

The background of the cover features a blue-toned world map. In the foreground, several large, light-colored puzzle pieces are arranged in a grid. A silhouette of a person is shown on the left, pushing one of the puzzle pieces into place. The overall aesthetic is clean and modern, with a focus on global connectivity and teamwork.

'mo

COVER STORY:

DUNKERMOTOREN & MAE – SYNERGY IN THE DRIVE WORLD

MAGAZINE OF **MOTOR TECHNOLOGY**

TOGETHER INTO THE FUTURE

CONTENT

TRADE SHOW ATTENDANCE	
2021/ 22	4
EDITORIAL	
Uwe Lorenz – Managing Director Dunkermotoren GmbH	6
NEWS	
New Main Catalogue	7
Dunkermotoren presents extensive webinar program for 2021.....	7
Configurator and webshop - configure online and order directly.....	10
3D models in the configurator - quick, easy and available online at all time	11
The success story continues.....	14
Dunkermotoren presents new railway encoder.....	15
Drive technology from Dunkermotoren in the EPLAN Data Portal	16
Play, fun and excitement with motor technology from Dunkermotoren.....	17
DUNKERMOTOREN AND MAE	
Dunker and MAE grow closer together – How?	18
The BB 42 - 73 mm blower – In the fight against Covid-19.....	20
BB 42 blower with integrated electronic	22
Cost-effective stepper motors - Made in Europe!.....	23
FACTS & FIGURES	24
INSIGHTS	
With drive into the future - Interview Uwe Lorenz & Tobias Pfendler	25
Dunkermotoren acquires 100% of the shares in EGS Automation	29

CONTENT

LOCATIONS	
MILAN – European Headquarters of MAE and Dunkermotoren Italy	30
ENGINEERING	
Interview: Development projects at Dunkermotoren.....	33
SEGMENTS – LOGISTICS & ROBOTICS	
Logistics & Robotics – our fields of application at one sight.....	36
Acknowledge the Smart Warehouse with Dunkermotoren.....	38
Dunkermotoren supplies centerpiece for mobile robot platform "Horizon XIX" from Frankfurt University of Applied Sciences.....	40
PRODUCTS	
Let us introduce: nexofox – our brand for Systems & Services	42
Dunkermotoren presents new IIoT brand "nexofox" on the market and thus goes beyond the boundaries of drive technology	44
Decentralization is a finished concept! Revolutionize your automation topology with MotionCode.....	44
Smart Motor Control Platform - the future is here.....	45
Dunkermotoren is the first drive technology manufacturer to integrate certified PROFINET with PROFIdrive in servo motor.....	48
Dunkermotoren "Safe Torque Off" (STO) certified	48
EtherCAT with distributed clocks	49
Dunkermotoren joins ODVA and starts product launch of Ethernet/IP for its BG series	49
BG 65 SI vs. BG 65 dMove - BG 75 PI/ CI/ MI vs. BG 75 dPro	49
IMPRINT.....	51



TRADE SHOWS

TRADE SHOWS

TRADE SHOW ATTENDANCE 2021/ 22

SPS SMART PRODUCTION SOLUTIONS	
Nuremberg, Germany.....	11/23 – 11/25/2021
AGRITECHNICA	
Hanover, Germany.....	02/27 – 03/05/2022
ALL ABOUT AUTOMATION	
Friedrichshafen, Germany.....	03/08 – 03/09/2022
LOGIMAT	
Stuttgart, Germany.....	03/08 – 03/10/2022
LIGHT & BUILDING	
Frankfurt, Germany.....	03/13 – 03/18/2022
HMI	
Hanover, Germany.....	04/25 – 04/29/2022
SMART INDUSTRIES	
Paris, France.....	05/17 – 05/20/2022
SPS SMART PRODUCTION SOLUTIONS	
Parma, Italy.....	05/24 – 05/26/2022
AMB	
Stuttgart, Germany.....	09/13 – 09/17/2022
MOTEK	
Stuttgart, Germany.....	10/04 – 10/07/2022
SPS SMART PRODUCTION SOLUTIONS	
Nuremberg, Germany.....	11/22 – 11/24/2022
SIDO	
Lyon, France.....	tbd.
ENGINEERING DESIGN SHOW	
Friedrichshafen, Germany.....	tbd.



EDITORIAL

DEAR READERS,

You are holding a new issue of our magazine "mo" in your hands, which fills us with pride. This issue represents a very special issue for Dunkermotoren. Firstly, we introduce you our sister company MAE. MAE and Dunkermotoren have been working closer together since the beginning of 2020 and have already been implementing various projects together before. Therefore, in this issue, we would like to introduce our expanded product portfolio to you. On the other hand, we announced the integration of the Donaueschingen-based company EGS Automation on March 01, 2021. For us, the acquisition represents a unique opportunity to further strengthen the competencies of both, Dunkermotoren and EGS Automation.

As another major highlight, we are pleased to launch our new brand "nexofox". Under the brand "nexofox" we will offer you a wide range of system

solutions and services in the fields of automation, networking and Industrial Internet of Things. With a newly created team we offer you the full competence to integrate our smart motors into your ecosystem and to realize state-of-the-art automation solutions. Part of this networking are the Industrial Ethernet and bus interfaces. Since this year you can get our complete BG series from 4 to 3,900 W with CANopen, EtherCAT, PROFINET or EthernetIP interface. As an additional feature for our smart motors (BG dPro series with Industrial Ethernet interface) a safety function (Safe Torque Off) is integrated in the motor.

Be curious about our topics and a concentrated bundle of highlights.

I hope you enjoy reading this issue.

Yours Uwe Lorenz,
Managing Director Dunkermotoren GmbH



NEWS

NEW MAIN CATALOGUE

Either send a short mail with your contact details and the desired quantity to: Sales.Dunkermotoren@

ametec.com or fill in the order form at: <https://www.dunkermotoren.de/kontakt/bestellung-gesamtkatalog> and we will deliver our catalogue to your desired location free of charge.



DUNKERMOTOREN PRESENTS EXTENSIVE WEBINAR PROGRAM FOR 2021

Already at the beginning of June, Dunkermotoren started its first webinar series for the year 2021. Michael Burgert, opened up the series "With Dunkermotoren to the Smart Factory" with an introductory train-

ing on the topic of smart motors and presented our portfolio in the field of brushless drives. The entire webinar block "With Dunkermotoren to the Smart Factory" dealt with different functions and possibilities for the programming and application of the intelligent BG motors. With these webinars we offered insights into the IIoT capability of our motors and an outlook on what customers can expect in this area in the future.

Further webinars will follow in October and November with the series "Experience Dunker-

motoren's Drives" and "Smart Motors for Smart Factories." In October, the presentations are aligned specifically to individual markets. The webinars in November will focus on bus and Ethernet interfaces. All webinars are free of charge for all participants.



NEWS

An overview of the individual topics can be found here:

EXPERIENCE DUNKERMOTOREN DRIVES				
Dunkermotoren - Drive Solutions for Mobile Intralogistics Solutions	Michael Basler	10/07/2021	03:00 p.m. – 03:30 p.m.	English
Dunkermotoren product partner for SIMATIC MICRO-DRIVE Teil 2: Intralogistic	Matthias Tidelski	10/12/2021	10:00 a.m. – 10:30 a.m.	English
IoMT - Internet of Medical Things: New Horizons of Drive Technology	Holger Tröndle, Markus Weishaar	10/14/2021	03:30 p.m. – 04:00 p.m.	English
Robotic Solutions EGS Automation – productive, qualitative, robotive!	Heiko Röhrig	10/21/2021	03:30 p.m. – 04:00 p.m.	English
Smart motors for smart agri-bots	Markus Fechtig	10/27/2021	03:30 p.m. – 04:00 p.m.	English

NEWS

SMART MOTORS FOR SMART FACTORIES – WITH BUS- AND ETHERNET INTERFACES TO A CONNECTED FACTORY				
Dunkermotoren for PROFINET	Peter Mittermeier, Michael Burgert	11/04/2021	03:30 p.m. – 04:00 p.m.	English
Dunkermotoren for EtherCAT	Alexander Haberstroh, Michael Burgert	11/09/2021	03:30 p.m. – 04:00 p.m.	English
Dunkermotoren for Ethernet/IP	Alexander Haberstroh, Markus Weishaar	11/11/2021	04:00 p.m. – 04:30 p.m.	English



REGISTER NOW: [HTTPS://WWW.DUNKERMOTOREN.COM/EN/WEBINARS](https://www.dunkermotoren.com/en/webinars)

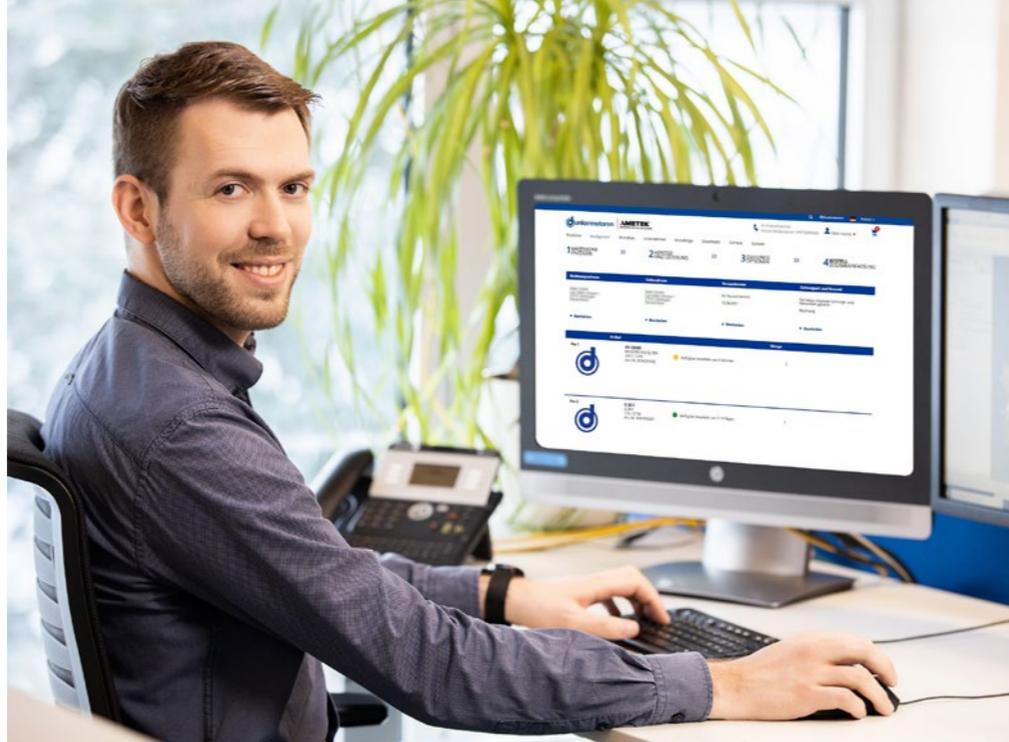
NEWS

CONFIGURATOR AND WEBSHOP - CONFIGURE ONLINE AND ORDER DIRECTLY

FACTS:

- » Shop is available in 52 countries
- » Approx. 133,000 product combinations can be ordered via the shop
- » 844 product combinations of our stock program available within a few days
- » Payment options: Prepayment, invoice, credit card, PayPal
- » Possibility to order matching or loose accessories such as cables etc.
- » Availability of the stock program is checked live

Since the beginning of April, the new online shop is available on the Dunkermotoren website. The new shop is based on an online product configurator that was already integrated into the website in 2018. This enables shop visitors to find the perfect drive out of 133,000 possible configurations online, check availabilities and order directly. The matching drive



specifications and 3D models can also be downloaded directly.

The shop does not only offer a great overview of Dunkermotoren's product portfolio for new customers, but also allows existing customers to order their products easily and quickly. Existing customers can register with their customer number so that individual conditions and agreements are applied automatically in case of an order via the Webshop. Known article numbers can be entered directly and a history of previous orders can be viewed in

the individualized dashboard, regardless of whether they were placed via the shop or through our sales department.

In this context, the express production for Dunkermotoren products will further be expanded. Currently, almost 2,000 items from the stock program can be configured, ordered and delivered within a few days. The new online shop is available immediately for Europe and some other countries at <https://shop.dunkermotoren.de>. A separate store solution is currently being developed for the USA and China.

NEWS

3D MODELS IN THE CONFIGURATOR - QUICK, EASY AND AVAILABLE ONLINE AT ANY TIME

With currently approx. 20 million possible product combinations in a power range from 1 - 3,900 W, including 133,000 in the preferred series, our online configurator offers suitable drive solutions for your requirements.

WHAT DOES OUR CONFIGURATOR OFFER TO YOU?

The configurator provides specifications and characteristic curves for the entire drive unit of your selected product combination. Since 2020, a 3D view is also available for the entire combination. The process is described below.

PROCESS:

1. Enter the required parameters in the configurator, e.g. torque, speed, voltage supply, or directly search for the required series:

2. Select a combination and click "continue" to be forwarded to the Product details.

#	<input type="checkbox"/>	Component	Power	Speed	Torque		
1	<input type="checkbox"/>	KDDR 52,1 PLG 52	230 V i = 8	5 W	150 1/min	0,27 Nm	CONTINUE
2	<input type="checkbox"/>	KDDR 52,1 PLG 52	230 V i = 64	5 W	18,8 1/min	1,92 Nm	CONTINUE
3	<input type="checkbox"/>	KDDR 52,1 PLG 52	230 V i = 512	5 W	2,34 1/min	13,89 Nm	CONTINUE

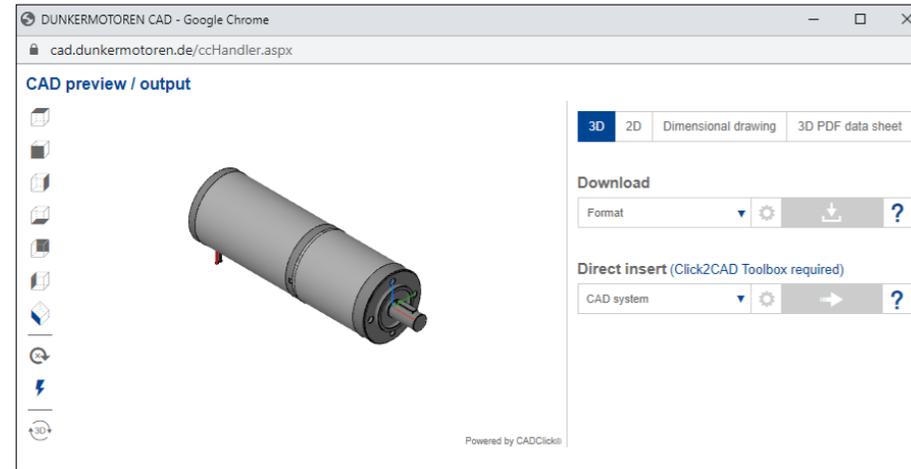
3. The details page provides a specification and characteristic curve for the overall drive. For the 3D view, click on the "3D View" button at the bottom left.

Motor-Gearbox Combination	
Nominal Speed	253 1/min
Nominal Torque	1,09 Nm
Stall Torque	6,93 Nm

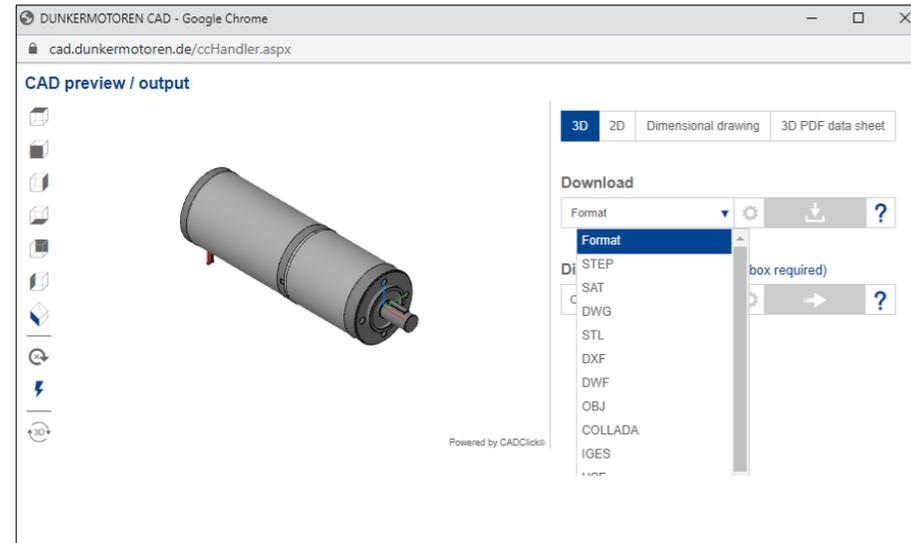
[3D View](#) [Request Combination](#) [Back to Overview](#)

NEWS

4. The 3D window opens up, where you can download different 3D and 2D versions, as well as dimensional drawings and complete PDF data sheets. On the left edge you have the option to display the drive in different views:



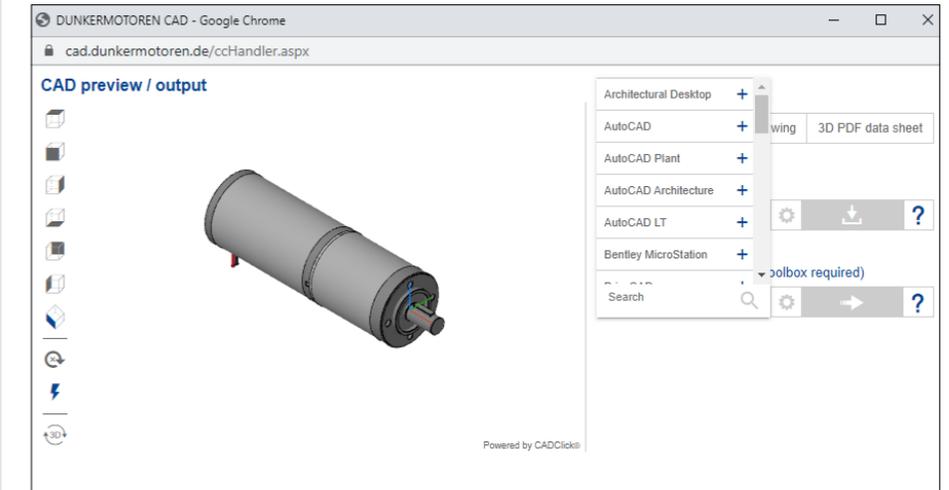
5. Download the 3D file here in your desired format.



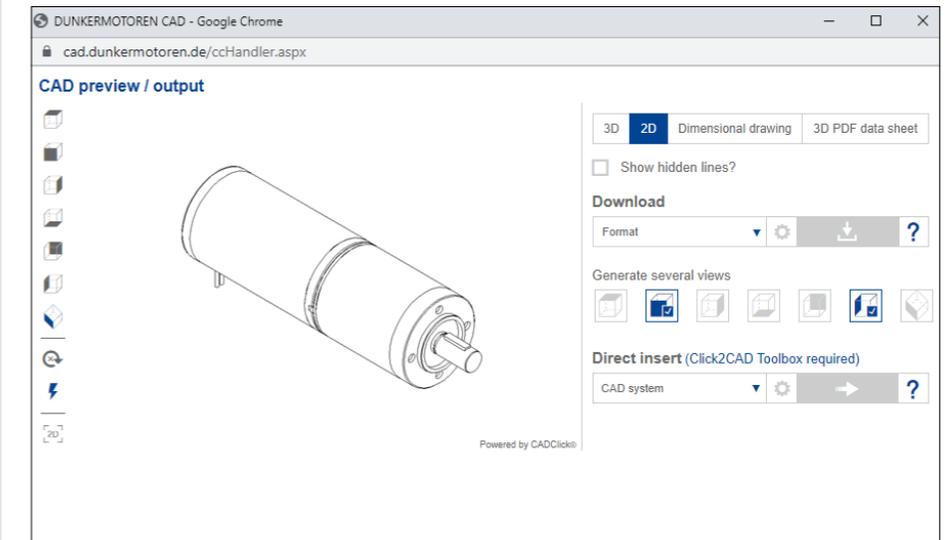
NEWS



6. Or transfer the 3D file directly into the CAD system you are using.



7. The 2D models can also be generated in different views. The 2D file can also be downloaded in various formats or transferred to the CAD system directly:



Visit our user-friendly online 3D configurator on our website and find the perfect drive solution today!



NEWS

THE SUCCESS STORY CONTINUES

EVEN PRODUCTS THAT HAVE SET STANDARDS FOR THEIR TIME IN TERMS OF PERFORMANCE AND COST-EFFECTIVENESS HAVE TO BE ADAPTED TO CHANGING REQUIREMENTS DURING THEIR LIFE CYCLE

The previous basic versions of the BG 65 and BG 65S, which are prepared for the combination with an external controller and equipped with Hall sensors for commutation and simple control and positioning tasks, have been reworked. The new designations are BG 65 **dCore** and 66 **dCore**. But what is the difference between the two versions? The BG 65 **dCore** is an extremely economical solution, while the BG 66 **dCore** is characterized by a higher power density.

With the Motor Control Platform, Dunkermotoren has created a basis that includes modern connection technology. These connectors are now also adopted for the BG 65 **dCore** and BG 66 **dCore**. This is a single-plug solution in hybrid design. Large cross-sections are used for power supply and small cross-sections

for signals. This allows high currents to be transmitted without connectors and cables becoming bulky. If motors with integrated controllers such as the BG 66 **dPro** are used in machine concepts in addition to the BG 65 **dCore**, the same mating connectors can be used for the cables.

The hybrid connector used can transmit effective currents of up to 25 A. This means that products such as the BG 66x75 **dCore** can also fully exploit their dynamics and be driven to the thermal limit. Following the BG 65/66 **dCore**, the BG 75 is redesigned without an integrated control system. As a result of the redesign, the BG 75 will also have a new product name - BG 75 **dCore**. Because of the higher performance, a larger connector is required for this. This will also be a one-plug solution that is already used in the BG 75 **dPro**.

PERFORMANCE GAIN

By improving the magnetic circuit, 20% more output power is achieved, and this with the same installation space. Thanks to the improved winding technology, particularly slim and powerful drives for low voltages are now possible. The most powerful version is the BG 66x75 **dCore**, which, when operated at 48 V, delivers a continuous torque of approx. 0.84 Nm and an output power of 274 W, and even 732 W for a short time. A 24 V version is already in preparation. This is ideal for battery-powered applications such as automated guided vehicles (AGV/AMR). The cor-

responding gearboxes to achieve the relatively low speeds and high torques are already available. The PLG 63 planetary gearbox and NG 250 hub gearbox are recommended for inline design, while the SG 120 worm gearbox and KG 80 bevel gearbox are recommended for right-angle output.

SIGNALS

Like their predecessors, both series include integrated hall sensors. In the BG 66 **dCore** series, a high-resolution encoder with 1,024 cpr or 4,096 pulses is integrated additionally. Coupled with appropriate controls, this encoder ensures precise speed control even at low speeds and high positioning accuracy. In times where safety is a top priority, the two encoder systems - hall sensors plus high-resolution encoder - can be used for redundant and, thus, safe design.

THE RIGHT EXTERNAL CONTROLLER - BGE 5510 **dPro**

The BGE 5510 **dPro** controller, which is also based on the Motor Control Platform, is perfectly tailored for operating with the BG 65 **dCore** and BG 66 **dCore**. In addition to the standard functionalities and bus interfaces such as CANopen, EtherCAT and PROFINET, the controller optionally offers STO functionality.

Author: Stefan Tröndle – Product Manager

NEWS

DUNKERMOTOREN PRESENTS NEW RAILWAY ENCODER

With the ME 52 RR, Dunkermotoren presents a magnetic encoder that meets the requirements of the railway industry according to EN 50155. As a further development of the ME 52, the new magnetic encoder fits perfectly into the modular system of the motor manufacturer. Together with the other modular components, this enables a 100% matched drive unit for rail applications. The robust design complies with the fire behavior requirements of EN 45545-2-2013 and offers optional protection up to IP 65. The encoder handles voltage ranges from 4.5 V to 34 V for the complete ambient temperature range from -40°C to 85°C.

With integrated ESD protection, the ME 52 RR meets the EMC requirements according to DIN EN 50121-3-2, making it the perfect addition to your drive unit in the railway sector.





DRIVE TECHNOLOGY FROM DUNKERMOTOREN IN THE EPLAN DATA PORTAL

The availability of 3D models and thus easy and quick integration into CAD systems was not a market standard in drive technology around 15 years

ago. Dunkermotoren recognized the trend back then and has been offering this service to its customers for the entire product portfolio ever since. The great demand for smart motors (DC servomotors with integrated positioning controllers, motor feedback and industrial bus interfaces) and the associated connection technology has created new requirements among users. Dunkermotoren recently started offering electrical CAD macros on the EPLAN data portal. This means that macros

from motors, external drive controllers and connection cables can be quickly and easily integrated into the electrical circuit diagram. As a result, the circuit diagram is not only created in a significantly shorter time, but also enables the designer to view all the relevant product data stored there in the Data Portal.

Simple integration of drive technology made by Dunkermotoren.

NEWS PLAY, FUN AND EXCITEMENT WITH MOTOR TECHNOLOGY FROM DUNKERMOTOREN

TABLE SOCCER IMPLEMENTED WITH LINEAR MOTORS

With the demand to create an attractive and compact exhibition demonstrator using linear motors, Dunkermotoren employees started to search for interesting suggestions. The clear favorite was the German's favorite game - soccer.

The Furtwangen University was chosen as a suitable partner for implementing the idea. Surprisingly, the Department of Industrial Engineering "WING" applied for the rather complex project and was awarded the contract.

The WING faculty can cover all the disciplines required.

1. Mechanical and electrical engineering design
2. Industrial design
3. Software
4. Project controlling

The previous experience with the Arduino Uno mini-computer was an advantage for the realization of the project. This allowed the team to set the axes in motion very quickly. The implementation was carried out by a team of six persons (five students and the supervising professor) with changing participants over two semesters.

The game is played man against man. The axial movement is realized by the linear motor module SM 11. The full dynamics, (acceleration up to 156 m/s² and speed up to 10.8 m/s) of this motor cannot be fully exploited in the game, as this would overwhelm the players. The rotational movement (the shot) is implemented by a small brushless and ironless motor with attached gearbox. The BGA 22 with the PLG 22, only 22 mm in diameter, accelerates strongly and has a "decent thump". The smooth running of the linear and the rotary

drive further improve the gaming experience. The players can concentrate on the game and are not disturbed by technical noises.

To meet the needs of players with different levels of training, three different performance classes can be selected (Sunday-/ Premier-/ Champions League).

The Playstation 4 is used as game controller and the signals are transmitted to the mini-computer via Bluetooth. The computer then communicates with the control cards of the motors (BGE 6010A sin/cos for the SM 11 and BGE 6005A for the BGA 22) and also controls the counting of the goals and supplies the display with the score. To avoid manual intervention in the game and to increase comfort, the ball boy has also been automated. The ball is returned via appropriate channels, which were partially produced using rapid prototyping. This is automated by another BGA 22 with PLG 22 and BGE 6010A, which kicks the ball back into play. With so much joy of playing, the goal celebration is guaranteed.



DUNKERMOTOREN AND MAE GROW CLOSER TOGETHER - HOW?

AN INSIGHT INTO DIFFERENT AREAS OF BOTH COMPANIES

Since the beginning of 2020, Dunkermotoren and its Italian sister company MAE have been cooperating even more closely. Like Dunkermotoren, MAE belongs to the American technology group AMETEK. Both companies have already cooperated in recent years, for example at trade fairs. This cooperation results in a significant expansion of the product portfolio for the customers of both companies.



TOBIAS PFENDLER,
HEAD OF
PRODUCTS &
SYSTEMS:

"In the area of Marketing, Dunkermotoren and MAE have been working together for some time. Due to its sales structure, our sister company MAE has hardly integrated any Marketing activities into its daily business. MAE has so far supplied only a few customers, but with very large series orders. Dunkermotoren, on the other hand, has positioned itself broadly in the market and offers high-quality drive solutions, in a modular system, from a single

source, starting from quantity 1. In order to utilize existing resources, the cooperation in the area of marketing has intensified. Since 2018, MAE has its own product catalog, which was created with support from Bonndorf. Meanwhile, the new website is also supported from Bonndorf with content and search engine advertising. PR, as well as trade fair appearances are also handled entirely in Bonndorf. In 2021, MAE news will also be included in the Dunkermotoren newsletter. From a product strategy perspective, MAE is expanding its portfolio through the modular system, and Dunkermotoren is benefiting from the stepper motors from Italy."



MARKUS VALENTIN,
VICE PRESIDENT
SUPPLY CHAIN
MANAGEMENT:

"In accordance with the principle of "best practice", we in Supply Chain Management also orientate ourselves to topics that have been introduced in the best possible way in each other's company. A mutual exchange is beneficial for both sides. Both, Dunkermotoren and MAE, have different expertise in supplier parts. In purchasing, the cooperation

broadens the view - an "I" becomes a "we". For example, MAE installs significantly more ball bearings than Dunkermotoren and thus has a strong position. Due to the stamping shop, which used to be part of MAE, the market access from our Italian colleagues for sheet metal is much better. Dunkermotoren, on the other hand, has a better supplier structure in electronics and gear parts - so it is a give and take. When everyone is open to see the benefits, projects like this work best. We work together as equals. That's what makes cooperation fun."



ANDREAS WINTERHALDER,
HEAD OF
PRODUCTS:

"For everything beyond the motor, we can help our Italian colleagues to further develop their products. Currently, MAE motors are combined with gearheads or encoders from Dunkermotoren. For Dunkermotoren, the lower cost stepper motors offer the possibility to cover a clientele that could not be served before. From an R&D perspective, MAE's stepper motors, with their high torque and small volume, offer

great development potential." Good to know: Dunkermotoren has continued to expand its electronics development over the past decades. From pure motors, to mechatronic development and combined with gearboxes, to smart BLDC motors with integrated electronics. Often, the same components are installed so that the Motor Control Platform can be used and synergy effects can be exploited. Joint projects such as the BB 42 - a blower with external rotor motor - are already in process. Furthermore, both R&D departments are working on a modular system in which stepper motors can be combined with electronic systems.



CLAUS KAIMER,
VICE PRESIDENT
SALES &
MARKETING:

"Currently, we are in the process of aligning the companies' sales processes. At Dunkermotoren, we have spent a lot of energy over the past few years analyzing the market segments in detail and developing their strategic

processing. We have now integrated MAE's customer and project data into Dunkermotoren's CRM system. It helps us to win more projects, prepare production capacities accordingly and derive long-term forecasts for the future. With combined sales forces and the additional combination possibilities of Dunkermotoren products with MAE products, both sides have even better market access."

The following products can be purchased from both sales divisions:

- » BLDC and DC motors
- » Stepper motors
- » AC motors
- » Universal motors
- » Linear systems
- » Planetary and worm gears
- » Brakes and encoders
- » Brushless blowers

Tobias Pfendler, Andreas Winterhalder, Claus Kaimer and Markus Valentin reveal how the cooperation is taking shape internally at Dunkermotoren and MAE.

THE BB 42 - 73 MM BLOWER – IN THE FIGHT AGAINST COVID-19

FROM THE FIRST IDEA TO THE FIRST
USAGE AT CUSTOMER'S APPLICATI-
ONS

It was during the first lockdown in April 2020 when one of the MAE's engineers was sitting at home in Germany and following the news reporting the dramatic situation in Italy's hospitals. They were showing the lack of ventilator systems to treat the corona patients. As a manufacturer of motors and blowers, the MAE engineer asked himself – "Why not design and manufacture a blower that can be used for a ventilator?"

A suitable small motor design already existed in the MAE portfolio – the BL 42, and suitable fan components were available from our US sister company DFS, plus an existing controller design within Dunkermotoren. The idea was born to use these existing components and combine them to

create a new blower design for use in hospital ventilators. The MAE BL 42 motor was designed for professional hairdryers. The fan stage from DFS was already used in industrial applications worldwide and the Dunkermotoren controller was produced in combination with the Dunkermotoren BG 45 KI motor.

The Dunkermotoren/MAE management was excited when the idea was brought to their attention. MAE's Engineering team took over the leadership on the project. It was new for all engineers to work on this project from their home offices; remote working and online team meetings were used to advance this project.

The BL 42 motor which was designed as a 230 VAC motor was recalculated and adapted to work at 24 VDC. A new motor housing was designed to allow the assembling of the existing fan housing and hall sensors have been added to the stator design to allow a precise control of the motor. The DFS fan stage was reworked to fit the motor shaft of the BL 42 motor. In parallel, the Dunkermotoren engineering already analyzed and tested the BGE 45 KI controller with the new blower prototype

which was built in record time to achieve proof-of-concept, with rigorous testing for functionality and proof of controller design with 40,000 rpm motor speed. While the entire project and close cooperation were a new situation for all team members, the collaborative efforts produced a great result.

During the test phase of the new blower, other competitor products were bench-marked. The team was convinced from the blower's behavior. There was just one parameter - the acceleration time, where we realized a performance lack compared to competitor products. The acceleration is very important for a ventilator as the blower must follow the exact breathing pattern of the patient. Despite having limited prior experience with those applications, three months after the first idea we provided the initial blower sample to a potential Italian customer.

It turned out that that due to the external rotor motor design of the BL 42 we cannot meet the acceleration and deceleration requirements of a hospital ventilator, which was the design disadvantage compared with our competitors using in-

ternal rotor motor designs to drive the fan stage. Now it was clear the blower cannot be used in a ventilator, but the test showed that the blower has superior performance benchmarked with competitor products when it comes to:

- » Excellent air-performance
- » Minimal temperature increase of the working air outlet
- » Low noise emission
- » High speed operation up to 45,000 rpm
- » Power to size & weight ratio
- » Simple design which reduces the production cost
- » Simple manufacturing process

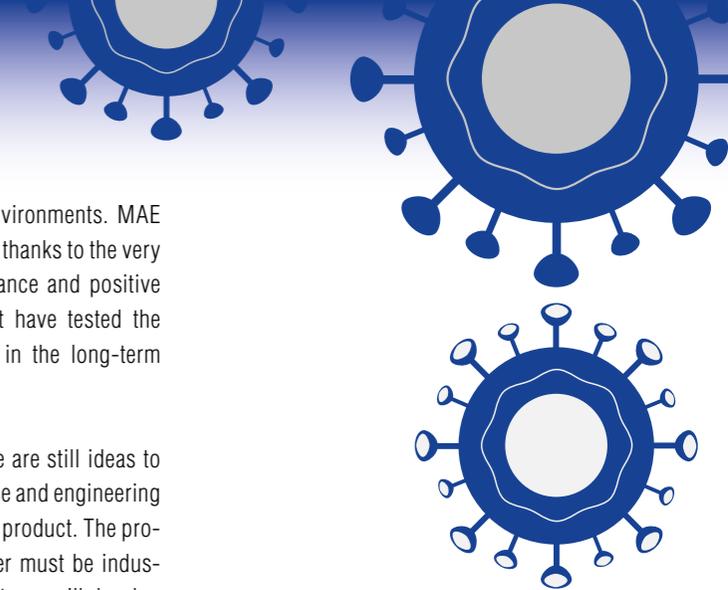
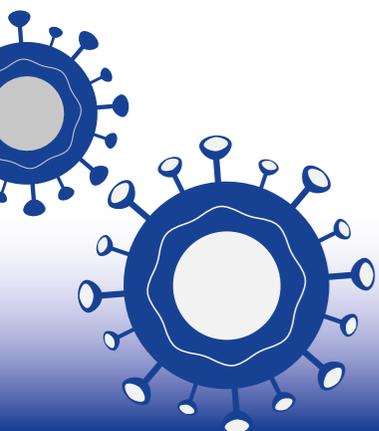
MAE has now sampled various customers looking to utilize the above properties of the new blower in different medical and industrial applications. MAE received very encouraging customer feedback and the first 2,000-piece production order was received before Christmas from a customer using the blower in a portable air disinfection system fighting Covid-19 in ambulances,

hospitals and other critical environments. MAE failed with the original idea but thanks to the very good overall product performance and positive feedback from customers that have tested the BB 42 blower, MAE believes in the long-term success of the BB 42.

Not all work is done yet. There are still ideas to improve the blower performance and engineering is working on fine tuning of the product. The production line to build the blower must be industrialized. In parallel, Dunkermotoren will develop a new integrated controller for the BB 42 blower. With the BB 42 a new product derived from a fast R&D response has now entered the market.

This speed of concept to realization was only possible by close cooperation and the resources available to an organization like AMETEK, where three business units could harness the available tools to deliver a great result.

Are you interested in the BB 42 - 73 mm for your application? If so, please get in contact with MAE. We look forward to helping deliver the perfect solution for your system requirements!



DUNKERMOTOREN & MAE

BB 42 BLOWER WITH INTEGRATED ELECTRONIC

In addition to the existing BB 42 (with integrated electronics for 230V AC), the MAE team developed a new DC low-voltage controller.

BB 42 high-power blower with integrated controller is designed to be plug and play, with only a DC-supply or a Battery connection required. The blower can be run from min 3 and up to 8 lipo-cells (roughly 9 - 40VDC) with power of up to 150 W within the small package size facilitated by high rotational speed (45k rpm), while highly efficient electronic commutation provides class leading total package efficiency. Furthermore, the speed can be set with a simple analog input.

Thanks to the smart design the blower with integrated electronic controller was created within the same package size as the version without controller, and the integrated controller offers blower protection against potential misuse.

The electronics has speed output signal capability to provide air-performance related feedback.

Due to the integration of the electronics within the blower housing, the system cost and engineering effort to utilize the blower is minimized. The efficiency of the complete system was optimized during the development phase with MAE engineering which took significant efforts to minimize the sound output level. As a result, the overall system efficiency and vibration level for the BB42 blower is state of the art.

THE BL 42 MOTOR WITH OR WITHOUT INTEGRATED CONTROLLER

During the development of the BB 42 Blower MAE Engineering discovered that the motor initially designed for air movement applications is also highly suitable for motor only applications, running from 3,000 rpm to 6,000 rpm. These are ideal conditions for pump and basic automatization applications. The motor is designed to mate with planetary gearboxes PLG 30 or PLG 32 and magnetic or optical encoders (e.g. RE 30). Initial customer programs have been sampled with motor/blower versions both with and without controller.



COST-EFFECTIVE STEPPER MOTORS - MADE IN EUROPE!

Reducing dependencies on complex global supply chains is again in focus for many companies - this is where MAE's European-made stepper motors come in handy.

MAE, Dunkermotoren's Italian sister company, is one of the last volume manufacturers of NEMA stepper motors with European production. In the current situation, where many companies are questioning the status quo of their supply chains, those manufacturers are higher on the agenda than ever before. In addition to the security of supply and the ability to plan, which are extremely important for many customers, sustainability is also improved, with the cost level practically unchanged.

The 2-phase hybrid stepper motors with a step angle of 1.8° are available in Nema 17, 23, 34 and 42 sizes. This enables holding torques of up to 12 Nm in a compact design. Within the last few years, the Nema 17 and Nema 23 sizes have been completely technically revised and are now a benchmark on the market in terms of performance.

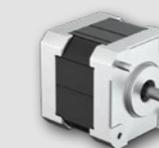
If required, planetary gearboxes, brakes and encoders can be combined with the stepper motors from



the Dunkermotoren modular system which was recently expanded by the new high-resolution and cost-effective encoder RE30-2-4000 with 4,000 increments on two channels plus index. Through the support of our technical team, customer-specific adaptations to the shaft, cable, connector, IP protection or other technical features can be made at any time.

Programmable controllers of various types are also available to complete the drive solution. Further integrated stepper motor controllers, from the low-cost Step & Direction RS485 controller to the high-end closed loop controller with Industrial Ethernet interface and Safe Torque Off functionality are being implemented and will be available soon.

Currently, the stepper motors can be purchased for projects starting at an annual demand of 200 units. From the end of 2021, a selection from the stepper motor portfolio will also be available for small quantities from Dunkermotoren's stock program with a delivery time of approx. 3 days. For further technical information and quotations on the stepper motors, please contact your Dunkermotoren sales representative.



FACTS & FIGURES



MATERIAL CONSUMPTION 2020



1991: 30 years ago Dunkermotoren was the first small motor manufacturer to be certified according to DIN ISO 9001



10 years ago Dunkermotoren acquired Copley Motion Systems, introducing Linear Systems to Dunkermotoren



Our subsidiary in Serbia celebrates its 10th anniversary in 2021



Go Live Online Shop 2.0 - April 06, 2021



In 2021, Dunkermotoren hosts 32 webinars in different languages



In 2021, Dunkermotoren organizes its international sales kick-off online for the first time

INSIGHTS

WITH DRIVE INTO THE FUTURE

BY CHIEF EDITOR ERIK SCHÄFER, KONSTRUKTION & ENTWICKLUNG

How is Dunkermotoren working on the future in the Corona crisis? Managing Director Uwe Lorenz and Head of Products and Systems Tobias Pfendler provide answers in an exclusive interview with "Konstruktion & Entwicklung".

Mr. Lorenz, "a crisis decelerates" is what you said in light of the first Corona pandemic lockdown in 2020. How did your company take advantage of this deceleration?

Uwe Lorenz: Deceleration is always relative. I think the pandemic has decelerated on the one hand and accelerated on the other. Dunkermotoren gained experience at an early stage and in good time, especially due to its global positioning, before the pandemic spilled over into Europe. We were able to see what was being done in China, how the virus was spreading. That's why we put the protection of our employees first and foremost. In terms of the company and technology, we were able to slow things down. We were in the office and formed a crisis team. It was all about dealing with the pandemic, protecting our employees, but also protecting the company, the substance. Acceleration: We have consistently and sustainably driven forward our Strategic

Plan 2025, which we drew up well before the crisis - at the beginning of 2019. That's why I'm talking about acceleration. We used the deceleration to do our homework and drive forward our strategic alignment, with digitalization at top of the agenda. It's important for me to mention that we already established a project team in 2019 that reports directly to me, with the task of leading Dunkermotoren into digital transformation. We have driven this topic forward consistently and well.

In 2020 - a time of uncertainty due to Covid-19 - Dunkermotoren celebrated its 70th anniversary. What do you think are the three most important lessons learned from these 70 years?

Uwe Lorenz: What we found very unfortunate is that we were not able to celebrate the 70th anniversary in person with our employees and our close business partners. Nevertheless, we did not miss the opportunity to review the chronology and history of the company and share it with our colleagues - including facts and anecdotes takes placing in such a company history. The Dunkermotoren company and all the employees are very proud of their past and their origins. I also pay a lot of attention to this history. The company's innovation compass of these 80 years has shown that we have worked forward-looking after the war and have shaped the future through innovation. This will of innovation encourages us to continue on this path into the future. Let's get back to the missed 70th anniversary

celebration: It is important to celebrate with personal contacts and conviviality, and that's why we have firmly resolved to make up for it.

„We have consistently and sustainably driven forward our Strategic Plan 2025, which we drew up well before the crisis - at the beginning of 2019.“

Tobias

Pfendler: I don't have much to add. We have invested a lot of time in documenting the company's history. It was interesting to see how many things repeated in the company's history. It was nice to see that from the very beginning, the company has continuously been moving forward with groundbreaking innovations.

Digitalization is the big topic in the industry. In 2020, you took part in



INSIGHTS

sps connect for the first time with a virtual trade show booth. What expectations did you have?

Tobias Pfendler: I didn't have too high expectations - even in advance. I think it needs to be said: It was rather sobering. But this probably applies to all previous digital trade shows. I think we're all looking forward to the time after Corona, when there will be "real" trade shows again.

Uwe Lorenz: I can confirm what Mr. Pfendler said. But on the other hand, we are all learning. In my eyes, our virtual trade show booth, which is also available on our homepage, is successful - it fits the times. Many digital events that took place were certainly not that good yet, because the situation changed very abruptly and was completely new. But the combination of traditional, classic trade show contact and the digital - not necessarily virtual - new world is something we will have to include in what we do. I'm sure there's an ambidexterity and we'll have a good combination of the active, classic trade show and the digital world which we need bring forward with a virtual trade show booth.

At your virtual booth, you will be showing, among other things, your BG series with IQ encoder, which is designed as a plug & play system for the SIMATIC MICRO-DRIVE servo drive system. Does this mean that you manufacture the motors for the Siemens SIMATIC MICRO-DRIVES? How do your customers benefit from your cooperation with Siemens?

Tobias Pfendler: The SIMATIC MICRO-DRIVE system is a great controller for DC applications with comprehensive safety functionalities like Profisafe profiles, but also like Safe Torque Off (STO), Safely Limited Torque (SLT) and much more. Another advantage of this system is the design via the TIA portal and the easy integration into the SIMATIC environment. Dunkermotoren offers a comprehensive portfolio for the MICRO-DRIVE controllers: Motors, gears, encoders and brakes.

All of this is perfectly matched to each other. The encoders are supplied with a digital nameplate, there are pre-assembled cables and so they are easy to operate plug & play. The whole thing is designed with a high IP65 protection class and is available from stock within a few days. This means that customers benefit from the cooperation and compatibility of the SIMATIC MICRO-DRIVE and Dunkermotoren systems.

Do you supply all motors for the SIMATIC MICRO-DRIVE-System?

Tobias Pfendler: There is one more manufacturer. But due to our broad portfolio in the entire performance range and a very good price-performance ratio we are able to convince.

Future now! Your sps trade show motto also conceals your efforts in the direction of IIoT, i.e., the networking of smart and energy-efficient motors. What is your agenda here?

Uwe Lorenz: On the one hand, it is to be a leader in the networking and connection of drive solutions, which is de facto behind it. That we are one step ahead with our intelligent motors - where we were also a pioneer with integrated electronics - and that we really offer networking for our customers and our applications across the board. We also recognized this point in good time, addressed it at an early stage on the basis of our intelligent drives, based on the Motor Control Platform. The software - our firmware - the integrated electronics and now, on top of that, the networking via IIoT, this is how we want to drive this system forward consistently, innovatively, sustainably and with foresight.

How far along are you on this path?

Uwe Lorenz: I would say very far along. We are one of the first members of the Open Industry 4.0 Alliance and are also part of (Siemens) MindSphere (World) and are involved in a number of topics there. We have initial pilots, both in our Smart Factory - in our value creation and production - and initial lead customer contacts.

Tobias Pfendler: We were already the market leader in smart motors and installed sensors and intelligence long time before the topic IIoT came into discussion. Thus, we already had the basis and can now focus on the device cloud.

In 2020, you joined the Open Industry 4.0 Alliance I just mentioned and also MindSphere World

INSIGHTS

e.V.. What was your motivation there and how does Dunkermotoren contribute to these two partner networks?

Tobias Pfendler: MindSphere is the preferred IIoT ecosystem for Dunkermotoren. It is the basis for the timely development and deployment of cloud-based apps and functionalities. We are among like-minded people in the Open Industry 4.0 Alliance, where we are driving standardization with the goal of enabling customers to easily use components from different manufacturers in the IIoT environment. I think that everyone can benefit from this - from small medium-sized companies to global players.

Safety, energy efficiency, integrability, communication capability between motor, edge and cloud - the demands on the motors of the future are increasing. Are these also the topics you want to drive forward in the two partner networks?

Tobias Pfendler: These are definitely the central topics. In the Open Industry 4.0 Alliance, it's about us improving compatibility and minimizing a usage barrier for machine and plant manufacturers. Without partner, we as Dunkermotoren would not be able to shape this. Basically, it's about making sure our customers don't have to worry about connecting motors and integrating our apps into their world - that's our job.

Uwe Lorenz: That was our drive many years before to realize safety, energy efficiency and integrability

in our motors. We see ourselves as a pioneer in this area, for example with integrated electronics, with the efficiency class, or in the area of sustainability. This is also what drives us to take the next step in networking, the cloud and digitization, and to help shaping and profit from these developments.

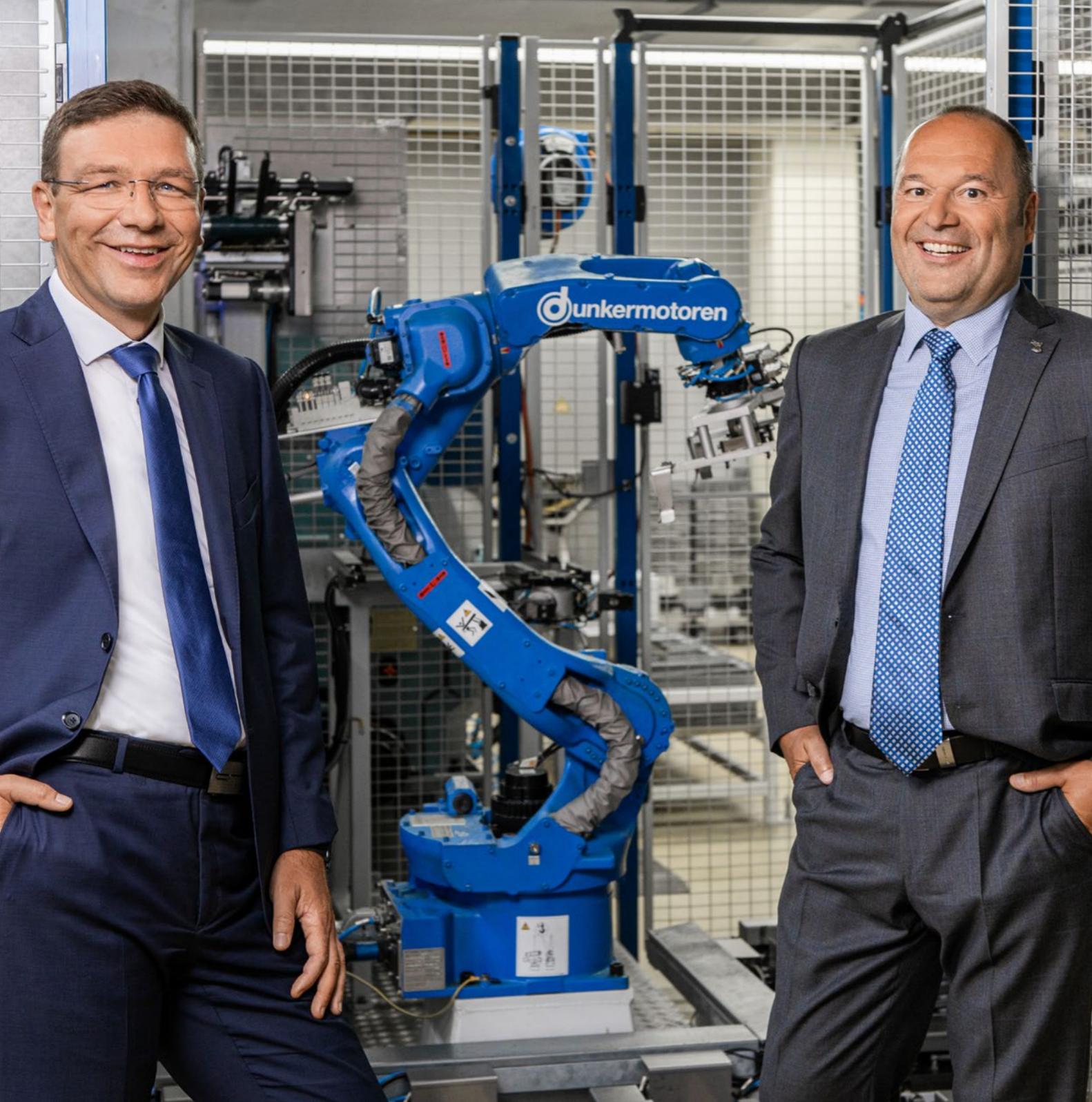
One question in conclusion: What question did you miss, or what should we go into in more detail?

„Dunkermotoren offers a comprehensive portfolio for the SIMATIC MICRO-DRIVE controllers: Motors, gears, encoders and brakes. All of this is perfectly matched to each other.“

Tobias Pfendler: I would like to talk about the benefits of IIoT solutions for our customers. The obvious thing is to use the data that our motors provide from the field for condition monitoring and predictive maintenance to forecast failures. These are added values that we already offer today. In the longer term, I also expect completely new business models, not only for us, but also for our customers, the machine and plant manufacturers. Again, we can only realize this together - in other words, commercialize it. The provision and sale of features through to pay-per-use of entire machines and production systems, these are completely new possibilities.

What we have in mind: If the machine builder implements such business models with his customers, he can obtain his core components from us with corresponding business models. We have no doubt that this will happen.





INSIGHTS

DUNKERMOTOREN ACQUIRES 100 % OF THE SHARES IN EGS AUTOMATION



BOTH COMPANIES STRENGTHEN THEIR COMPETENCE IN THE FIELD OF AUTOMATION

Dunkermotoren took over the automation specialist EGS Automatisierungstechnik on March 1st, 2021. With the acquisition Dunkermotoren took over 100% of the shares of EGS. In the meantime, the company EGS, based in Donaueschingen has been renamed to EGS Automation and will remain legally independent at the Donaueschingen site. The company's total of 54 employees are all taken over. With Dunkermotoren's headquarter in Bonndorf in the Black Forest, the two companies are only a short distance apart. For both managing directors, the acquisition represents a unique opportunity to further strengthen the competencies of their respective companies. For EGS Automation, Dunkermotoren opens up access to drive technology, which is an important component of future-oriented technology for EGS Automation's robot solutions. In addition, Dunkermotoren offers further market access through its international presence. With the acquisition of EGS Automation, Dunkermotoren strengthens its expertise in

automation technology. For the drive technology manufacturer, the industrial automation market is one of the most important markets of the future. Uniform concepts in the area of control, IIoT connectivity and cloud applications can be jointly developed and used by both companies.

Uwe Lorenz, Managing Director Dunkermotoren: "We as Dunkermotoren are very pleased about the cooperation with EGS Automation and look forward to a joint future. I am sure that certain exciting tasks are waiting for us. I am even more pleased to have found a great partner in the field of robotics from the region. For us, automation technology represents the growing market of the future par excellence."

Robert Eby, Managing Director EGS Automation: "I am very pleased about the cooperation with Dunkermotoren. As a result, my life's work will be preserved and further expanded. Together we are strong. We can use synergies in many areas. Starting with the training and further education of the employees up to the legal support of more and more complex future tasks in all areas. Being part of the extremely innovative and future-oriented Dunkermotoren family means security for us and offers us growth opportunities in the most interesting future markets in the areas of IOT and digitalization. A very big advantage is the spatial proximity and the home-like nature of the employees of both companies."

EGS Automation GmbH, founded in 1996 by Robert Eby, has grown from a one-man show into a 54-person company. In 1999, Robert Eby designed his first robot-based palletizing and loading system based on a Yaskawa robot. Today, the equipment is sold under the name SUMO Multiplex. In the meantime, EGS Automation also installs robots from Kuka and Epson.

Sales are divided equally between special machine construction and standard automation. The situation is similar for sales in the metal and plastics industries. In the field of Industry 4.0, EGS Automation has already been working with special sensors and communicating with higher-level ERP and MDE systems for more than 20 years.

Dunkermotoren, world market leader for integrated brushless DC servo motors with headquarters in the Black Forest, employs around 1,200 people worldwide. The company offers rotary and linear drive solutions from 1 to 4,000 W. In this context, the product portfolio includes brushless and brush DC motors, AC motors, linear systems, gearboxes, brakes and encoders.

Since January 2020, the Italian sister company MAE has also been cooperating closely with Dunkermotoren and has merged organizationally into one unit, expanding the product portfolio to include stepper motors and blowers. In 2020, the group achieved sales of over €300 million.



LOCATIONS

MILAN – EUROPEAN HEADQUARTERS OF MAE AND DUNKERMOTOREN ITALY

MAE, our Italian sister company has its plant in Peschiera Borromeo, in the outskirts of Milan, which is the second most popular city in Italy after Rome. With the city's strengths in finance, fashion, art, media, entertainment, design and education, Milan is more than perfect for tourism and has a lot to offer to every single type of visitor. You can visit a unique mix of modern high-rises, skyscrapers and centuries-old historical landmarks.

One of the most popular buildings to see is the iconic Duomo Cathedral. Taking hundreds of years to complete, it's beautiful and the largest church in Italy. A 15-minute walk away we can find Sforzesco Castle, once one of the biggest in Europe – built 500 years ago and still fascinating for citizens and millions of tourists every year. Not only architecture is interesting, if you pop inside you can visit exhibitions and explore artefacts. All around the city there are many masterpieces that you can only see in Milan, such as Leonardo da Vinci's "The Last Supper" and "The Marriage of the Virgin" at Pinacoteca di Brera.

Speaking about architecture and arts, we cannot forget Galleria Vittorio Emanuele II, one of the most stunning sights to see in Milan, with its luxury shops and fine dining restaurants, it's a must

to visit. Through the Galleria you can reach La Scala, the theatre. Built centuries ago, is a special place where the most famous ballets and operas take place.

If you fancy a little slice of Venice, then the Darsena Canal is worth going for a stroll. It's one of the best things to do in Milan if you want to take a break from the historical sites. You can walk around the banks and stop at the little cafes, bars and restaurants all along the route.

Seeing the Monumental Cemetery is another spot of Milan if you want to see some historic tombs and artistic mausoleums. As you can see, Milan can offer magical places and unique spots for a wide range of interests!

However, Milan is not only famous for these aspects, but also for its cuisine. In fact, the city has some classic dishes that you'll fall in love with. Traditional Milanese dishes are extraordinarily tasty, rich, and hearty, meant to help fight the damp and foggy climate. One of the region's most famous traditional Italian recipe is Risotto alla Milanese, that elevates a simple rice dish with one of the most regional ingredients – saffron.

The result is a silky smooth and vivid risotto in both colour and flavour. People say that it was invented by chance in 1574 thanks to a curious painter called "Zafferano" (Saffron), who used to add this yellow spice to his palette to make the colours brighter. During a wedding he added the spice to the rice as a joke, but surprisingly the dinner was

not ruined. The opposite was the case and one of the typical Italian dishes was born.

But Milan wouldn't be Milan without its Cotoletta alla Milanese, breaded and fried in melted and clarified butter veal cutlets. Moreover, the most basic elementary requirement for a true Cotoletta alla Milanese is that it must include the bone. Many believe that the origin of this food is from Wien, Austria; yet history is a bit different. In 1134, in order to celebrate the brother of Saint Ambrogio in the same church in Milan, the "lombolos cum panatio" (breaded meat in Latin) the "Cotoletta" was served during the party for the first time. It is only in 1848 when the Austrian Count Attems, the first officer of general Radetzky, brought the receipt to Wien after his stay in Milan.

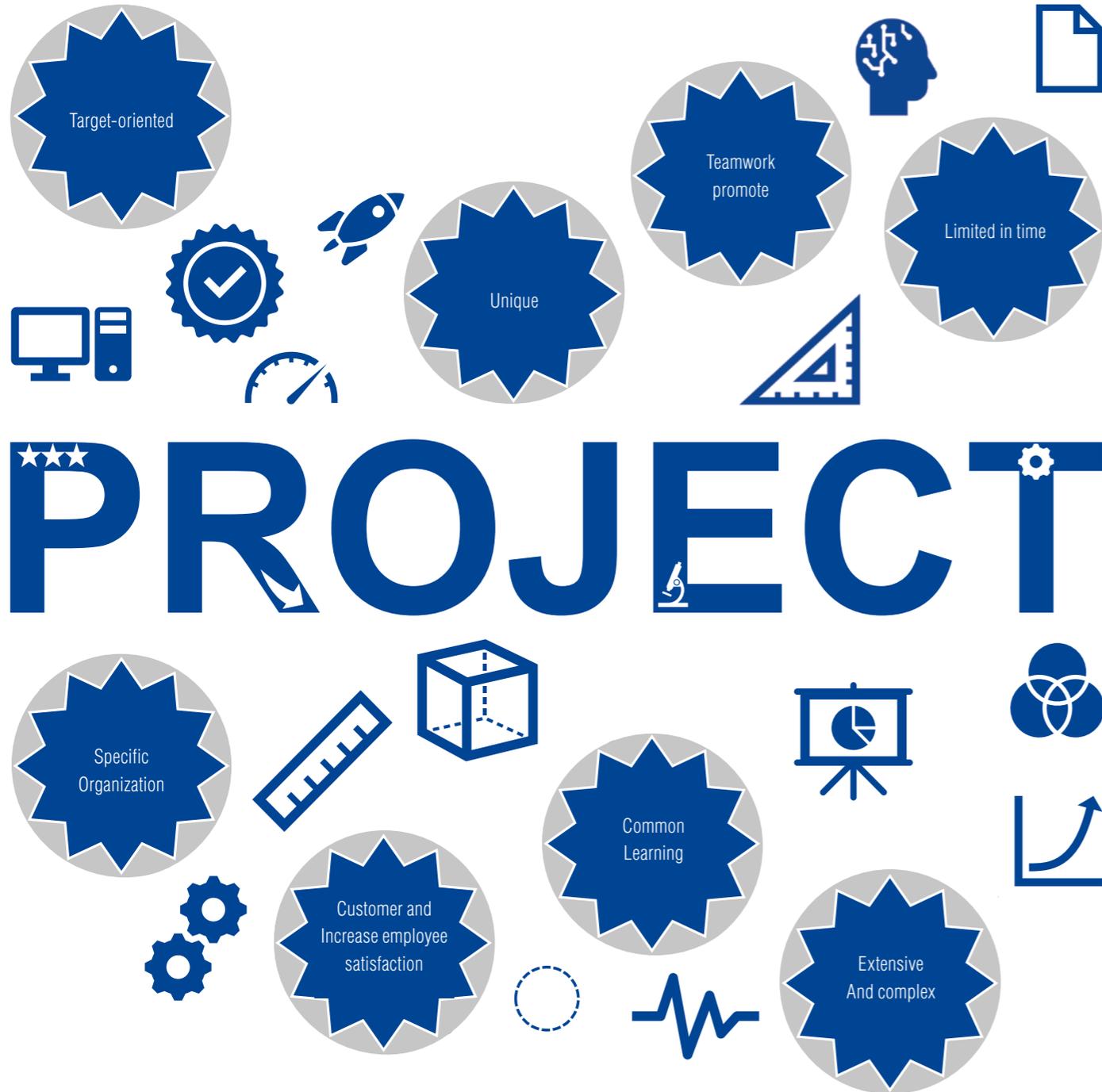
That's not all: Milan is also the ideal location to visit in a daytrip beautiful and natural locations like Lake Como, Lake Maggiore and the Alps. These are perfect places to unwind and relax from the daily chaos, enjoying boat tours or walks.

Authors: Sofia Vimercati, Valeria Cuomo beide MAE HR Communications



Milan will also be the protagonist of the 2026 Winter Olympics as an organising member. The city will also be the host city for the opening ceremony of the XXV Olympic Winter Games.





ENGINEERING

INTERVIEW: DEVELOPMENT PROJECTS AT DUNKERMOTOREN

For our customer magazine "mo, the project management experts at Dunkermotoren answer the editors' questions. We are happy to introduce them to you: Tobias Baier, Project Manager and Markus Wollenzien, Team Leader Project Management.

Editor: Mr. Wollenzien, what characterizes a project at Dunkermotoren?

M. Wollenzien: At Dunkermotoren, a project is extensive, technically complex, unique, time-limited and is handled by a project team. In projects, new products are developed or essential parts and components on the product are revised. The team members take on responsibility and are motivated to solve difficult tasks. Learning together is a matter of course for the team

members. In the project, performance, time, resources / budget, generated quality and customer satisfaction are tracked.

Editor: Mr. Baier, can you give us an insight into which employees make up a project team?

T. Baier: The interdisciplinary project team is made up of employees from Product Management, Research and Development, Industrial Engineering, Strategic Purchasing and Project Management. If necessary, the team can be expanded.

Editor: Mr. Wollenzien, how does a project work?

M. Wollenzien: Basically, a project runs according to the product development process. A project starts with the kick-off meeting and ends with the product release. In between, there are various project phases and milestones. Depending on the project, different project management methods are used.



Fig.: Composition of interdisciplinary project team

Editor: Is there anything else you would like to add, Mr. Baier?

T. Baier: Agile project management is also in vogue currently. At the moment, a pilot project is implementing a "hybrid model" consisting of agile and classic elements. The first three project phases are implemented agilely and the other two

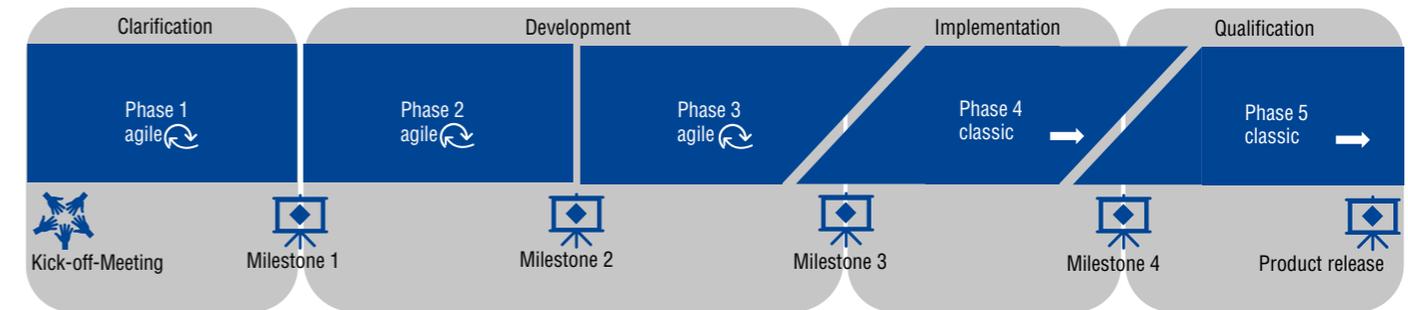


Fig.: Phase model with milestones and agile elements





Tobias Baier, Project Manager

project phases classically. In the agile phases, the focus is on the development of the required products. In the classic phases, the focus is on meeting deadlines according to planning. We try to combine the positive characteristics of both approaches and adapt them to Dunkermotoren's specific needs.

Editor: How would you describe the difference between the two approaches?

M. Wollenzien: In the classic approach, the requirements are known at the beginning of the project. There is a clear hierarchy in the project team. The project team consists of many specialists to whom tasks are assigned. Effort

estimation is done by experts. Changes to requirements are often difficult to implement during the course of the project and usually require re-planning for the rest of the project.

In the agile approach, the requirements are fuzzy or not yet fully known at the beginning. The project team mainly organizes itself and shows joint responsibility. Team members take on tasks independently. Effort estimation is developed jointly in the team. Changes to requirements are planned during the course of the project and can be implemented more easily.

Editor: Is there a personal favorite for you?

M. Wollenzien: I don't have a favorite. Each approach has its benefits. From my point of view, a suitable approach should be chosen depending on the requirements of the project. Based on the feedback so far, the hybrid model is very popular. For me, the sprinting in the agile approach is particularly interesting.

Editor: Mr. Baier, who is the client and who is the customer for a project or for the products resulting from a project?

T. Baier: The client for projects is the Product Management department. This department consults with the Sales Department in advance on market views and trends and incorporates the results into the requirements for the products

to be developed. The project is approved by the Steering Board and then implemented in the company. Depending on the availability of resources and other factors, the projects are started.

M. Wollenzien: In the first step, the customers for the products from the project are the Product Managers. They represent the Sales Department and the end customer for the entire duration of the project. In the second step, it is the end customers themselves who receive the first samples and, at the end of the project, the released products.

Editor: Mr. Baier, how are clients and customers involved in the project?

T. Baier: The clients and other people interested in the project are informed about the project status by the Project Manager in the monthly multi-project meeting. Decisions can be made there or in separate meetings. The project team presents the milestones for completion of the project phases. The direct supervisors of the team members approve the milestones and are involved in the project progress. By creating samples early in the project, end users can provide direct feedback to the project team and influence the project progress.

Editor: In conclusion: Mr. Wollenzien and Mr. Baier, what fascinates you about your job as a



Markus Wollenzien, Teamleader Project Management

project manager and where do you see the daily challenges?

M. Wollenzien: A major challenge is not losing sight of the project goals throughout the entire project duration. The project team must be motivated and the people involved have to be integrated into the project. In case of changes, the effects have to be pointed out and, if necessary, new plans have to be made. Many of the project manager's tasks are not visible to outsiders, but they influence the success of the project. Working with many colleagues from different departments is very varied. I particularly enjoy actively shaping projects.

SPRINTING IN THE PROJECT



In sprint planning, the project team estimates the effort and decides which tasks will be worked on in the next sprint.



In the sprint, the tasks deemed realistic are worked on by the project team.



In the daily stand-up, the project team discusses whether the tasks are on track or whether there are issues that jeopardize implementation. The goal is to be able to react early if something is in danger of not being completed.



In the sprint review, the project team presents and discusses the results of the respective sprint. The goal here is to obtain feedback on whether the results meet the expectations or whether improvements or enhancements are necessary.



In the sprint retrospective, the project team discusses what went well and what went badly in the Sprint. What is preventing us from being even more effective?

Fig.: Sprinting in agile project phases

T. Baier: Working together as a team on a project goal and implementing the best drive solutions for our customers gives me great pleasure. Accompanying a product from its creation to its release always set a great challenges that need to be solved.

Editor: Thank you both very much for your insight into project management at Dunkermotoren.

M. Wollenzien: You're welcome.

T. Baier: You're very welcome.



SEGMENTS – INTRALOGISTICS & ROBOTICS



nexofix®

SHUTTLE SYSTEMS

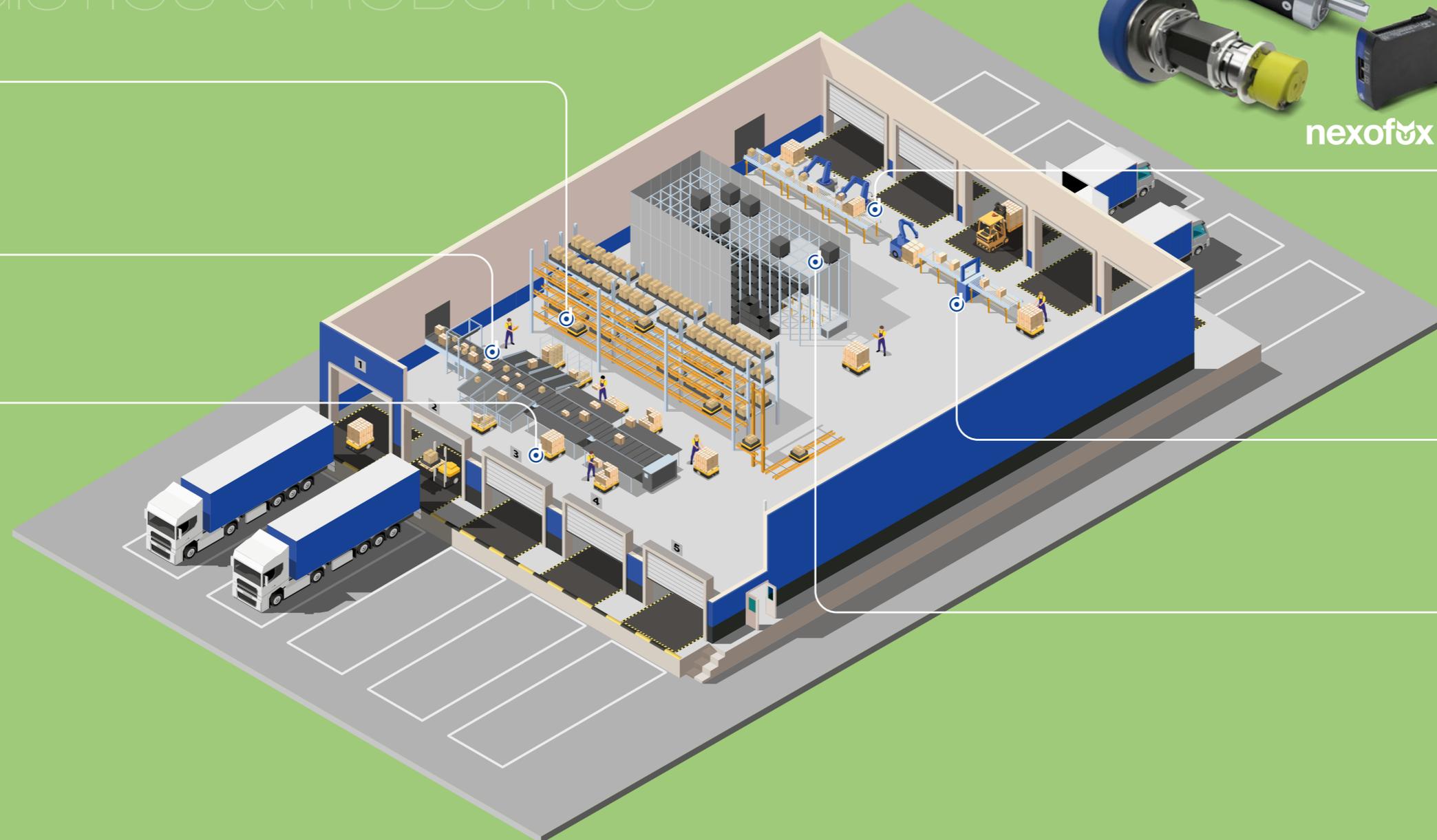
Pallet or small container shuttle systems offer a wide range of applications for Dunkermotoren drives. Be it the travel drive, the lift drive, the telescopic motor, the finger motors or a belt drive, Dunkermotoren has the right drive solution for every application.

PARCEL SORTING

When it comes to dividing, diverting, redirecting or sorting letters, parcels or pieces of luggage, Dunkermotoren drives have proven their worth over the years.

AGVS

Automated guided vehicles (AGV/AGC/AMR) increase productivity and improve efficiency in warehousing. Dunkermotoren drives are used as traction drives in combination with a hub gear, designed for high radial loads, and as hoist motors.



OUR VALUE PROPOSITION FOR YOU:

- Compact motors and hub gearboxes for minimal space
- Smart, connectable and robust drive systems
- Safety-solutions like STO directly within the motor
- Expert for decentralized solutions
- Linear pick-and-place systems
- Innovative, energy-efficient DC-concepts (IE 5)

PALLETIZING ROBOT

Robotic palletizing systems from EGS Automation for fast and flexible palletizing. Due to optimized programming processes shorter cycle times are achieved. EGS Automation offers the user intuitive operation and handling of the robot system. Universal and modular gripping tools are suitable for workpieces. EGS robots communicate via various bus systems or OPC UA. Sensors or image processing are used for part recognition.

STRAPPING

In the field of strapping technology, both stand-alone as well as line-integrated, Dunkermotoren offers intelligent and controllable drives from strap unwinding to strap sealing solutions for all sub-steps of this packaging and load securing process.

BOTS

The importance of robots in automated small parts warehouses is steadily increasing. Dunkermotoren drives can be used to lift the bins or the robot.

ACKNOWLEDGE THE SMART WAREHOUSE WITH DUNKERMOTOREN

In the past, the growth curve in the intralogistics sector knew only one direction. Year after year increasing growth rates could be communicated. This is not likely to change in the foreseeable future. The extent to which the Covid-19 crisis will give this trend a further boost cannot yet be estimated. It will definitely influence the market and possibly create new sales markets.

Dunkermotoren has also seen very strong growth in this market segment in recent years. Not only the sales figures increased, but also the requirements on drive technology have changed in terms of speed, acceleration, weight to be transported, intelligence and safety.

With the BG 95 **dPro**, Dunkermotoren has a new "strong" motor in its portfolio, which fulfils the above-mentioned requirements in several respects. With a peak output power of 4 kW at a maximum supply voltage of 60 VDC, the motor technology manufacturer has quadrupled the achievable output power of its portfolio.

At the same time, Dunkermotoren has developed a new controller generation for brushless motors, which is used in the BG 95 **dPro** for



Michael Basler, Key Account Manager Industrial Automation

the very first time. For the motor versions BG 75, BG 66 and BG 45, the conversion to this new generation is also in the implementation phase. With the Motor Control Platform, Dunkermotoren customers have the possibility to configure the control electronics with features specified for the customer and adapt them to the requirements of the application.

The bus and Ethernet interfaces are integrated into the motor and allow an operation without

external control unit. This saves space at the customer's premises and enables simple commissioning with the Drive Assistant Tool.

In addition to the previously known CANopen communication interface, PROFINET (PROFIdrive application classes 1 and 4), EtherCAT (Distributed Clocks) and Ethernet/IP are now also available. As before, motor parameters (e.g. current, temperature, etc.) can be queried cyclically during operation. Among other things, the new motors fea-

ture an electronic name plate, an operating hours counter, cycle synchronism and the option of free programming. The dielectric strength of the motor electronics has been improved so that higher battery charging voltages no longer damage or even destroy the motor.

In order not to neglect the safety aspect, the integrated motor electronics will be optionally available with STO functionality in the future. In addition to integrated control electronics, customers of Dunkermotoren can also use external solutions. The BGE 5510 **dPro** is the first control electronics based on the Motor Control Platform and supports all common bus and Ethernet interfaces. With the BGE 5510 **dPro**, motors up to approx. 250 W can be controlled. The Motor Control Platform and the interfaces provided form the perfect basis for the IIoT connection of our drives in the Smart Warehouse. We are already working together with our customers and partners on the first digital solutions.

In parallel to the extension of the modular system and the motor portfolio, Dunkermotoren has added the hub gear to its existing gear unit versions. The hub gears of the NG 250 and NG 500 series are used in the traction drive. The transmission is designed in a way that a maximum load capacity of 500 kg can be achieved without additional bearings.

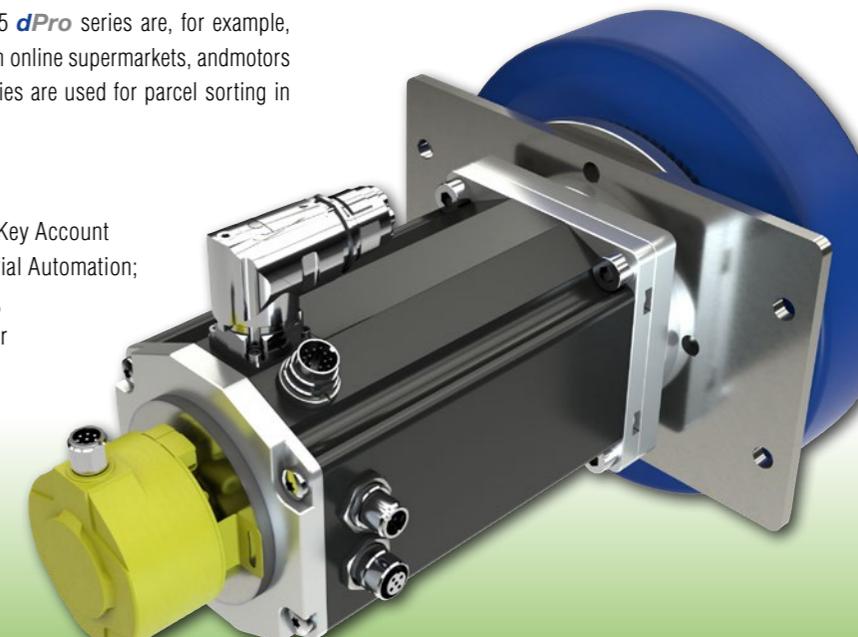
Dunkermotoren's intelligent motors are used e.g. in shuttles, AGVs, sorting and storage systems. Mo-



Michael Burgert, Product Manager BLDC Motors

tors of the BG 95 **dPro** series are, for example, used for robots in online supermarkets, and motors of the BG 75 series are used for parcel sorting in logistics centers.

Authors:
Michael Basler, Key Account Manager Industrial Automation;
Michael Burgert, Product Manager BLDC Motors



DUNKERMOTOREN SUPPLIES CENTERPIECE FOR MOBILE ROBOT PLATFORM “HORIZON XIX” FROM FRANKFURT UNIVERSITY OF APPLIED SCIENCES

Students of the Frankfurt University of Applied Sciences develop the mobile robot platform (rover) “Horizon XIX” for the international student competition “European Rover Challenge”. The rover is designed for the mars-like challenges of the competition. Smart Dunkermotoren motors of the BG 65S series form the centerpiece of the rover, they power the chassis.

FRANKFURT UNIVERSITY OF APPLIED SCIENCES & EUROPEAN ROVER CHALLENGE

Four faculties, 70 versatile degree programs, over 15,000 students, the Frankfurt UAS builds on the future – integrated, sustainable and application-oriented. Since the winter-term 2016/17 Faculty 2: IT and Engineering, offers the master’s degree “Mechatronics and Robotics (M.Sc.)”. The idea: concentrating projects of multiple students, to work on ambitious topics in the field of robotics.

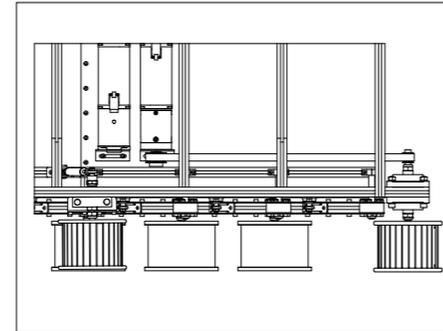
The European Rover Challenge is one of the biggest international space and robotics events in the world and takes place in Poland since 2014. The student competition is the highlight of the event. Approximately 60 universities from all over the world apply for participation. Teams composed of students from one university develop and build a proportionally large and partially automated “Mars-Rover” for the competition. The teams show off their skills and competences in different disciplines within a highly competitive environment.

FROST & HORIZON XIX

Students of the Mechatronics and Robotics program founded the “FRoST - Frankfurt Robotics Science Team”, in late 2018 for the participation at the ERC-competition. In 2019, FRoST achieved the 23rd place² out of approx. 40 qualified teams with their rover “Horizon XIX”, for their first participation

Horizon XIX is divided into four key components: the chain-based chassis, the 5-axle robotic arm, the drilling unit and the ground station. The chassis measures 1270 mm x 788 mm in length and width and disposes approx. 220 mm of ground clearance. Two Dunkermotoren drives mounted transversely in the center, with a 180° offset, power the chassis, see graphic “Rover “Horizon XIX” top view – Detail view without drive chain”. Torque is transferred by a toothed belt. The powerful Dunkermotoren drive units consist of a BLDC-motor of the BG65Sx50 series, the planetary PLG 63LL gearbox, as well

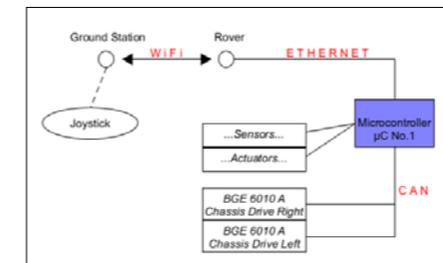
as the brake/encoder-combination E90 + RE30-3-500TI24.



Rover „Horizon XIX” top view - detail view without drive chain

Considering the chassis geometry and the requirements of the European Rover Challenge regarding the maximally permitted rover speed of 0.5 m/s, a reduction ratio of $i=29.4:1$ has been chosen. The exact specification at the maximally permitted speed was done by software. A 32-bit microcontroller with real time operating system, acting as “master”, located on top, connects the rover. Ground station and microcontroller exchange information via WLAN IEEE 802.11.a/n. The network protocol UDP is used. The drives are controlled through the BGE 6010 A control electronics from Dunkermotoren. The control electronics is based on an H-bridge. Data exchange between control electronics (device profile CiA 402) and microcontroller happens via CANopen, see graphic “Rover “Horizon XIX” – System architecture chassis”. The microcontroller communicates via the

self-developed CANopen Library. When a new movement command occurs via the joystick, the brake is released first, the CiA 402 Power State Machine is run through until the state “Operational enabled” is reached. In this state, tension for the controller is switched on and torque released. The microcontroller converts the joystick movement into speed for both motors and writes via CANopen message in the object dictionary. The control electronics now executes the run-up at the desired speed.



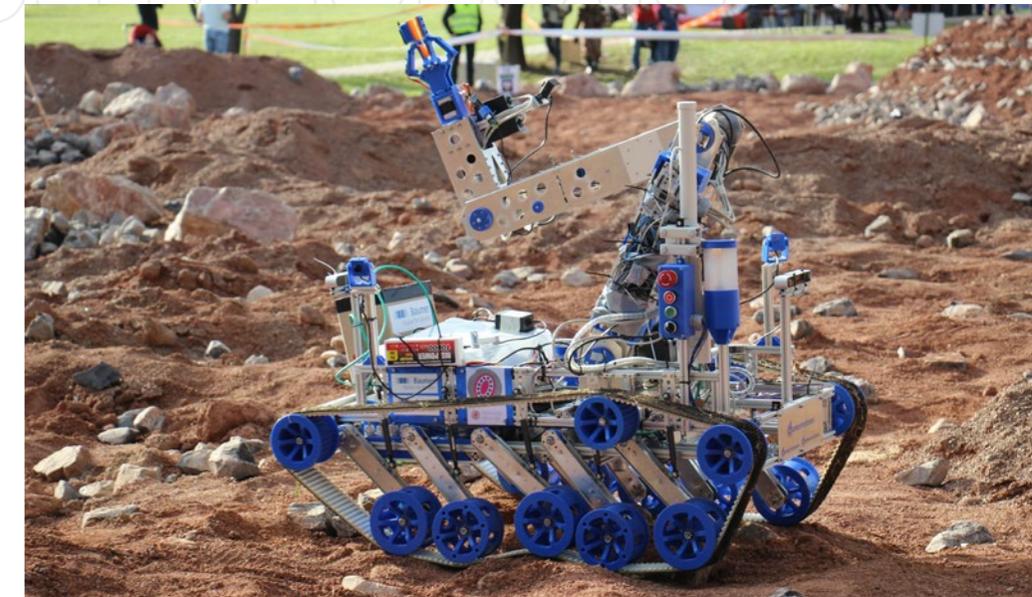
Rover „Horizon XIX” - System Architecture Chassis

The rover “Horizon XIX” masters the uneven “mars terrain” at the ERC 2019, with obstacles sometimes the size of a medicine ball, without any problem. The chain chassis in combination with the powerful drive units from Dunkermotoren allows for precise control of the rover in difficult terrain.

Authors: Evandro Caxala / Sven Erchen
Frankfurt University of Applied Sciences

¹ <http://roverchallenge.eu/about-erc/>

² <http://roverchallenge.eu/2019/09/15/erc-2019-scores/>



PRODUCTS

DUNKERMOTOREN PRESENTS NEW IIOT BRAND "NEXOFOX" ON THE MARKET AND THUS GOES BEYOND THE BOUNDARIES OF DRIVE TECHNOLOGY

On October 11, 2021, Dunkermotoren announced the market launch of the new IIoT brand "nexofox". Under nexofox, Dunkermotoren will offer its customers a holistic solution portfolio covering all aspects of the use and networking of its smart motors. Holistic means, on the one hand, from the initial consultation and joint concept development to project implementation in partnership. On the other hand, holistic also means from the field level to the cloud from a single source, i.e. from the implementation of the control logic with **MOTIONCODE** to condition monitoring & predictive maintenance using cloud services.

With nexofox, the drive technology manufacturer is breaking new ground and moving from a pure product supplier to a full-service provider. With nexofox, Dunkermotoren is launching its own brand which fully addresses the topic of the Industrial Internet of Things and its unlimited possibilities as well as the connectivity and programmability of smart motors. In the field of integrated smart BLDC motors, Dunkermotoren has been considered a pioneer in the industry for years and is now taking on a pioneering role with nexofox once again.

For more information, please visit:
www.nexofox.io - nexofox - more than motors.

DECENTRALIZATION IS A FINISHED CONCEPT! REVOLUTIONIZE YOUR AUTOMATION TOPOLOGY WITH **MOTIONCODE**

Nowadays, intelligent devices are ubiquitous. They provide information about their condition and have sufficient computing power to make real-time decisions about their interaction with the environment. Dunkermotoren, as pioneer and world market leader of smart integrated BLDC motors, is constantly pursuing this path of decentralization. With the newly available programming environment for **MOTIONCODE**, Dunkermotoren now provides its customers the opportunity to create their own programs for the **dPro** and **dMove** motor series.

MOTIONCODE can conveniently be programmed in C and loaded onto the corre-

sponding motors. The entire functionality and all parameters of the motor can be accessed via the programming environment. This allows the programmer to fully focus on his application. A ready-made template is already included for a quick and easy introduction to programming, which provides many useful structures such as interaction with external tools or other motors. In addition to the programming environment itself, the **MOTIONCODE** is also embedded in the tool landscape of Dunkermotoren and can be parameterized and controlled directly from Drive Assistant 5.

As you can see, there are no limits to your ideas, doesn't matter if you work with individual independently operating motors or completely decentralized software architectures. And if you don't want to program yourself, that's no problem either. Dunkermotoren is happy to support you as a competent service provider and will gladly implement your applications as **MOTIONCODE** to complement our motors.



PRODUCTS

SMART MOTOR CONTROL PLATFORM - THE FUTURE IS HERE

Whether cost-optimized CANopen drive, freely programmable motion controller or IIoT capable Ethernet motor - there is something for everyone! Dunkermotoren's innovative Smart Motor Control Platform is now completely available across all series from 20 to 4,000 watts output power. The market leader is thus strengthening its position in integrated EC motors and enabling its customers to implement effective and future-proof control concepts.

LEADING IN PRICE AND TECHNOLOGY

To master the balancing act between cost and functionality, there are two fundamentally different basic characteristics: **dMove** - trimmed for efficiency, **dMove** drives can control the speed, position with hall sensors and assign functions to the digital inputs and outputs. Even CANopen communication with profile CiA 402 is possible. On request, it is also possible to realize a less demanding communication via an RS 485 interface.

dPro - Customers who want to outsource PLC functions to the motor in whole or in part and require the full range of features will find their solution with **dPro** drives. A high-resolution encoder is always integrated. Interpolation, communication via Industrial Ethernet, Safe Torque

Off, jerk optimized ramps, absolute encoders and high-end motion functions are also possible with **dPro** drives.

PROFINET, ETHERCAT, ETHERNET/IP - THE CUSTOMER HAS THE CHOICE

The triumphal procession of Industrial Ethernet will continue, and Dunkermotoren offers mature solutions that can be implemented with little effort. The PROFINET interface is designed for BLDC motors in the **dPro** version including PROFIdrive with application classes 1 to 4. This enables synchronous operation of several axes, for example. PROFIdrive itself is a drive profile that significantly simplifies commissioning compared to earlier technologies. The times of tedious adjustment of individual parameters and programming of sequences are over. Drives are simply integrated into the configuration environment and are ready for operation immediately. The OPC UA capability of PROFINET can be called the gateway to the IIoT universe. By the way, Dunkermotoren is the first manufacturer to offer Application Class 4 completely integrated in the motor housing.

Even in the completely revised **dPro** EtherCAT versions, Dunkermotoren offers the associated option of real-time synchronization with distributed clocks as standard. Ethernet/IP is currently still being implemented and will be available in the usual high quality across all **dPro** sizes from Q2/2021.



FREE DA5 DIAGNOSTICS AND COMMISSIONING TOOL

With the free Dunkermotoren computer software "Drive Assistant 5" (DA5), **dMove** and **dPro** motors with bus interface as well as stand-alone motors can be set up comfortably. In stand-alone operation, they are parameterized once and then react automatically to digital and analog input signals and provide information on operation and faults via digital outputs. With the Quick Start Plus function, digital inputs can be freely assigned functions. For example, a fixed speed can be assigned to one combination of digital inputs, a position to the next combination, and a maximum current to another combination, thus limiting the motor's torque. Thus, a simple and very cost-effective motor can be used to provide comprehensive functions as standard.

The tool is also used for tuning, firmware updates and error analysis. Customers appreciate the high reliability, intuitive operation, and the included oscilloscope.



PRODUCTS

FUTURE-ORIENTED MODULAR CONTROL CONCEPTS

Long before Industry 4.0, Dunkermotoren, together with innovative customers, had already taken a pioneering role in smart integrated BLDC motors and the decentralization that this made possible. With the new Smart Motor Control Platform, this path is being consistently pursued and expanded. Everything is possible, from individual independently operating motors to completely decentralized software architectures. Machines and systems can be easily divided into individual modules and assembled for the end customer according to his needs.

Sequence programs can conveniently be programmed in C and loaded onto the corresponding motors. The entire functionality and all parameters of the motor can be accessed via the programming environment. This allows the programmer to fully focus on his application. For a quick and easy start in programming, a ready-made template is already included, which provides many useful structures such as interaction with external tools or other motors.

SAFETY INCLUDED

The integrated motors and external controllers with **dPro** functionality are also available with Safe Torque Off (STO) functionality. The Certification by TÜV Nord is done. The integrated solution often saves machine builders the need for a safety relay and the associated cabling effort. Furthermore, based on the integrated STO functionality and the integrated motor feedback, additional sa-

fety functions such as SS1 (Safe Stop 1) or SLS (Safely limited speed) can be implemented easily.

IIOT WITH ADDED VALUE

Dunkermotoren uses its many years of experience in smart drives and customer applications to offer suitable IIoT solutions. Dunkermotoren uses applications to enable its customers to implement their own digitization projects - without having to worry about the connection and analysis of motors. The focus here is on docker software solutions that run on standard edge gateways. The software takes on the function of connecting the various engines to the cloud or providing data for customer applications. At the same time, a device cloud is currently being created that will function as a remote platform independent of location. This will enable, for example, analytics functions such as the prediction of failure probabilities or remote firmware downloads. The IIoT will only unfold its full potential when thinking in terms of ecosystems in which all components from the motor or sensor to the ERP system are compatible. This is how the promised added value is created for the end customer, the plant operator. Dunkermotoren is a member of the Open Industry 4.0 Alliance and the MindSphere World e.V., to actively participate in the design of such approaches and to offer innovation-leading solutions.

SIMPLE CONVERSION FOR EXISTING CUSTOMERS

Dunkermotoren has been developing and producing integrated DC servo motors based on brush-

less DC motors for more than 20 years. During this time, many functions have been created, further developed and optimized. All these existing functions, now called "features", have been scrutinized and almost completely implemented in the new Motor Control Platform. Thus, customers do not have to miss anything when converting older series to **dMove** or **dPro**. Mechanically, too, conversion and backwards compatibility is simplified by flying adapter couplings. This enables service and replacement of components on machines in the field.

Dunkermotoren has implemented the roll-out of the Smart Motor Control Platform - a new generation of integrated control electronics - almost completely and across all motor sizes. The advantage of the platform is its modular design. All new features are therefore available for all motor series. This also applies to new possibilities for IIoT connection. Here, Dunkermotoren uses its many years of experience in smart motors and customer applications to offer suitable IIoT solutions. With the help of applications, the drive technology manufacturer enables its customers to implement their own digitalization projects - without having to worry about the connection and analysis of motors.

Author: Tobias Pfendler, Head of Products & Systems



EtherNet/IP



BGE 5510 **dPro**
BG 32



BGE 5510 **dPro**
BG 45



BG 66 **dPro**



BG 75 **dPro**



BG 95 **dPro**

20 – 3900 W

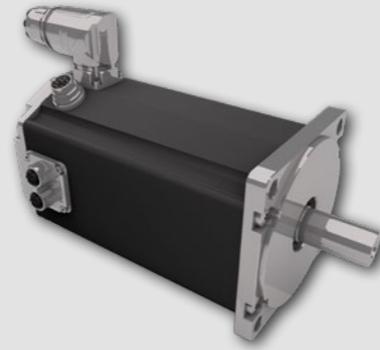
» TÜV certification not yet available for all series.

DUNKERMOTOREN IS FIRST DRIVE TECHNOLOGY MANUFACTURER TO INTEGRATE CERTIFIED PROFINET WITH PROFIDRIVE IN SERVO MOTOR

Since the end of February 2021, Dunkermotoren's fully integrated PROFINET solution has been officially certified by the PROFIBUS user organization. This means another important feature is fully integ-

rated into the motor, which is a milestone in terms of cabling, commissioning and IIoT capability.

Dunkermotoren, the world leader in brushless DC motors with integrated electronics from 1 to 3,900 watts, is the first drive technology manufacturer to fully integrate its certified PROFINET solution with PROFIDrive into a motor. By using the certification, Dunkermotoren assures the compliance of the high standards of stability even under extreme bus conditions. Currently, the products BG 95 **dPro**, BG 75 **dPro**, BG 66 **dPro** and the BGE 5510 **dPro** are available with PROFINET interface, covering the output power from 1 to 3,900 W.



ETHERCAT WITH DISTRIBUTED CLOCKS

The complete BLDC motor series **dPro** from Dunkermotoren is now also available with EtherCAT interface. The **dPro** versions are available with integrated servo controller (BG 66 **dPro** EC to BG 95 **dPro** EC) or as external version (BGE 5510 **dPro** EC). In contrast to the previous EtherCAT product portfolio, a special highlight is Distributed Clocks and the associated possibility of real-time synchronization.

A large number of brushless motors of the BG series in the power range from 10 W to 1,100 W are controlled via the industrial Ethernet interface (CoE protocol). Easy integration of the units into the Beckhoff TwinCAT environment is guaranteed with the help of a simply explained "Let's Connect" manual and the appropriate parameter files (ESI).

Since February 2021, the BG 95 **dPro** EC is equipped with another "must have" feature. With the safety function "Safe Torque Off", the motors will be found in numerous autonomous vehicles (AGV or AGC) or in traditional mechanical engineering in the future.

DUNKERMOTOREN JOINS ODVA AND STARTS PRO-DUCT LAUNCH OF ETHERNET/IP FOR ITS BG SERIES

Today, there is no chance to dodge real-time capable machine communication via industrial Ethernet. Dunkermotoren recognized this early on and expanded its BG series to include the PROFINET and EtherCAT interfaces. This year, Ethernet/IP will be added as a third interface in order to integrate the motors even more flexibly into different bus environments. The motors can be fully integrated into Studio5000 to ensure easy commissioning and programming of the drives. Dunkermotoren ensures the clean integration of its drives by working towards ODVA certification for the Ethernet/IP drives from the outset by ensuring that they fully comply with the official specification. For this reason, Dunkermotoren joined the ODVA in 2021. In addition to the easy integration of its drives, Dunkermotoren is also already planning further expansion stages of the Ethernet/IP interface, such as CIP-Motion or CIP-Safety, which will be introduced gradually according to customer requirements.

Starting in Q2/2021, Ethernet/IP will be available for the BG 66 **dPro**, BG 75 **dPro** and BG 95 **dPro** series as well as for the external control electronics BGE 5510 **dPro**. As the external control electronics realizes its potential especially when the motor length is strongly limited or in combination with BG 45, customers of Dunkermotoren will now be able to use the advantages of Ethernet/IP for all drive tasks in the power range from 20 to 1,100 W continuous output power and 3,900 W peak output power.



DUNKERMOTOREN "SAFE TORQUE OFF" (STO) CERTIFIED

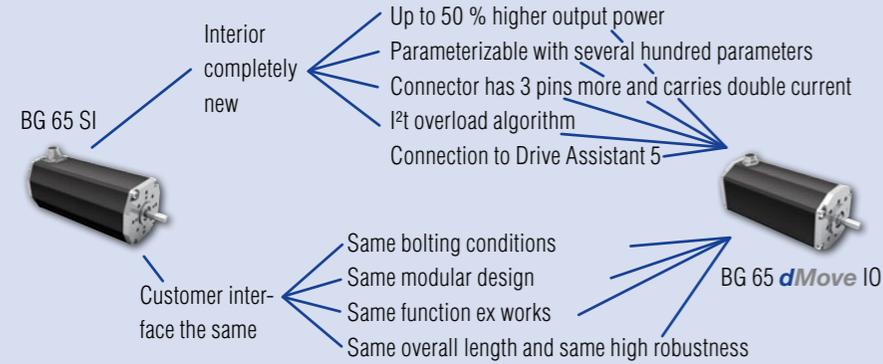
Even our grandparents knew "better safe than sorry". The principle of redundancy is one of the core principles of functional safety: If, for example, any component fails, then another component must compensate for the defect. Dunkermotoren applies this principle in DC servomotors (BG series) so that, if necessary, it can be guaranteed that there is no longer generated any torque. It is unnecessary to say that Dunkermotoren has complied in detail with all the required standards in the design of the safe circuits. The TÜV Nord has checked the com-

pliance with the standards just as meticulously. Correctness has now been confirmed at the very first attempt and the corresponding certificate for the standard compliant STO function has been issued.

Dunkermotoren is a pioneer in the integration of functions in brushless DC motors in the 20... 3,900 W range. With the certified STO function, Dunkermotoren has integrated a function that makes applications safer, especially in the fields of industrial automation, intralogistics, medical technology and door automation. By combining the motors with components from the modular system, the motors with certified STO can be individually adapted to a wide variety of applications.

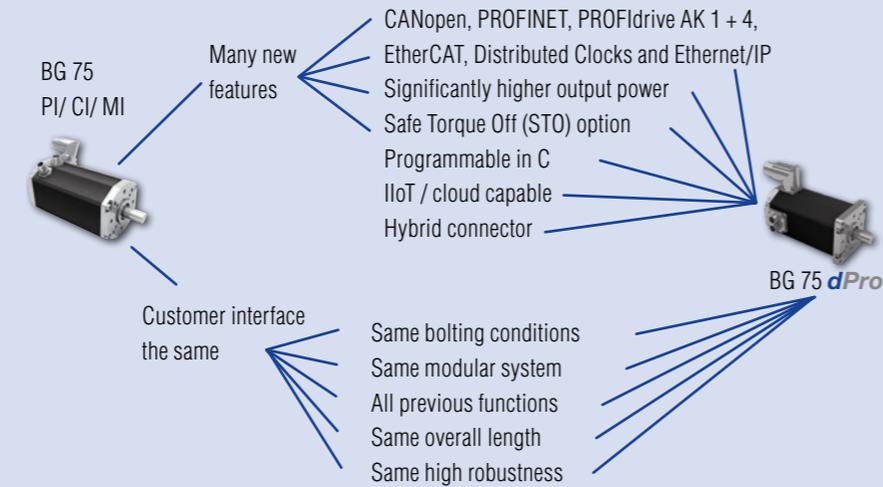


BG 65 SI » BG 65 **dMove IO**



Externally, the BG 65 **dMove IO** looks identical to the BG 65 SI, but functionally it offers completely new possibilities.

BG 75 PI/ CI/ MI » BG 75 **dPro**



The new BG 75 **dPro** can be integrated into your network the same way as the BG 75 PI/ CI/ MI and offers many more functions compared to its predecessor.

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 E-Mail: info@dunkermotoren.de
 www.dunkermotoren.de

PROJECT MANAGEMENT AND EDITING: Heike Dreher, Director
 Marketing Processes Inside Sales
 Janina Dietsche,
 Live Communication & PR
 Dunkermotoren GmbH

DESIGN: Ann-Kathrin Kopf,
 Creative & Design Consultant
 Dunkermotoren GmbH

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Dunkermotoren GmbH

Allmendstraße 11 | 79848 Bonndorf/ Schwarzwald, Germany

t: +49 (0) 7703 930 - 0 | info@dunkermotoren.de | www.dunkermotoren.com

