we can automate the entire process chain across several production processes - from milling, drilling, countersinking or grinding to cutting or molding plastics of various shapes, materials and sizes.

It goes without saying that we support our customers from the very first minute. From feasibility studies and the development phase to training, programming and, of course, maintenance work throughout the entire service life. Through the acquisition by Dunkermotoren, we have now added more advanced software services such as condition monitoring and predictive

” THERE IS ALMOST NO AUTOMATION OR MANUFACTURING PROCESS THAT WE DO NOT KNOW.



# EGS AUTOMATION

maintenance, which we will be able to offer for our automation solutions in the future with Dunkermotoren electric drives.

*Where do you see EGS Automation's strengths - what sets you apart from your competitors?*

**Robert Eby:** One of our greatest strengths is our experience in robotic automation. We have been designing and building a wide variety of systems for many years. There is almost no automation or manufacturing process that we do not know. This enables us to provide our customers with specific recommendations and to offer them the perfect solution for their individual process. Another strength is our reliability and the scope of services we offers. Everything comes from a single source. We do not buy in any services, but instead work out everything ourselves. From the construction to the programming and even the commissioning and service of our plants.

We are also able to handle large projects in the millions.

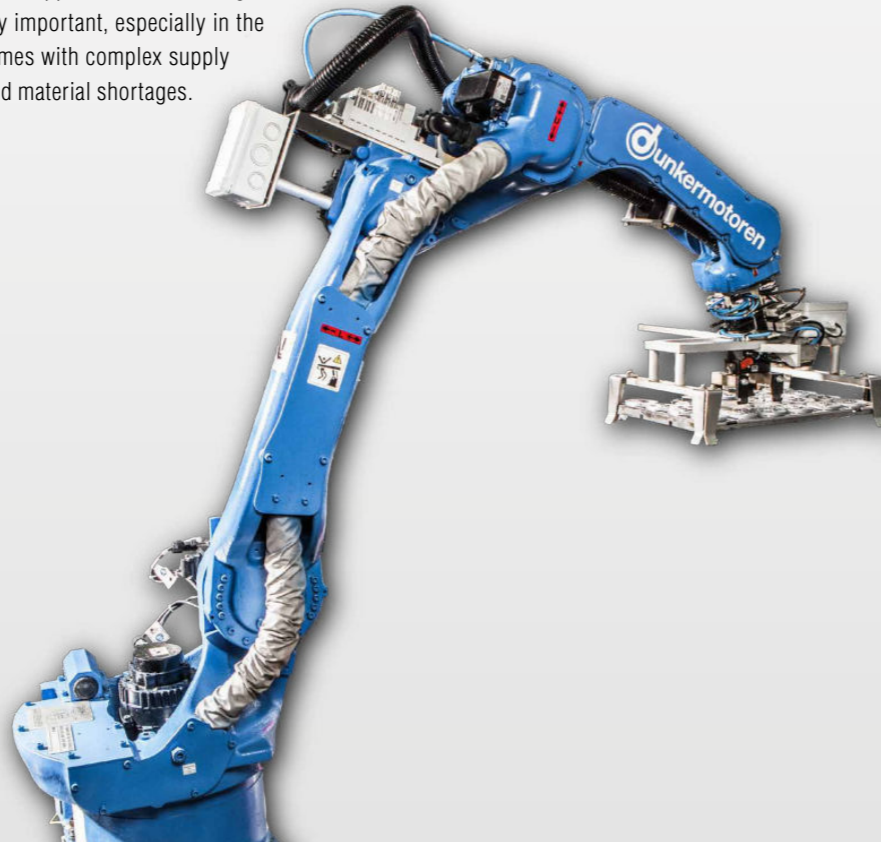
*With the acquisition of EGS by Dunkermotoren, two companies became ONE team. Where do you see the biggest benefits from the collaboration?*

**Robert Eby:** One of the biggest benefits of working with Dunker is the excellent support from the IT department. We are well prepared for the future in terms of IT security.

On the product side, we have been able to develop further in energy efficiency and flexibility by using Dunker drives in our standard equipment. Together, we will develop new products and bring them to market. The stability of Dunkermotoren is very well received by our customers, as reliable suppliers are becoming increasingly important, especially in the current times with complex supply chains and material shortages.

*What are your goals for EGS?*

**Robert Eby:** We will continue to develop further in the future. We will continue to be innovative and bring great newly developed products to market that meet current demands and technologies. One of our goals is to continue to move robotic automation forward and become the market leader in this field.



## EGS AUTOMATION

### FACTS & FIGURES

<b>Location:</b>	Donaueschingen - Schwarzwald-Baar County
<b>Employees:</b>	54
<b>Product range:</b>	Robotic automation systems as well as standard devices like the SUMO series
<b>Markets:</b>	All manufacturing! Domestic engineering, medicine, automotive and vehicle construction, packaging, general metal and plastics processing.

# METAL

- » Automation of machining and processing tasks for an efficient production of metal components
- » Optimization of automation concepts and user interfaces based on customer needs and batch sizes
- » Robust design and protected configuration of sensitive components and sensors, as well as tracking and insertion tools for aligning new clamping fixtures ensure a long service life of the systems.
- » Realization of single or multi-spindle machines, from three to multi-axis, depending on the requirements and the level of automation.

EGS Automation offers its customers many years of experience in automating manufacturing processes in industries such as plastics and metal component processing. Since EGS was founded in 1996, the robotics specialist has realized countless automation projects.

As each project is unique, it is of great importance to incorporate the customer's unique process conditions, knowledge, and requirements into the development of the automation solution. Learn more about EGS Automation's expertise in the metal and plastics industry.

# PLASTICS

- » Automation of manufacturing and machining processes of complex plastic components
- » Manufacturer-independent system communication via EUROMAP standard
- » User-friendly operating and monitoring unit for clear visualization and control of complex automation processes
- » Individual and flexible automation solutions for hydraulic and electric, as well as vertical and horizontal machines in single and multi-component applications



## SMART ROBOTICS

Nexofox offers its smart services and IIoT solutions not only for motors from Dunker-motoren, but also for EGS robots and automation systems. From the field level to the cloud, nexofox enables the easy integration in existing systems, condition monitoring & predictive maintenance for drives, robots and complete plants - all from one single source.

# Smart

# Robotics



Service



Smartphone App



Robots - the Central Component



Analysis



Autonomous Manufacturing



Workpiece Storage



Maximum Compactness



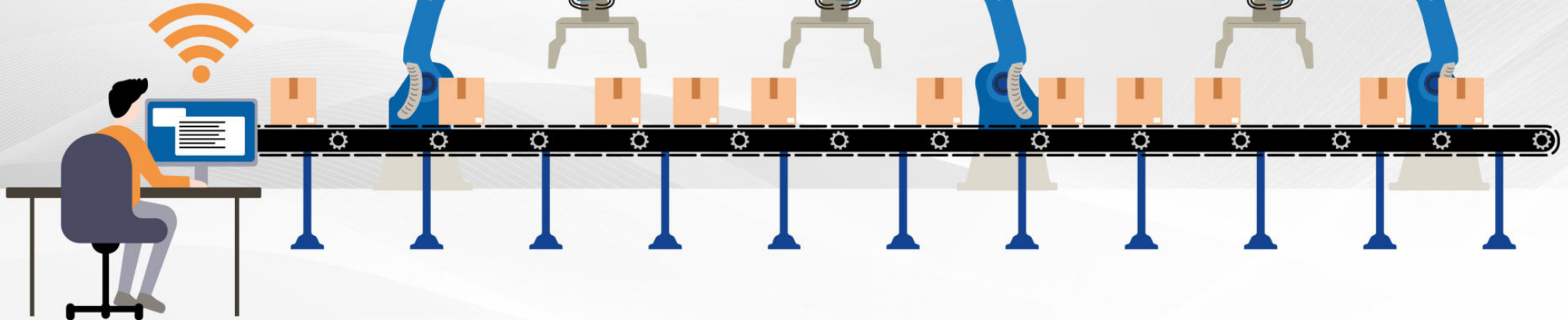
Remote Monitoring



Additional Value added



Digital Twin



## EGS AUTOMATION RELEASES NEW PROGRAM OF SUMO AUTOMATION SYSTEMS

EGS Automation releases a new range of the SUMO automation systems. The SUMO automation systems is a well-designed and field-tested product line that can be used in many applications and industrial sectors. In this example, the systems are suitable for process automation of diverse applications in the metal and plastics industries.

With the Dunkermotoren acquisition of the automation specialist EGS, the long-standing and profound know-how in electrical drive technology can be shared within the new team. The systems are consistently converted from pneumatic actuators to environmentally friendly and efficient electric drive technology, resulting in an energy savings potential of up to 70%. In 2021, Dunkermotoren also introduced its new nexofox brand to the market. With nexofox, Dunkermotoren will offer its customers a complete range of solutions related to the use and networking of its smart motors and the robot and automation systems of its subsidiary EGS Automation. The options for remote monitoring and predictive maintenance are particularly advantageous for the SUMO systems. Maintenance periods and times can thus be further optimized, and operating costs minimized.

## HIGHLY AUTOMATED PRODUCTION OF SEVERAL MILLION CONNECTORS

### INTELLIGENTLY LINKED AND CONSISTENTLY AUTOMATED

How does one cope with the constant increase in demand for plastic hybrid components in spite of space restrictions and personnel constraints? An international automotive supplier has opted for an intelligent linked system with two injection molding machines and six robots – and it is going quite well.

With around 3,000 employees worldwide, KE Elektronik is one of the most valued suppliers for the automotive and aviation industries. With production sites in Germany, the Czech Republic, Slovakia,

northern Macedonia, China, and Mexico, the company belongs to the American Amphenol Corporation – a leading manufacturer of connectors.

This 300 people strong manufacturer, headquartered in Kressberg-Marktustenau, has built engine fan connectors that are used in both hybrid and internal combustion engine vehicles. These connectors are so-called plastic hybrid components in which four metal contacts are over-molded with three different plastics.

“The production of these connectors is a relatively complex process that involves numerous testing stages as well as complete traceability. To be able to meet the constantly increasing demand given the shortage of skilled workers, an intelligent automation solution was required,” says Jens Gradenegger, Team Leader Injection Molding Automation at KE Elektronik.



### AN EXTREMELY CHALLENGING PROJECT

KE Elektronik turned to EGS Automation GmbH to take on the task of automating and interlinking two punching and bending units as well as two Arburg injection molding machines in such a way that the resulting manufacturing station could reach an output of several million connectors per year. “Our previous experience of working with EGS was positive, so we were sure they’d be able to offer us a reliable solution in this case as well,” says Jens Gradenegger.

EGS would not be EGS if it wasn’t able to come with a perfect automation solution to do this complex job. “We like to prove ourselves by taking on challenging projects – and this one certainly gave us plenty of opportunity to do so. In close cooperation with KE, we succeeded in designing a 15 x 6-meter manufacturing station that meets all requirements, including six Yaskawa Motoman robots, lots of handling and testing technology,

and a SUMO Ecoplex2 palletizing system,” says EGS project manager Hartmut Pfalzgraf.

The complete production line is clearly divided into four modules – and the transparency of the layout is impressive. To guarantee the cycle time requirement of ten seconds or less per connector as well as maximum accessibility, only the highest quality components were used. Close attention was paid to good availability for all parts of the system as well. This is what the system looks like in the real world:



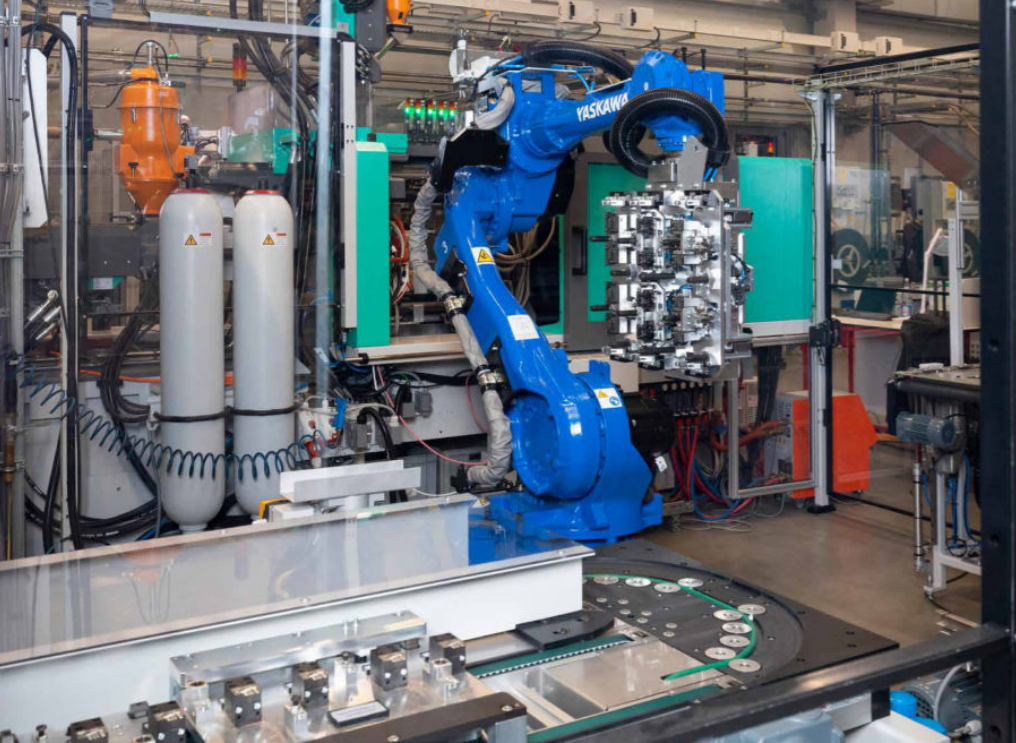
### MODULE I: PROVISION OF THE CONNECTOR PINS

Two punch-bend units ensure continuous supply of the connector contacts. While one line produces signal pins, the other produces power pins. A MOTOMAN GP7 with mechanical gripper – equipped with integrated sensor technology and tilted 25 degrees – is installed on each punch-bend unit. “The inclined position of the robot allowed us to achieve the required rotation from the removal to the insertion position entirely via the S-axis, thereby reducing the cycle time to a minimum,” says Hartmut Pfalzgraf – an ingenious piece of engineering that reflects EGS’ experience of over 2,000 robot installations.

The two 6-axis robots each remove two contacts from their line and position them in a workpiece carrier with four receptacles, each of which in turn must be fitted with four contacts. After four work cycles, the two 6-axis robots have completely loaded the four receptacles and the workpiece carriers reach their unloading position, where they are received by the MOTOMAN GP50 on Module II.







## MODULE II: COMPLEX HANDLING PROCESSES WITH THE GP50

The heart of Module II is an Arburg 2K injection molding machine which processes two plastics simultaneously. In the first shot, an overmold is applied with the upper portion of the Injection molding machine to fix the contacts precisely in the desired position. The resulting contact carriers are then overmolded to a connector plug in the second shot by means of the lower injection mold.

All loading and unloading processes of this injection molding machine are completed with a Yaskawa MOTOMAN GP50 6-axis robot, which uses a 36 kg triple gripper system. With a reach of 2,061 millimeters and a payload of 50 kg, the robot is perfectly suited to this task. The task spectrum of the 6-axis robot is highly complex. The robot first must unload the injection molding machine

before it can fit it with new contacts. To do this, the robot must remove the finished overmolded connector plugs from the lower mold, transfer the pre-molded parts from the upper mold to the lower mold and finally fit the now empty upper mold with the 4x4 stamped and bent contacts from the workpiece carrier of Module I.

“In order to be able to achieve the required precision when gripping, the robot docks onto the molds by means of a centering gripper prior to the actual handling. To keep the mold open time as short as possible, we make full use of the GP50’s exemplary dynamics,” says Jens Gradenecker.

Finally, the overmolded connectors are placed on another workpiece carrier in the assembly line. With a total of eight connectors, the workpiece carrier is transferred from Module II to Module III via a transfer system.

## MODULE III: SPECIAL LIQUID SILICONE RUBBER (LSR) OVERMOLDING

The essential step in Module III consists of LSR overmolding of the connectors, which is also carried out on an Arburg injection molding machine. The advantage here is that by overmolding the connectors with a silicone lip, a separate seal is not required. This means there is no need for an additional component that might cause problems during assembly.

Module III also uses a MOTOMAN GP50, but its job is not quite as complex as that of its colleague in Module II. Here, the robot removes the 2x4 connectors from the workpiece carrier and checks their temperature by holding them in front a thermal imaging camera. Only when the temperature is within the defined window, the parts are suitable for and the robot then places them in the mold.

The first step before loading the injection molding machine is to remove the eight finished parts. The GP50 then loads a 2-fold shuttle which takes a total of 16 parts to the last module.



## MODULE IV: TEST, TEST, TEST

Another MOTOMAN GP7 is used in Module IV. Its task is to pick up the finished parts and move them to a revolving transfer unit. “On this revolving transfer unit there are various test stations and an assembly station equipped with a MOTOMAN SG650 Scara robot. Here we’ve successfully integrating a really large number of processes in an extremely compact space,” says Jens Gradenecker.

This module is all about quality assurance. The first step is a continuity and high-voltage test, followed by a pin position check with a triangulation laser, and then a camera inspection of the LSR overmolding. The component is then given a data matrix code by a marking laser, thereby ensuring one hundred percent traceability. Subsequently, the Data Matrix Code is tested, too.

Once the component has passed the entire test marathon, the final step is the torque-controlled assembly of a protective cap, which is performed by the SG 650 Scara robot. “The fact that Yaskawa has been offering 4-axis robots for some time now has proven to be a great advantage here. This allowed



us to fit the entire plant with robots made by a single manufacturer and stay with Yaskawa controls,” says Jens Gradenecker.

The Scara robot is not pushed to its limits, but the situation is quite different with the MOTOMAN GP7: “The 6-axis robot is critical in terms of the time cycle because it not only loads the rotating transfer unit, but also finalizes the process by placing the finished parts into trays in a SUMO Ecoplex2 – the top seller among the EGS palletizing systems. We had to pull out all the stops here so as not to jeopardize our cycle time targets. Among other things, the robot is fitted with a 2+2 gripper system to reduce the number of movements,” says Hartmut Pfalzgraf. The plant has been running three shifts since September 2021 and fully meets KE’s expectations, as Jens Gradenecker assures us: “EGS really did an excellent job – from planning right through to commissioning. We were able to benefit from the exper-

tise of the EGS designers in all kinds of detailed solutions. An added bonus is the reliability of Yaskawa robots, which we particularly value here at KE.”



## DONAUESCHINGEN - SOURCE OF THE DANUBE AND HOME OF OUR SUBSIDIARY EGS AUTOMATION

The city of Donaueschingen in the Schwarzwald-Baar county is the home of our subsidiary EGS Automation and the source of Europe's second longest river - the Danube.

From the famous spring in the castle garden, where the "Mother Baar" shows the Danube the way to the east, water flows into the Brigach, which joins the Breg just a few hundred meters further on. The convergence of the Brigach and Breg marks the origin of the Danube, which flows from right here in the heart of the Black Forest for more than 2,800 kilometers and through ten countries until it ends in the Black Sea. This makes the Danube the second longest river in Europe after the Volga.

The best way to experience the beauty of the river and its surrounding towns in an active way is to follow the Danube Cycle Path, which begins right in the heart of Donaueschingen. The German part of the cycle path takes you downstream for about 600 kilometers to Passau on the Austrian border. In addition to well-known cities such as Ulm, Ingolstadt and Regensburg, numerous castles, palaces, and unique natural spectacles such as the Blautopf near Blaubeuren can be marveled along the route.



Dividing the route into a total of twelve stages between 35 and 60 kilometers makes the Danube Cycle Path the perfect vacation experience for everyone - whether as a family or for the athletically ambitious. By the way: the Danube Cycle Path was already certified as an official 4-star cycle path by the German Cyclists' Club (ADFC) in 2017. In addition to gorgeous surroundings, certified bike paths are tested for many other quality aspects, such as clear signage, low traffic congestion and consistently good drivability even with luggage, tandem or trailer.

Don't hesitate and plan your visit to this beautiful destination soon!

For a well-deserved refreshment after a strenuous trek, the Fürstenberg Brewery is the place-to-be. A 90-minute guided tour of the brewery, which includes a beer of course is the perfect way to quench your thirst. It also offers interesting insights into the Fürstenberg Brewery (founded in 1705) and the secrets of the isotonic drink.

The city itself is also worth exploring. You can do this on your own in two ways: you can stroll through one of the numerous museums, or you go on an exciting, approximately three-kilometer-long geocaching tour through the tranquil Donaueschingen Castle Park and experience its monuments and the city in an adventurous way.

If you are more interested in the historical aspects of the city, you can join one of the guided city tours that immerse you in Donaueschingen's 1,100-year history once a week all year round. These tours have a lot to offer. The town was first documented in 889. At that time, it was known under the name "Esginga". In the High Middle Ages, it became "Eschingen on the Danube" and later the Donaueschingen we know today. However, Donaueschingen became increasingly known recently when the Lord of Fürstenberg moved his residence to there in 1723. Donaueschingen rose to become a real economic and cultural metropolis. In addition to the construction

# LOCATIONS

of a princely park, numerous residences, a court library and even a theater, Lord Joseph Wenzel zu Fürstenberg, among others, helped the town to shine in 1778 with the founding of the Fürstenberg High School. Until today, the town has lost none of its splendor to this day.

This is also the opinion of Robert Eby, founder and managing director of EGS Automation. For him, the city has "a special charm" with its beautiful castle and the source of the Danube. From a business perspective, the city's location is very useful. Centrally located between the two major airports of Stuttgart and Zurich and only five minutes from the A81 motorway, the city can be optimally approached by truck from any direction. Thanks to the well-developed road network and rail connections, not only can material be delivered easily, but employees can commute to work quite easily.

But Donaueschingen is not only designed for people to come and work, but also to simply relax and unwind. After all, the city has been a recognized "health resort" since 2012. Spread over Donaueschingen itself and its total of seven districts, four swimming pools and three Kneipp spa facilities offer plenty of room for relaxation and self-care.

If you do now not know which highlight in Donaueschingen you want to experience first, simply go to the famous spring in the castle garden and let "Mother Baar" show you the way.

### FACTS:

#### » History/ Foundation:

- » First documented mention in 889
- » Large district town since 1993

#### » Location: Schwarzwald-Baar county

» Altitude: 680 - 950 meters above sea level

#### » Inhabitants: 22.486

» Districts: Wolterdingen, Aasen, Grüningen, Heidenhofen, Hubertshofen, Pfohren, Neudingen

#### » Special highlights:

- » The Spring and castle garden
- » Fürstenberg brewery
- » various museums
- » last but not least, the automation specialist EGS Automation



# PRODUCTS

## A NEW LABEL FOR ALL HOUSINGS - EASY TO READ AND NOW WITH QR CODE

Dunkermotoren is introducing a new standardized label for its motors and drive solutions. This combines all relevant information about the motor or the complete drive combination with, for example, gearbox, encoder, brake, and electronics on a single label.

This is made possible by the new Data Matrix Code and the Dunkermotoren TypeLabel app. By scanning the code with the Dunkermotoren app, the product information it contains is decoded and immediately displayed on the smartphone or tablet. In addition to the visible information on the label, the customer or user receives further useful infor-

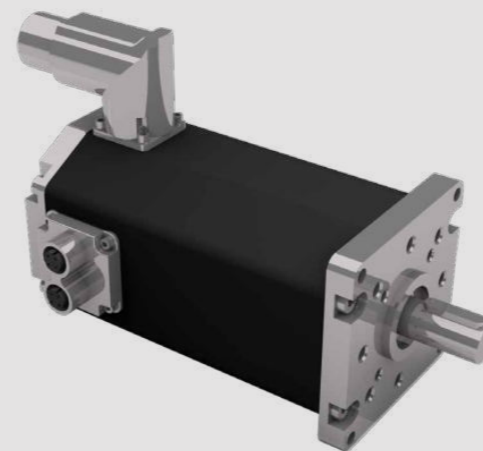
mation about the drive solution and its different components. The Dunkermotoren TypeLabel app is available via the Apple App Store and the Google PlayStore, where it can be downloaded free of charge. Drive solutions with the BG 65 brushless motor series have been the first products to bear the new type label in mid-July 2022. All other BG brushless and GR brushed motors will follow one by one.

With the introduction of the new scannable label and app, the drive technology manufacturer from the Black Forest is taking another step towards the Internet of Things and offering its customers additional convenience and transparency through the simple provision of motor-relevant information.

## BG 75 JOINS THE *dPro* - FAMILY

Following the BG 66, BGE5510, and BG 95, the BG 75 is now also available in a *dPro* version. With a continuous output power of up to 590 W, peak power of up to 1700 W, and a peak torque of almost 5.8 Nm, the BG 75 *dPro* is more powerful than all other versions of the BG 75 series – with a supply voltage of just 24 or 48 VDC. This means more power in the same space, allowing machines to be built even more compact in the future. These characteristics makes the BG 75 *dPro* the perfect partner in the fields of logistics, robotics, as well as machine and plant engineering. It can, for example, be used effectively in the food, semiconductor, and electronics industries, or can operate as a drive for AGVs (Automated Guided Vehicles).

Connection and programming is easy with the *dPro* family and can be done either via CANopen or one of the Industrial Ethernet interfaces including PROFINET, EtherCAT or Ethernet/IP. The hybrid connector used for this motor reduces the cabling effort to a minimum. The motor can then be programmed, controlled, and monitored via the Drive Assistant 5 commissioning and configuration tool and/or MotionCode. To get the best out of your motor solution, our nexofox team will be happy to advise you on features like condition monitoring or predictive maintenance.



In addition, safety is a top priority at Dunkermotoren. That's why a certified STO function (Safe Torque Off) is available for all BG 75 *dPro* versions and comes standard in the BG75 *dPro* with Industrial Ethernet. This allows the motor to be reliably switched off torque-free without interrupting the logic voltage, which eliminates the need for time-consuming referencing when restarting. With the new BG 75 *dPro*, there are no obstacles in your path towards the realization of a smart factory.

## STRONG, STRONGER, BG 95X120 *dPro*

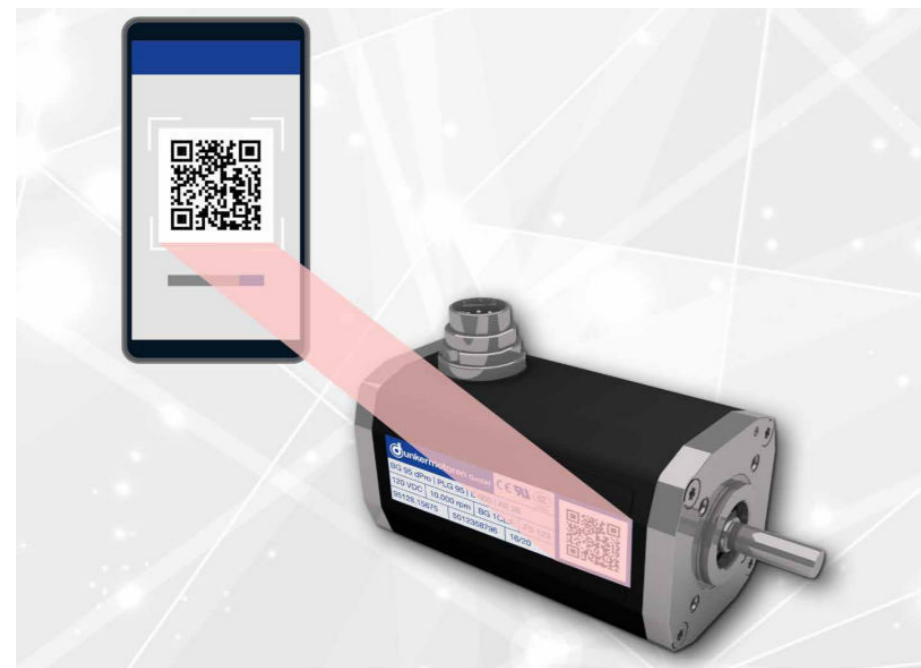
With the new BG 95x120 *dPro*, Dunkermotoren expands the product portfolio in the BG 95 series with a new length and thus breaks its own records. The BG 95x120 *dPro* is currently the most powerful motor and achieves a peak power of 4.4 kW and a torque around 14.5 Nm - with a battery voltage supply of just 48 VDC. These characteristics combined with the space-saving slim design makes it the perfect drive for mobile applications including AGVs (Automated Guided Vehicles) or AMRs (Autonomous Mobile Robots) as an example. The transport of heavy loads is no longer a problem.

Like all *dPro* versions, the connection is made easy: It does not matter if you use CANopen or the various industrial Ethernet interfaces (PROFINET,

EtherCAT or Ethernet/IP). The BG 95x120 *dPro*, can be integrated into an existing system and then be programmed and controlled via Drive Assistant 5 and/or MotionCode.

For more safety, the certified STO function (Safe Torque Off) is available as a standard for all BG 95x120 *dPro*. STO allows the motor to be switched off reliably and torque-free. A sudden obstacle in the path of an AGV/ AMR is no longer a danger. Additionally, the logic voltage is not interrupted in such cases. This saves time-consuming re-referencing after restart.

The BG 95x120 *dPro* is the perfect friend for more flexibility in transport robotics.



# PRODUCTS

## SOME OF THE TRICKS OTHER MANUFACTURERS USE

At Dunkermotoren, they know that customers appreciate the robustness and reliability of the products. This is confirmed with direct feedback, surveys, and low number of complaints.

The main basis for this positive perception is the solid design and precise manufacturing of our products. In fact, there are major differences between manufacturers in the way products are specified. A direct "catalog data comparison" often leads to misperceptions. It is therefore worthwhile to analyze the specified data more closely:

### Methods for specifying motors

The measurement methods for specifying motors are not uniform and sometimes differ greatly between different suppliers. This makes it difficult to compare specifications even for comparable motor designs. For example, Dunkermotoren always measures motors according to EN60034 in a thermally insulated state, which means that no heat is emitted to the outside, while competitors mount heat sinks on the motor or even specify values with application-typical active cooling. Many manufacturers do not provide any information regarding their measurement methodology at all.

For better comparison, motors from market competitors were measured at Dunkermotoren labs and the values were compared with the respective catalog specifications. For example, a BLDC motor from a German manufacturer specified with 178 W (0.425 Nm at 4000 rpm, 24 V) would only achieve 113 W (0.22 Nm at 4900 rpm, 24 V) according to Dunkermotoren's specification methodology. Other compared products also showed deviations in measured output power of 35 to 50 percent.

### High rated speeds

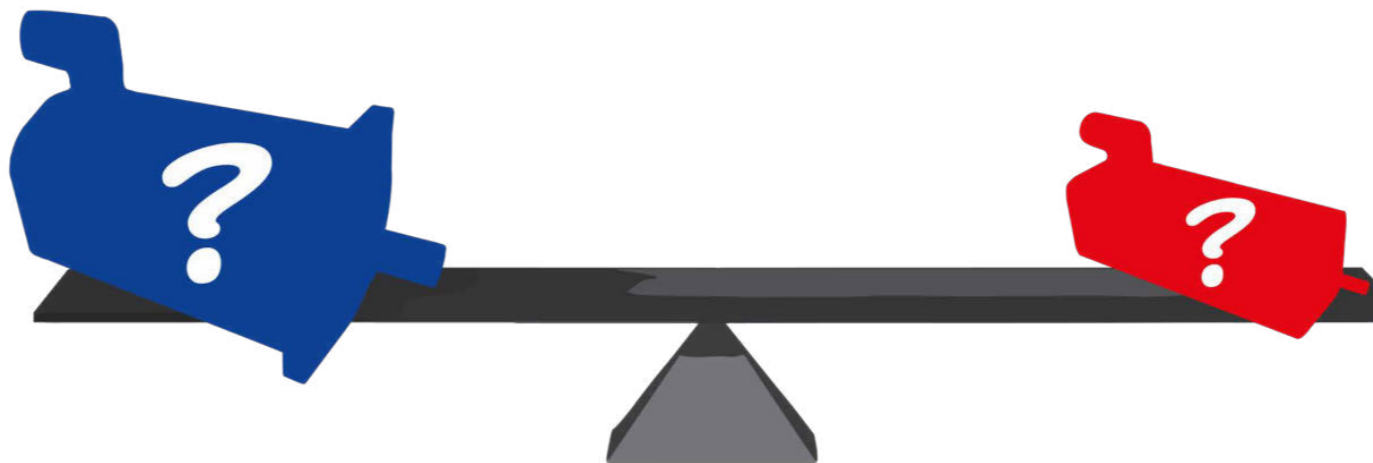
In DC motors, the winding design, such as the number of turns and the wire thickness, is crucial for the motor speed at a given voltage. This makes it possible to design the motors for a high speed with only a slightly lower continuous torque. This results in optimized power density. Some manufacturers specify their brushless motors for very high speeds and can thus also specify a very high rated power, although the high speeds are not practical for many industrial applications or would overload the gearboxes.

In one example, specialists at Dunkermotoren compared BLDC motors with a diameter of 32 mm. The motors have a similar continuous torque of approx. 45 mNm, but the rated power of 80 W at the competitor differs significantly from the 20 W specified at Dunkermotoren. This is due to the different rated speeds of 15000 vs. 3800 1/min.

### Restrictions in the footers

In many cases, the catalog data given is not to be understood as a binding specification, but is devalued, sometimes massively, in the footer.

In one example from a German gear manufacturer, the footer of the data sheets states "All data in this brochure are approximate values. Deviations are possible (...)". Thus, the information is practically meaningless. With other manufacturers, reference is made in the footers to the application-specific design with tools. The tools themselves are very good and helpful, but the totality of the nominal data from the product table is rarely achievable, which means that the permissible torque or the service life are usually lower after entering the application parameters.



# PRODUCTS

## Efficiency data for gear units

At Dunkermotoren, gearbox efficiency is given for the complete gearbox, in cold and not run-in condition, with tolerances considered at worst case. Almost all competitors indicate a much better efficiency (dynamic, under full load or even only the pure gear efficiency). This is the reason why Dunkermotoren specifies three-stage planetary gearheads at 73 percent efficiency, while most competitors specify an unrealistic value of 92 to 98 percent. In fact, the planetary gearboxes from various manufacturers hardly differ in efficiency with the same number of stages.

## Different motor concepts

When comparing different motor concepts, not only the rated power but also the high overload capacity of DC motors should be considered. In many applications with cyclic operating modes, it is not the continuous output power that is relevant, but the power that can be achieved for a short time. Both the brushed and brushless DC motors from Dunkermotoren can be loaded with several times the rated torque. This is a feature that is not available with many other motor designs (e.g. asynchronous motors, stepper motors).

The Dunkermotoren sales department will be happy to answer any questions you may have about the ideal design. Depending on the project, it is also possible to have alternative products measured at Dunkermotoren's laboratory for better comparison of specifications.



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Dunkermotoren GmbH

# PRODUCTS

## DUNKERMOTOREN PRESENTS A STOCK PROGRAM FOR STEPPER MOTORS

Dunkermotoren added a selection of MAE stepper motors to its stock program, which are now also available in small quantities and with a delivery time of just a few days. For greater independence from global supply chains, stepper motors made in Europe offer key advantages and are an important component for many drive solutions.

With the three most popular NEMA sizes, 17, 23 and 34, Dunkermotoren includes a wide power range in its stock program. The stepper motors enable holding torques in the range of 0,27 to 12 Nm and are particularly compact in design. The NEMA 17 and NEMA 23 sizes have been completely revised technically over the last years and can meet demanding requirements in terms of performance and quality. Planetary gears, brakes, and encoders from the well-known Dunkermotoren modular system can be combined with the stepper motors. A new highlight is the high-resolution and cost-effective encoder RE30 with 4000 increments.

MAE's many years of experience in stepper motor construction make the motors reliable and durable, which is ideal for industrial applications. In combination with Dunkermotoren drive components, even more fields of application become possible.

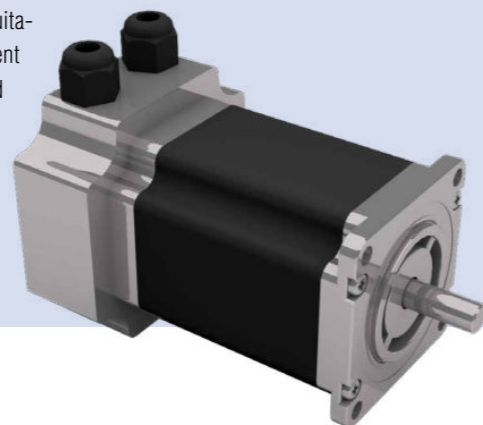


## STEPPER MOTORS WITH ATTACHED CONTROLLER

Stepper motors are currently experiencing a true renaissance. Many still think of products from the Far East, which are more noticeable for their typical noise than for their performance. However, sophisticated stepper motor controllers nowadays not only compensate for this supposed weakness. They make clever use of the special stepper motor characteristics and offer functions that are otherwise more commonly assigned to the servo area. These include fast positioning modes, different acceleration ramps, bus connection, and status monitoring.

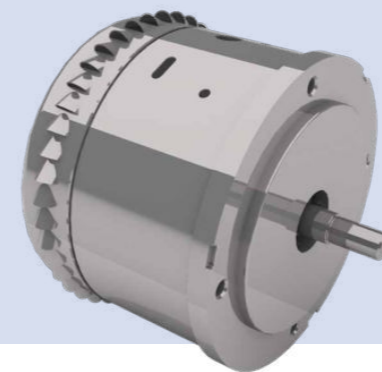
With the new ST XX STE series, MAE combines the high quality of stepper motors developed and produced in Europe with precisely matched high-end electronics that are mounted directly on the motor. These control electronics are operated via CANopen, EtherCAT or digital inputs. Stand-alone sequence programs are also possible. ST XX STE are particularly suitable for applications in equipment manufacturing, industry, and medical technology. Special versions are available with ratings up to IP 65.

All versions can operate without external components in the control cabinet and are thus optimized for simple wiring. Even though the high-torque stepper motors do not require a gearbox in many cases, the ST XX STE can draw on Dunkermotoren's extensive gearbox modular system for particularly torque-demanding applications.



# PRODUCTS

## MAE PRESENTS THE HIGH-SPEED BL 89 SI AC MOTOR



With the BL 89 SI AC motor, MAE presents a high-speed motor that offers many functions with integrated electronics. This enables an enormously wide speed range of 3000-20,000 1/min, as well as simple control of inrush current, continuous current, and speed. The motor is controlled via an analog input. Operation on 110 V/230 V mains voltage makes the application versatile and easy to implement. These motors remove the need of external components in the control cabinet and are thus optimized for simple cabling and operation without an additional frequency converter.

Two different sizes with an output of up to 230 W and 0.65 Nm cover a wide range of applications. Additional customer adaptations for mounting are possible.

The areas of application range from fan drives, pumps, blowers, to component cooling or combustion chamber ventilation. Due to its high efficiency, the BL 89 SI AC is ideally suited to replace inefficient AC motors in your applications. MAE's many years of experience in fan design make the motors reliable, durable, and perfectly suited for industrial applications.

## A NEW BLOWER SERIES FOR MORE EFFICIENCY

MAE has developed a new blower series specifically designed for battery-powered cleaning machines. The new universal blower BU 82-130 mm By-Pass 2-stage offers enormous advantages in terms of design, compactness, efficiency, durability, and performance. Compared to other motors commonly used in scrubber-dryers, the new blower can provide the same air output at reduced input current, allowing longer battery life. On the other hand, up to 20% higher air performance and better noise performance than conventional solutions can be

realized with the same power consumption. The increase in performance ranges from 27% to approximately 37%. The improvements in efficiency, power consumption, battery life, dimensions, and weight make the new BU 82 - 130 mm By-Pass 2-stage universal blower the perfect choice for battery-powered wet and dry cleaning applications.

The new design offers the highest standards in bearings and fan housing protection, which make it suitable for harsh environment applications. The series will initially be available with peripheral and later also with tangential extraction system. The DC version of this innovative solution is already available for your projects. The AC version will follow

shortly. Experience innovation, with the new BU 82-130 mm By-Pass 2-stage universal blower.



# NOTES

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