BAUMÜLLER

AUTOMATION

Automation concepts, control technology, field bus communication, ProMaster, Motion Control, IoT Industry 4.0, b maXX HMI, I/O systems

We plan and supply complete automation systems for our customers –
from the operating system to the machine control including software solutions to the drive.

Enabling Industry 4.0

Added value for our customers

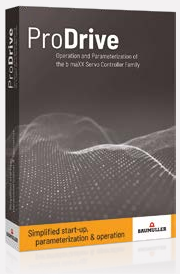
Make our experience your advantage

- More than 25 years of experience in automation and control technology
- Coordinated products
- Software libraries for fast time-to-market
- Scalable solutions
- Excellent degree of flexibility

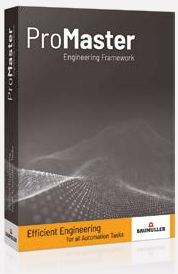
AUTOMATION

SOFTWARE TOOLS

Parameterization



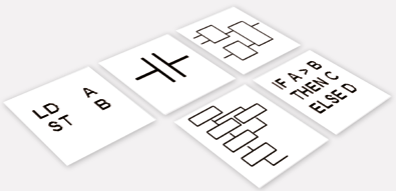
Programming



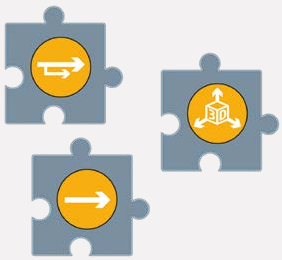
Visualization

PROGRAMMING

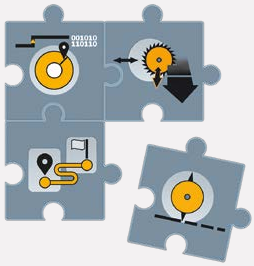
IEC languages



Basic libraries



Advanced libraries



COMMUNICATION

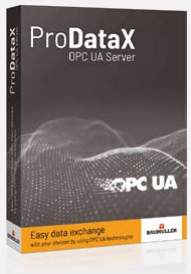
Field level

EtherCAT®

Command level

Ethernet

IoT connectivity



Automation in a new dimension

With Baumüller you can design your machines to be flexible and highly efficient

CONCEPTS

CONTROL

b maXX softdrivePLC

b maXX drivePLC

b maXX PLC mc

SERVO DRIVES

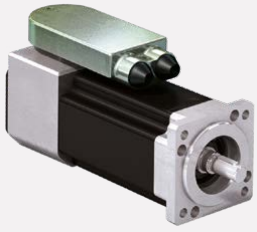
Small servo drives

Side-by-side technology

Mono technology

MOTORS

Low voltage



Low power

High power

This is based on scalable components, which can be freely combined and optimally adapted to your machine topology. By using standardized interfaces, your automation solutions from Baumüller are state-of-the-art, future-proof and extendable.

The choice is yours – determine the extent to which you want to use the components, modules and services of Baumüller. Benefit from the possibility of freely combining function modules, technology solutions, and libraries, and optimally adapting them to your needs. Protect your automation know-how with your own libraries; draw on your stored knowledge for new projects and reduce your project planning effort.

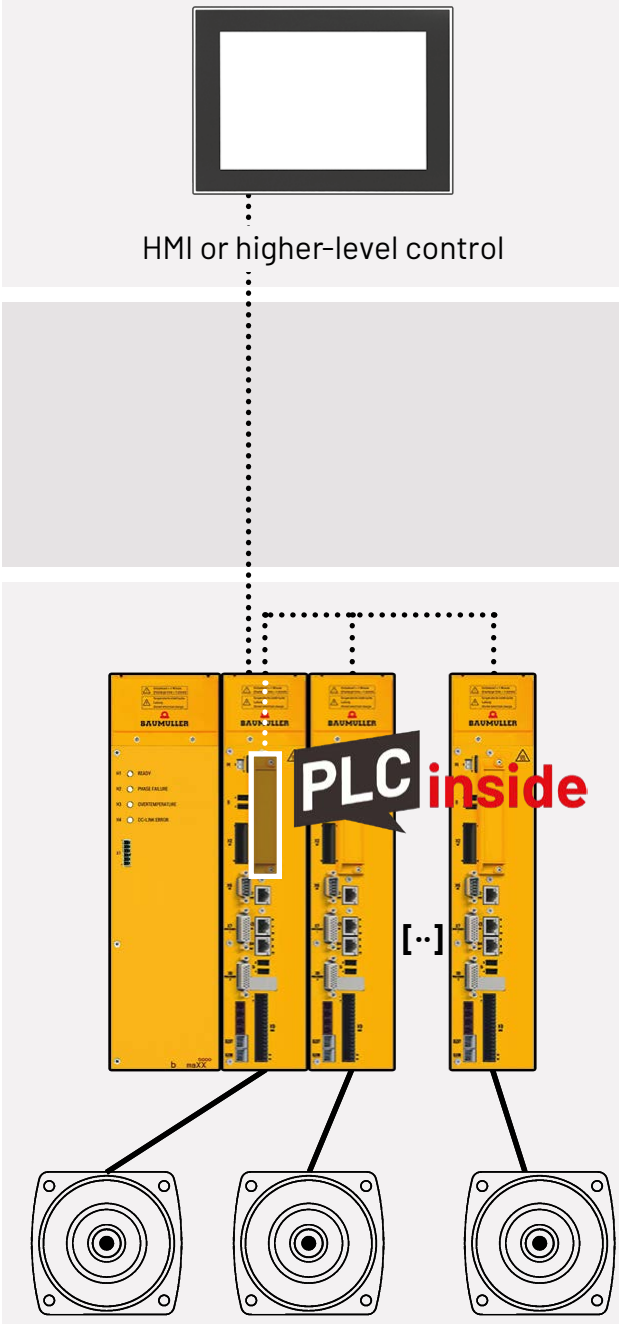
b maXX drivePLC

Highly synchronized motion control with drive-integrated PLC

The drive-integrated b maXX drivePLC enables highly synchronized motion control, maximum speeds, and a modular layout of machines and plants.

- Additional hardware in the controller
- Higher performance:
  minimum cycle times up to 62.5 µs for highly synchronized motion control
- Modular machines: central or decentralized topologies are possible
- Maximum connectivity:
  ready for future requirements and IoT
- Data from the drive are provided by an OPC server interface with your own and external systems

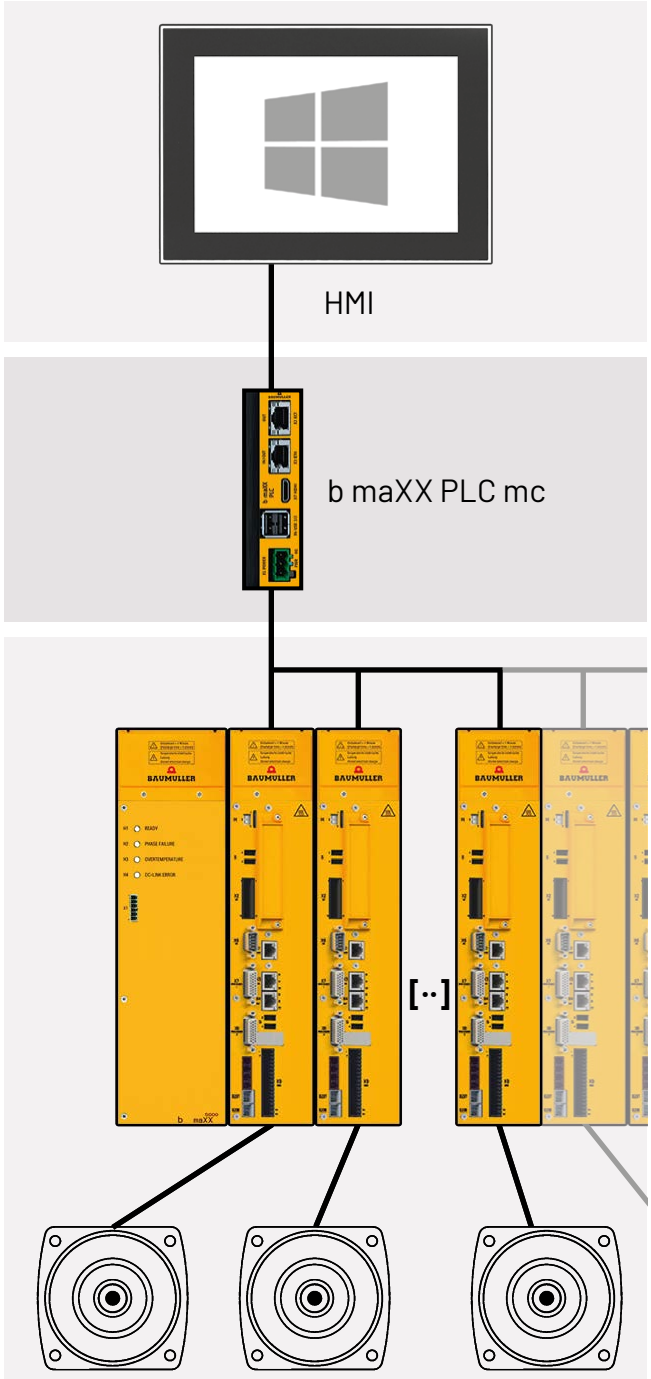
DECENTRALIZED CONCEPT



Technology function **directly in the drive**, e.g. for servo-hydraulics in injection molding machines

LATFORMS

CENTRALIZED CONCEPT



Technology function **in the control unit**,
e.g. for web processing machines

b maXX PLC mc

PLC & PC combined

Combines industrial PC and classic PLC control on joint hardware and apart from the actual control tasks, also enables use of the Windows operating system.

- Control cabinet PLC
- Can be used universally for virtually any automation task
- HDMI interface type C
- IP20 stainless steel housing with mounting clips
- WIN 10 IoT 2019 LTSC Enterprise
- Maximum connectivity: ready for future requirements and IoT
- Large internal memory enables the storage and preprocessing of data

b maXX drivePLC

Drive-integrated PLC for decentralized automation concepts

Highly synchronized motion control with drive-integrated PLC

Baumüller has successfully implemented the principle of the drive-integrated PLC decades and with the new drivePLC has made it future-proof and fit for IoT. The drive-integrated b maXX drivePLC control can execute complex motion control, technology and control functions directly in the drive.

This creates numerous advantages for the machine builder: By integrating the Baumüller motion modules directly in the drive, the user can use numerous preprogrammed functions without having to make time-consuming adjustments to the higher-level control.

The fieldbus is relieved and faster communication between the PLC and drive optimizes the precision and accuracy and thus the productivity of the machine. Highly synchronous processes at high speeds become possible.

- EtherCAT Master
- 1000 Mbit Ethernet
- IEC-61131-3
- Motion Control

The integrated PLC also paves the way for a modular layout. The advantage of this is that individual machine modules can be produced independently of each other and commissioned in advance, which simplifies and accelerates significantly the commissioning of the overall machine on site on the user's premises.

Since, as the EtherCAT master, the b maXX drivePLC can also control other drives, the higher-level PLC can even be omitted completely in several cases. This reduces costs for the machine builder and the machine operator. Due to the integration in the drive, the PLC achieves minimum cycle times of up to 62.5 µs and is therefore even faster than its predecessor model.

Open system

Baumüller opts for openness in control technology. With a new IEC 61131 runtime environment developed completely in-house, Baumüller offers a platform that supports current standards such as high-level language programming, e.g. with C++ and IoT connectivity. The runtime system is based on Linux and therefore ensures maximum openness for the integration of other systems and absolute flexibility for the implementation of customized projects.

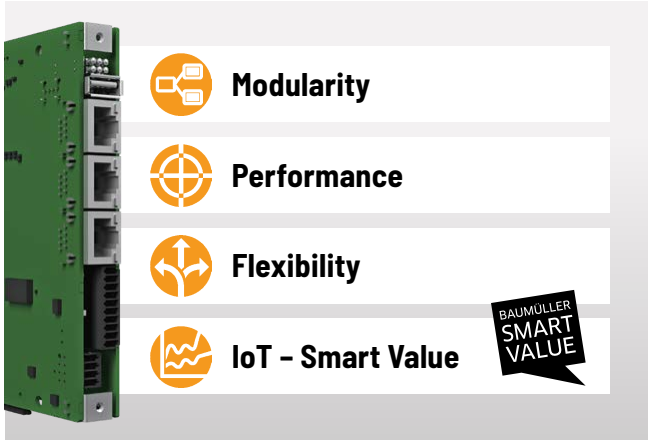
With interfaces such as OPC UA, MQTT, EtherCAT and Ethernet, the b maXX drivePLC is optimally prepared for future requirements in the automation and IoT environment.
This comprehensive openness improves efficiency in development, time-to-market and flexibility for the machine builder.

Communication in real time

The digital and analog inputs of the drivePLC are fully designed for speed. The b maXX drivePLC responds to important events, for example, touch probes in real time via digital inputs. The advantage: The control works more efficiently and reliably, an advantage particularly for applications with high dynamic and precision requirements, in which fast response times are needed.

The analog high-speed inputs (without additional hardware, minimum sampling time 1 µs) enable completely new IoT solutions. External sensors can be connected directly. Analyses, e.g. vibration analyses, take place in the PLC in the drive and responses to external events are also handled directly in the drive-integrated PLC without a detour via additional components.

Communication between the drivePLC and servo controller takes place via an internal interface instead of via the field-bus. The drive's parameters, for example, voltage, current, power, torque or position can therefore be accessed in "hard real-time". The servo drive therefore undertakes sensor tasks and enables smart monitoring with relatively little effort. The intelligent modules from the Baumüller SmartValue toolkit are then used to carry out the processing also directly in the drive-integrated PLC.



EtherCAT® OPC® Unified Architecture MQTT

b maXX PLC mc

PLC & PC combined for centralized automation concepts

Extensive IoT functionalities

With the b maXX PLC mc control platform, Baumüller combines the properties of industrial PCs and PLC controls and thus covers the area between these existing solutions optimally.

The b maXX PLC mc controls motion-control applications and can be rapidly and easily deployed for high-performance automation tasks thanks to the comprehensive Baumüller technology libraries. This makes it the ideal solution for networking machines and machine modules right down to individual automation components.

The compact control unit with high power reserves has an IEC-61131-3 environment for the realization of sophisticated control tasks.

EtherCAT®

- EtherCAT Master
- Intel Atom Multicore CPU
- 1000 Mbit Ethernet
- IEC-61131-3
- Motion Control
- Coordinated Motion

Combines industry PC and classical PLC control unit on shared hardware

In addition to the actual control tasks, the combination of PLC and PC allows the possibilities of the Windows operating system to be used. By using the Intel Atom series of multi-core processors and partitioning into a real-time operating system and a Windows operating system, both of which operate independently of each other, applications can be realized that previously required at least two systems. Machine visualization is a typical example of this. This saves space in the control cabinet and reduces complexity and costs in the after-sales area – for example, with spare parts inventories.

b maXX PLC mc also offers great user-friendliness with its tool-free, externally replaceable battery for the real-time clock, for example. Likewise, a very fast non-volatile RAM memory – NOVRAM – also enables safe data storage, even in case of power failure.

The flexible platform for controlling and networking complex applications

- For the networking and control of machines and machine modules
- Enables complex data analyses
- ProDataX and Ininet SpiderControl implemented
- MQTT module included
- The OPC UA module ensures interoperability at the machine level

EtherCAT. OPC® Unified Architecture MQTT

For even more interfaces: Box-PC b maXX PCC-04

Powerful. Fast. Flexible.

The b maXX PCC-04 is the current generation of industrial PCs from Baumüller. It offers users a scalable and versatile platform that provides a large number of interfaces, can be expanded, and thus enables a flexible machine design.

Highest performance for motion control applications consisting of a large number of synchronous drives.

ProMaster

One engineering framework for all automation tasks

The ProMaster Engineering Framework contains the tools for solving all automation tasks: from the drive design to the parameterization, the programming of control units, fieldbus parameterization through to visualization. This applies throughout the entire life cycle, not only during the planning and initial commissioning but also during maintenance.

ProMaster makes engineering more efficient and systematically reduces the extent of work required despite increasing complexity. Defined interfaces, modular machine architectures, and optional extensions result in more efficient automation solutions for flexible use.

An engineering framework for all automation tasks makes processes more efficient, enables faster plant production, improves product quality, and reduces the probability of errors. In addition, it increases the productivity of both the machine manufacturer and the operator.

The tools for drive technology in ProMaster

- Drive configurator **sizemaXX** – determine the ideal drive solution for you
- Virtual commissioning **ProSimulation** – use the digital twin for the simulation of your drives and mechanics
- Drive commissioning **ProDrive** – commission your drive systems and use extensive functionalities e.g. for vibration analysis
- Drive safety **ProSafePara** – parameterize drive safety easily and intuitively

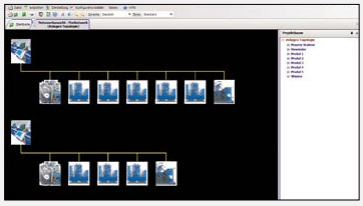
The tools for control technology in ProMaster

- **ProProg** programming system – implement PLC projects according to IEC 61131-3
- **ProPLC/ProDevice/ProCatalog** – configure b maXX PLCs and declare I/O assignment, allocation, and EtherCAT nodes
- Visualization tool **ProViz** – implement user interfaces easily with the configurator
- **ProCAM** – create your own cam data with the cam editor
- **ProEtherCAT** – configure and check the fieldbus systems of your application
- **ProOscilloscope:** Measure, monitor, and analyze all parameters across an entire ProMaster project (PLC, drives, etc.)

Motion libraries and machine templates

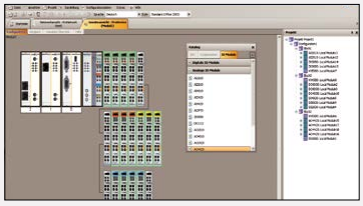
- **Basic libraries** and advanced libraries – preconfigured modules reduce your time 2 market
- **Libraries external controls** – basic motion control functions for Baumüller converters in third-party control systems
- **Machine modules** – use individual preconfigured process steps to quickly and easily implement complex motion controls
- **Machine templates** – ready programmed machine software adaptable to your own application

Machine topology



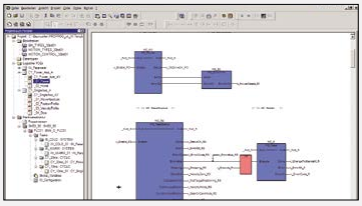
Catalogs,
machine module templates

Configurators



Fieldbus communication
PLC modules
I/O modules (local/remote)

Application creation



PLC acc. to IEC 61131-3, CAM editor (VDI), Visualization, Drive parameterization and operation

Library concept – reusability

- Common database
- User expansion templates
- User is free to structure library
- Structured archiving of expertise acquired in machine modules
- Basic and advanced libraries
- Standardized software elements
- Especially suitable for use in modular system design, with different machine versions and in the context of continuous development
- Easier management and maintenance

MOTION CONTROL

Automation software – motion libraries and machine modules

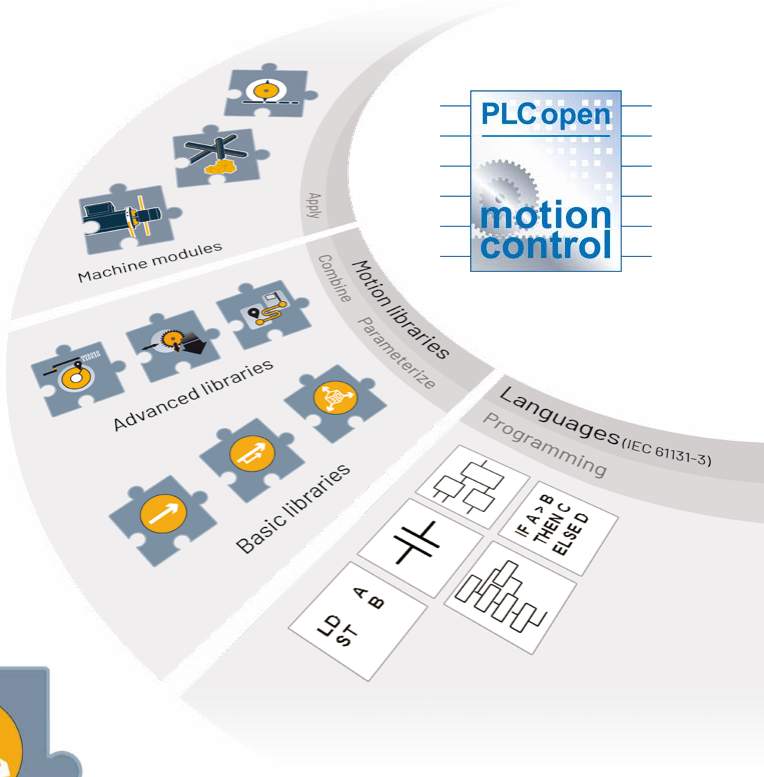
Innovative motion libraries and machine modules for your machines and plants

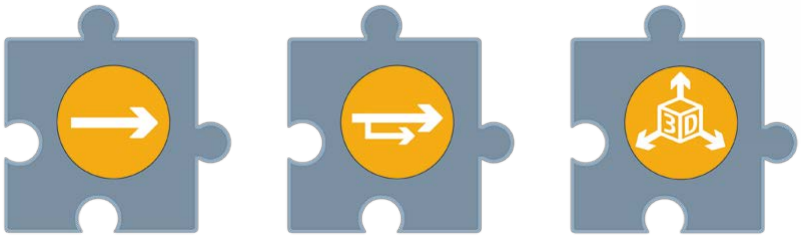
The motion libraries are software libraries developed in-house by Baumüller, which can control the movement sequences for the motorized axes of a system. This is enabled by numerous prefabricated modules.

- ✓ Basis libraries
- ✓ Advanced libraries
- ✓ Machine modules

Basic libraries

The basic libraries form the basis of the motion control. More than 500 modules are already preinstalled, free of charge, on the ProMaster engineering framework. They contain fundamental functions, which are useful for the movement sequences of motorized axes. By applying international standards, such as the programming languages to IEC 61131 and technology-specific extensions from Baumüller, maximum investment security exists due to reusability.

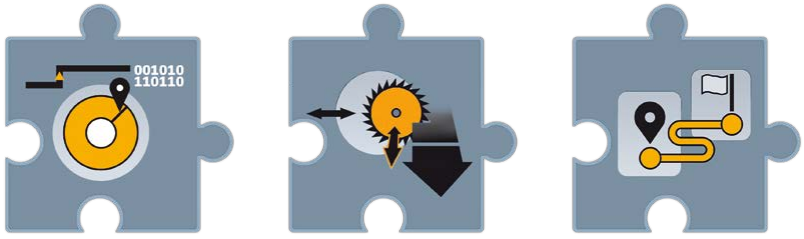




Advanced libraries

In addition to the basic libraries with motion components based on PLCOpen, Baumüller offers enhanced libraries with specific modules as well as machine modules with extensive functions for fast and easy engineering. Each machine module is tailored to fundamental machine functions and is adapted to the respective application type.

BAUMULLER
IEC 61131-3



Your benefits

- **Cost cutting:** Prefabricated machine modules to cut the initial effort and costs
- **Industry knowledge:** Use our process know-how
- **3D motion:** Make your control unit 3D-capable and use G-code
- **Easy programming:** From the motion module to the complete machine module
- **Know-how from the professionals:** Benefit from our knowledge and save valuable time

Machine modules: Subsystems for individual modules/axes

Innovative machine modules for your machines and plants

Baumüller offers user-friendly and machine modules for the time-saving creation of optimum processes on the control level. The machine modules are available for different applications. The innovative and optimized solutions save an inordinate amount of time in parameterizing the machine. Complex motion controls can be configured with only a few movements of the hands. The customer is able to benefit from extensive process know-how, which is integrated in the individual machine modules.

Each application is unique, however, this does not necessarily mean that everything has to be reinvented – on the contrary: in the interests of modular engineering, the aim is to draw on that which is tried and tested and to concentrate on the specific task at hand.

Our machine modules can be easily linked to your machine control systems. Your plant is therefore ready for use in a short time with no major adjustments.
With our preconfigured machine modules you not only save time, but can also reduce energy consumption significantly and benefit from shorter cycle times, greater accuracy, and less noise generation.

Machine modules are available for the following applications:

DRIVE-BASED CROSS-CUTTER

SERVO PUMP

3-AXIS-LINEAR

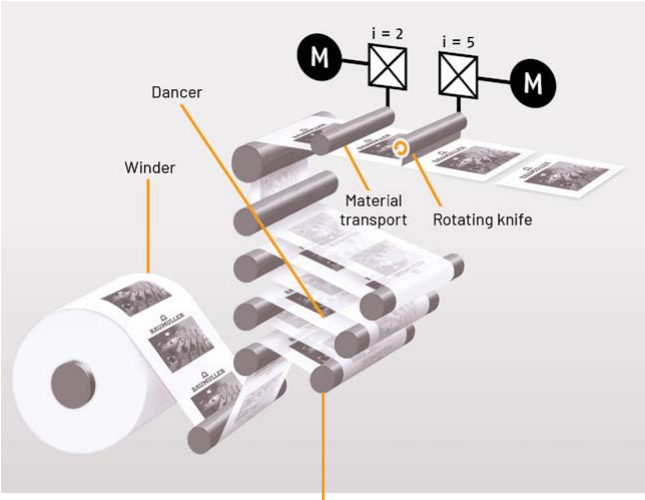
Your advantages – quick and efficient software creation

- A solution, individually compiled for your system
- Scalable in functional scope and drive power
- A custom solution combined from standards
- Time and cost-optimized

Time advantage: parameterizing instead of programming

No programming knowledge whatsoever is needed for the finished technology solution, the movements merely have to be parameterized. All parameters, e.g. transmission factor, distance from the measuring point or roll circumference are adjustable.

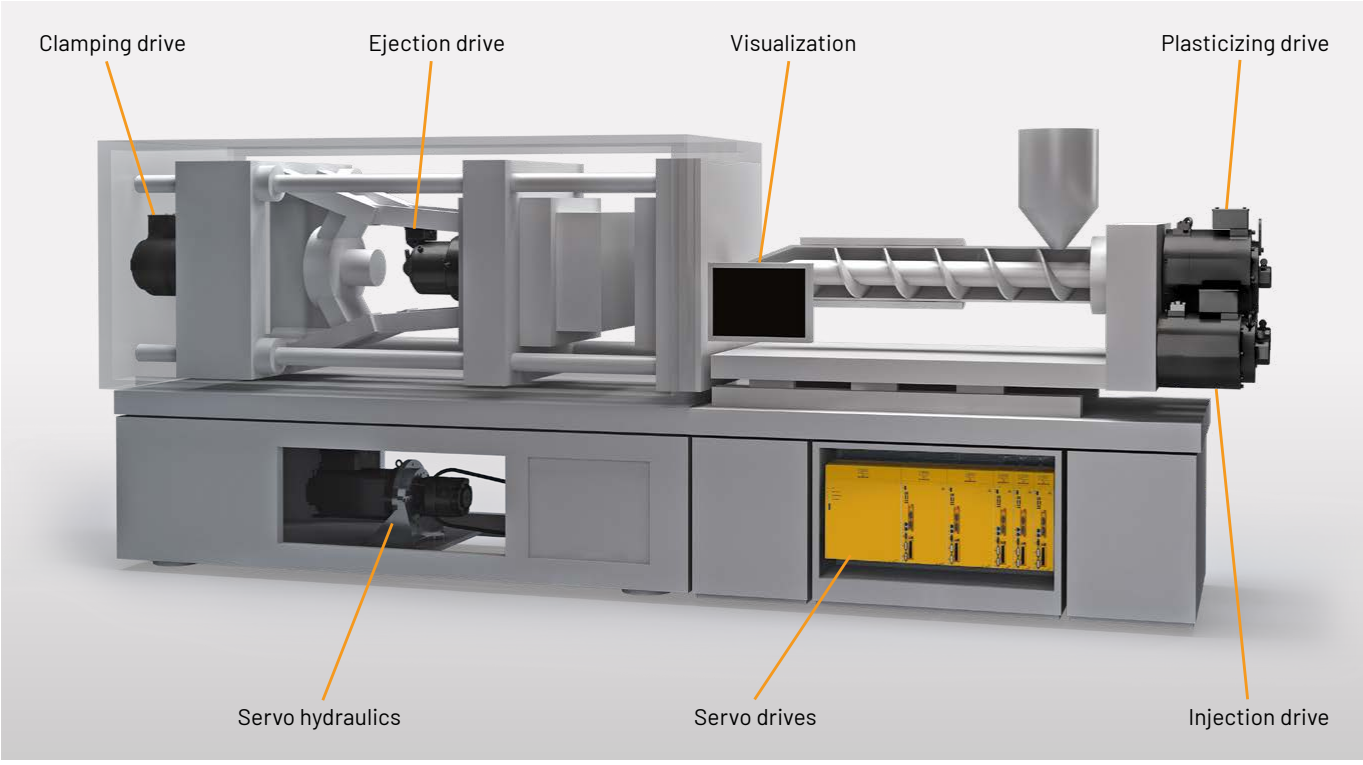
Major advantages in using the Baumüller technology solutions include the non-existent programming work due to simple parameterization, the shorter time to market, and the lower costs. The customer can therefore conveniently fall back on validated and tested technology experience.



The drive-based cross-cutting solution contains the typical process steps, for example, those required for metalworking or for paper and foil cutting

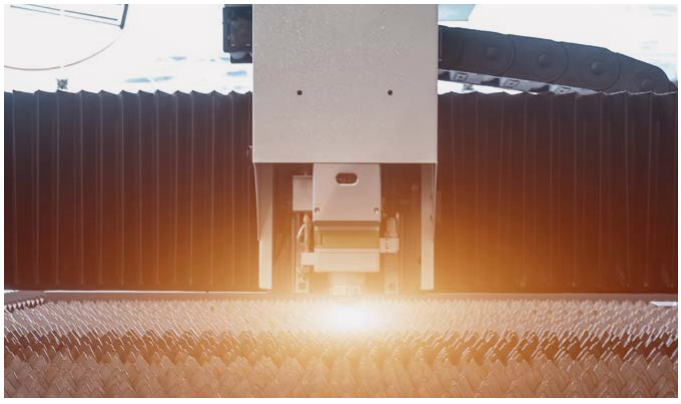
Your benefits at a glance

- The customer can concentrate on the actual machine process
- Validated and approved technology function
- No programming, but instead parameterization of the technology functions
- Easy integration in existing system solutions thanks to different fieldbus interfaces of the converter
- Relieves the load on the machine control system
- Greater dynamics and accuracy due to calculation in the converter



TEMPLATES

Automation software – complete package for the control unit



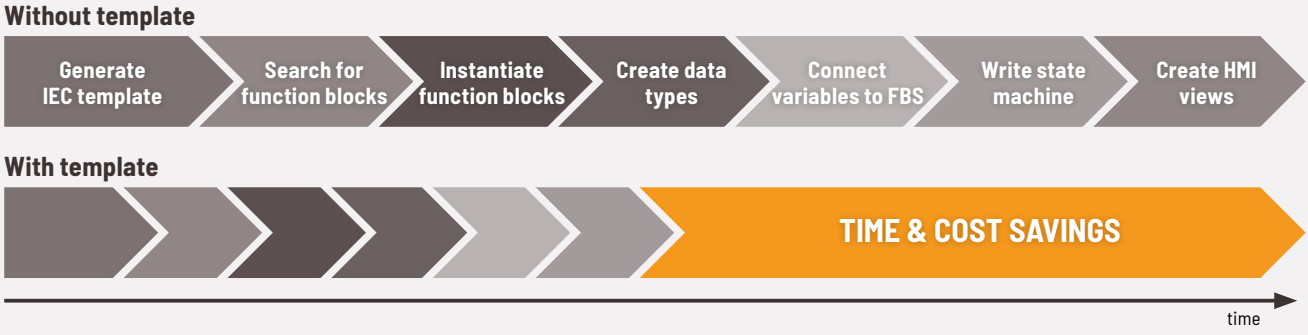

Your lead in the development process: ready programmed machine templates

The Baumüller machine templates contain a large number of the required machine functions as well as motion modules for controlling the motors, templates for the machine visualization, and functions such as EtherCAT diagnosis, commissioning mode, load balancing, and water cooling control.

With the software templates, developers save a lot of time especially during the project start phase and can therefore more easily concentrate on the important machine functions. For the machine manufacturer, this means a faster time-to-market and significantly reduced development costs.

Time advantage: parameterizing instead of programming

The software templates contain frequently needed machine functions for the application and can be easily loaded into the control unit. The movements then merely have to be parameterized. The machine programmer no longer has to worry about the basics during development.



In addition to the shortened development time, with the software templates, machine manufacturers also benefit from the technology experience of the respective industry. For example, in the software template for the shredder control, the operation of two motors with load balancing in one shaft is already preprogrammed. The customer only has to integrate the existing communication interface, and can then, among other things, control the shredder shafts directly via a speed setpoint. A predefined is available for communication with a higher-level control. The connection can be made via an EtherCAT gateway or an OPC-UA server. Other interfaces can be added on request.

The advantages of the machine templates at a glance

- Do not only contain motion control
- Easy familiarization with "new" machine functions possible
- Templates for PLC and HMI included
- Templates fully executable
- Machine functions easily and understandably preprogrammed
- Easy adaptation possible
- Includes installation package for control unit and development PC

Machine templates are available for the following applications:

3-AXIS-FLEX

SERVO PRESS

WEB & FOIL

SHREDDER

b maXX softdrivePLC

Technology functions directly in the drive

Drive-based solutions without separate control hardware

With the b maXX softdrivePLC, Baumüller makes separate control hardware unnecessary for suitable applications. By combining motion control and PLC functions in the controller, Baumüller creates a decentralized control architecture for programming according to IEC 61131, which makes it easy to set up distributed intelligence in the machine. From the simple linking of digital inputs to complex control algorithms, control tasks can therefore be realized locally in the controller without sophisticated control programming tools, and is very easy to do with the ProDrive parameterizing tool.

Advantages

- Cost savings due to the elimination of control hardware
- Fieldbus communication between two axes not necessary
- Easy realization of master-slave functions
- Cross-axis access to parameters possible (double axis)

b maXX – Intelligent drives

The b maXX softdrivePLC runs as part of the firmware in the Baumüller drive concepts b maXX 6000, b maXX 5000 and b maXX 3300, and is suitable for single and double axis applications. With the help of the b maXX softdrivePLC, programs in the drive can run highly synchronously with the controller clock at cycle times of up to 125 µs. This can be used, for example, to program special filters.

Programming via ProDrive for basic version

By using the b maXX softdrivePLC, simple control tasks can be very easily realized decentrally in the drive via the ProDrive parameterizing tool – from the simple calculation through to control algorithms. With the help of the b maXX softdrivePLC, programs can run highly synchronized with the controller clock cycle (≥62.5 µs).

Integrated into ProMaster and programmable with ProPROG 5 as the extended version

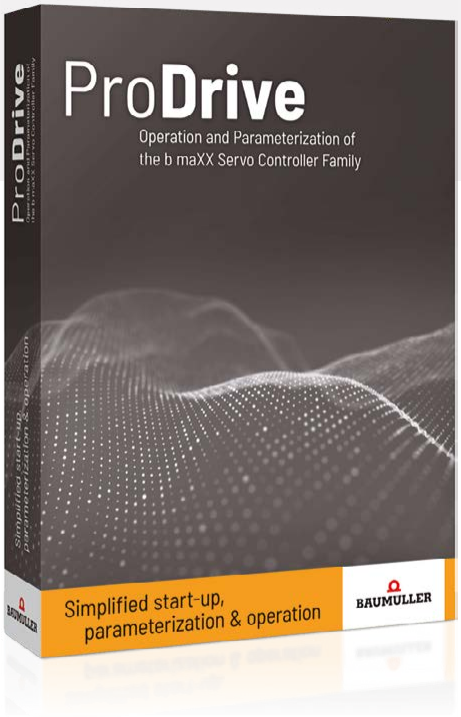
The extended version of the b maXX softdrivePLC is completely integrated into the ProMaster engineering framework. All applications for creating the machine and plant topology, the fieldbus and I/O configurators as well as applications such as the ProPROG 5 programming environment, the ProCAM cam disk editor, and much more are available to you there.

Numerous preconfigured software modules, which can be used for motion control or analysis functions directly in the drive, are available for the extended version.

Basic version

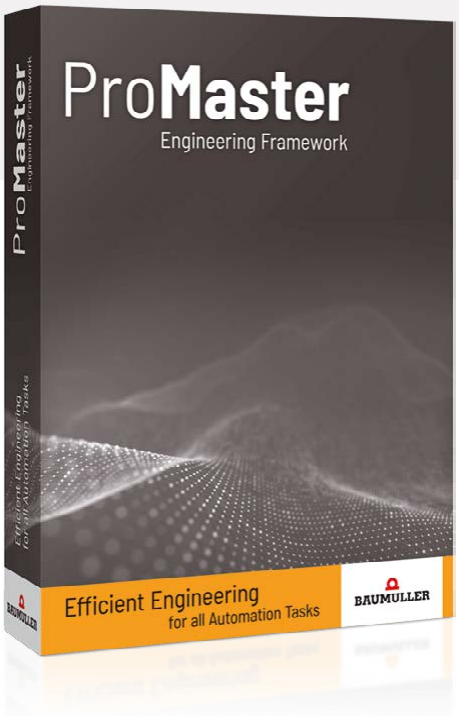
INCLUDED

- Simple functions
- Can also be used by customers, e.g. for logical links, rescaling



Extended version

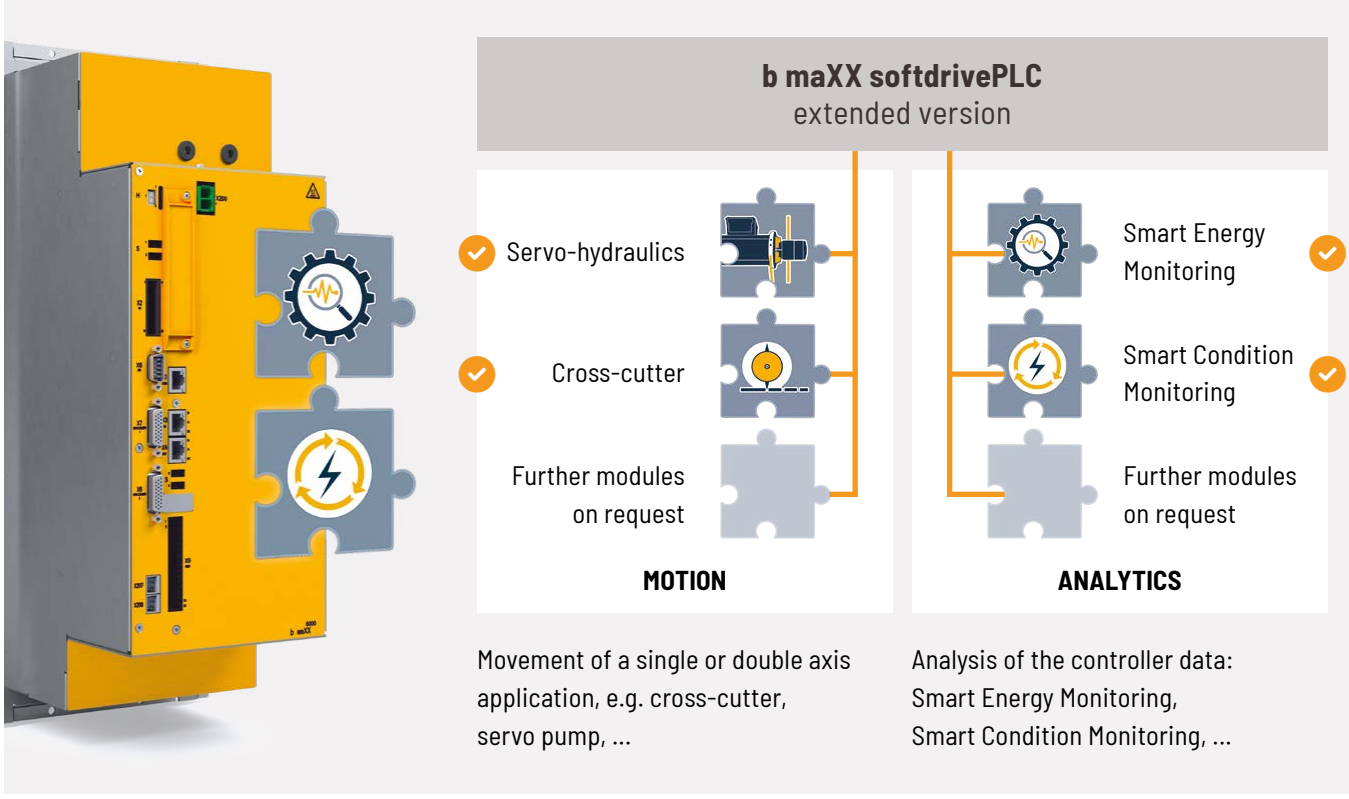
- More complex functions
- Applied by Baumüller, e.g. movement of an axis, analysis of drive data



b maXX softdrivePLC as motion control and for analyses in the drive

Technology functions directly in the drive

The drive-integrated PLC runs as part of the firmware in the b maXX servo converters of the 5000 and 6000 series.
With the b maXX softdrivePLC, control functions for single and double axis applications can be moved from the central PLC to the drive. In addition, the data available in the drive can be used for analyses – completely without any external sensors.



High-performance and modular: motion control functions in the drive

If motion control functions are moved into the drive, individual axes can be controlled more precisely.
The calculations are implemented directly in the drive.
The dynamics in the process is increased, as a result of which the cycle times and thus the performance of the machine can be increased. Another advantage is the modularity: the flexible topology allows individual functions to be separately integrated in the machine concept. The technology modules are available as finished machine modules.
Example applications are cross-cutter or servo pump.

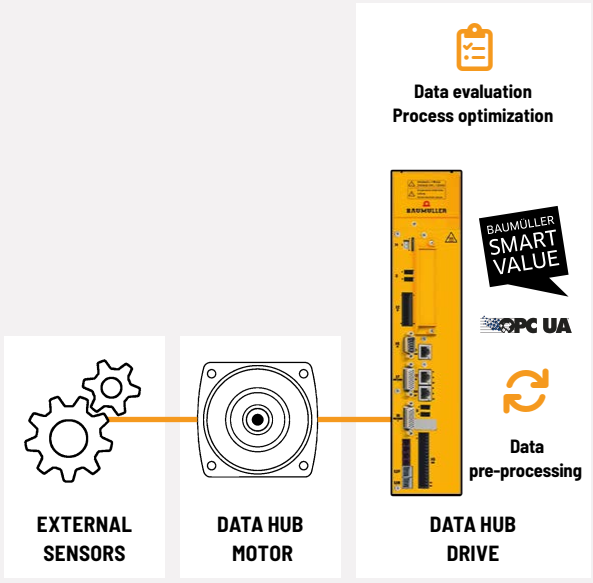
Cut process costs with analytics in the drive

Machine manufacturers can use the analytics modules to offer their customers added value without using additional hardware.
The Smart Energy Monitoring module enables the energy consumption to be recorded reliably for individual axes or the whole machine. This transparency helps to lower energy consumption in the next step by making adjustments to the process.
The Smart Condition Monitoring module enables the vibration analysis to be run directly in the drive. A machine standstill due to motor wear can therefore be prevented.

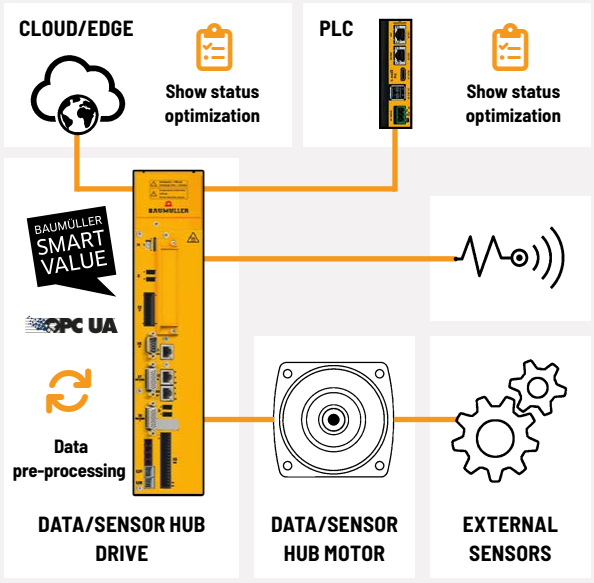
Baumüller SmartValue
Intelligent drives for Industry 4.0

Get more out of your drive technology with IoT

Baumüller SmartValue stands for the added value offered by the intelligence in the drive for mechanical engineering and the machine operating company/owner. Use data already available such as power, current, torque, speed or position, for example, to monitor the operating state of the machine. These functions can also be implemented directly in the controller even without external sensors. In addition, decisions can be taken directly in the drive so as to avoid machine failures.



During operation, the intelligent drives react independently to optimize processes and product quality.



Servo motors and drives function as a sensor hub and can record the data of external sensors, e.g. of transmissions.

Extend the database: integrate external sensors

If the available data is insufficient for the desired use case, the servo drive or the servo motor can easily be used as a data hub too. This allows the database to be extended with external sensors, e.g. vibration sensors of with data from the transmission. Direct sensors can be connected via digital or analog inputs so that the relevant data can be sent to the drive. The drive thus becomes a data hub with the goal of not only performing the work of a drive, but also of collecting additional, relevant data from various sources, pre-processing this and forwarding it to the cloud or a control unit and edge PC.

Based on this data, users are provided with recommendations for action and important information, e.g. on the operating status of the machine, that can in turn be used to optimize the machine or process. One application is the Smart Operation Point function. The utilization rate of the power semiconductors (IGBT) used in the servo drive are hereby determined and simulated by means of a dynamic temperature model. Power reserves can be released if necessary depending on the result. This solution could be put to practical use in a shredder, in which material had become jammed.

INDUSTRY 4.0

IIoT | Connectivity | Engineering

FIELDBUSES

Real-time Ethernet and fieldbus communication

Fastest real-time Ethernet bus system for all applications in the field of mechanical engineering and process automation:

Standard logic, Motion Control, measurement and control technology with integrated IT communication technology. The EtherCAT technology and its further development is actively supported by more than 7000 member companies of the EtherCAT Technology Group.

EtherCAT – Real-time Ethernet

The EtherCAT real-time Ethernet field bus exhibits high performance, low wiring expenditure and openness for other protocols. EtherCAT even makes it possible to integrate Ethernet down to the I/O level in an economically sensible way.

As one of the founding members of the EtherCAT Technology Group, Baumüller recognized the advantages of EtherCAT early on and actively took part in expanding and standardizing EtherCAT. In addition to EtherCAT, Baumüller also supports standard Ethernet and field bus systems, such as POWERLINK, CANopen, Modbus, Profibus, Varan and EtherNET/IP.

EtherCAT®

EtherCAT features:

- Full Ethernet compatibility
- Internet technology in even the simplest devices
- Maximum utilization of the Ethernet bandwidth
- Excellent real-time features at low cost

Additional possible fieldbus systems

CANopen · PROFINET® · ETHERNET POWERLINK · VARAN · EtherNet/IP™ · Modbus

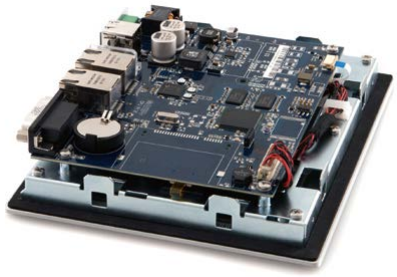
b maXX HMI

Visualization and operation

With the b maXX HMIs, Baumüller offers an extensive portfolio of operating devices: Various formats with 16 million colors, LED background lighting and front frames in aluminum, aluminum true flat or glass.

The hardware is based on a 1 GHz ARM Cortex A8 processor combined with 1 GB of system memory and 4 GB of eMMC memory for saving and managing your HMI projects. The products are rounded off with an extensive, integrated software package starting with system tools and the HMI runtime environment all the way through to integrated remote maintenance software.

The devices are available with display sizes from 4.3 to 15.6 inches in the Basic and Standard product lines, and 7.0 to 15.6 inches in the Premium product line. They are equipped with USB and Ethernet ports and a configurable serial interface. Equipped with LCD and LED-backlit TFTs with 16 million colors and touchscreens, this device series includes models that are ideal for any application.



Brilliant and adaptable

- 4.3 – 15.6 inch displays with touchscreen
- 1 GHz ARM Cortex A8 CPU
- 1 GB system memory, 4 GB eMMC memory
- WIN CE with integrated software package

BASIC WINDOWS		Aluminum front, 4.3" – 15.6" Windows operating system
STANDARD WINDOWS		Aluminum true flat, 4.3" – 15.6", IP66 Windows operating system
PREMIUM WINDOWS		Capacitive glass touch, 7.0" – 15.6", IP66 Windows operating system

Integrated runtime environment

The **Premium HMI** Runtime environment is part of the PremiumHMI platform. Adjusted to the hardware platform, state-of-the-art standards and interfaces are supported. With PremiumHMI, customers are provided with high-quality HMI systems. The runtime is part of the software package of all Win CE-based HMIs from Baumüller.

System manager

The **system manager** provides an extensive and pre-installed package of software tools.

Specially adapted to improve the opportunities for using Win CE, useful and helpful functions (system backup and clones, anti-aliasing, etc.) are available.

Remote maintenance

The **Ubiquity runtime** is a software component that allows remote maintenance. It is integrated into the Baumüller HMIs running Win CE. No additional hardware is required, and even network configuration can be dispensed with. The system uses the existing Internet connection. The package includes an integrated firewall, secure connections and remote desktop functions.

PREMIUM HMI

Visualization

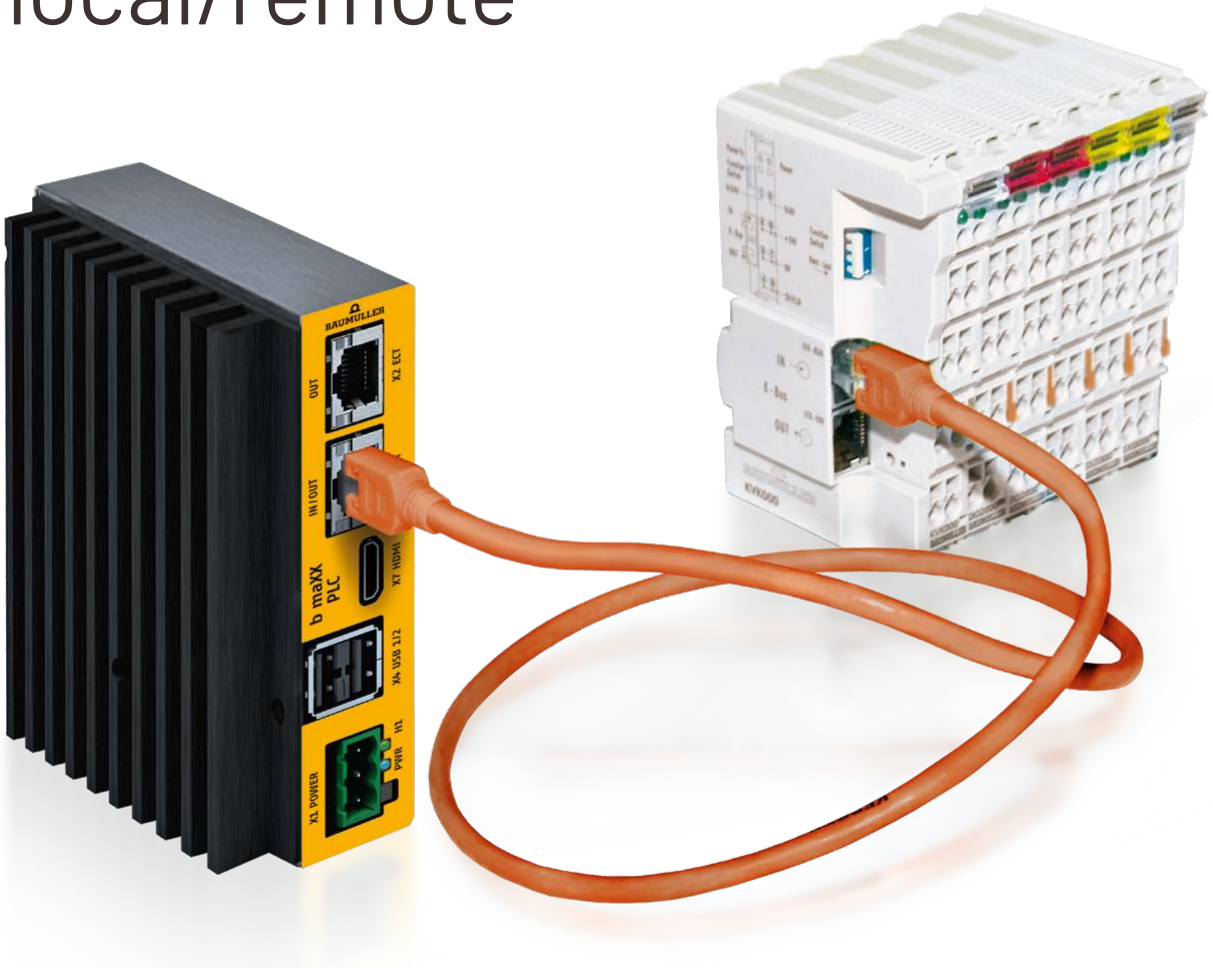
With PremiumHMI, customers are provided with a modern, high-quality and comprehensive software platform comprising a development environment, runtime environment and mobile app. Always state of the art, a wide range of interfaces and standards is supported.

Elements-oriented programming significantly reduces the amount of work required not just for project development, but also for maintenance and troubleshooting. With a user-friendly environment that can be configured to suit, and with the assistance of a wizard, the project creation process is actively supported and made easy.

- Development environment for implementing HMI projects for the Windows CE and Windows 32/64 operating systems
- Use of the latest technology standards XML, ODBC, OPC, VBA, TCP/IP, SQL, etc.
- Sophisticated tools such as trend and data logger objects for analyzing and displaying archived data.
- Precision for events administration, ensuring ongoing and direct monitoring of systems / machines.
- Object-oriented administration of production formulas
- Integrated graphics and driver library
- Printed reports, multi-lingual support, scripting and web clients, as well as schedulers and simulators

I/O SYSTEMS

Machine interfaces local/remote



Baumüller I/O components provide users with a wide range of modules for optimum adaptation to their requirements. Industry-standard signal types can easily be integrated into the application for evaluation purposes.

The use of I/O islands allows both machine information to be detected at its place of „origin" and the PLC to be supplied and exploited. As required, terminals can be arranged side-by-side in a modular and scalable way on bus couplers (CANopen and EtherCAT). A wide range of modules are available, allowing users to easily and flexibly implement machine configurations.

- ✓ CANopen/EtherCAT bus couplers
- ✓ System terminals
- ✓ Digital inputs and outputs
- ✓ Analog inputs and outputs
- ✓ Counter terminal
- ✓ Thermo elements

- Proven bus terminal technology
- Compact design for confined spaces
- Modules can be bayed via bus couplers
- EtherCAT terminals with up to 65,535 devices
- E-bus coupler with integrated digital I/Os
- HD terminals with 16 digital inputs or outputs

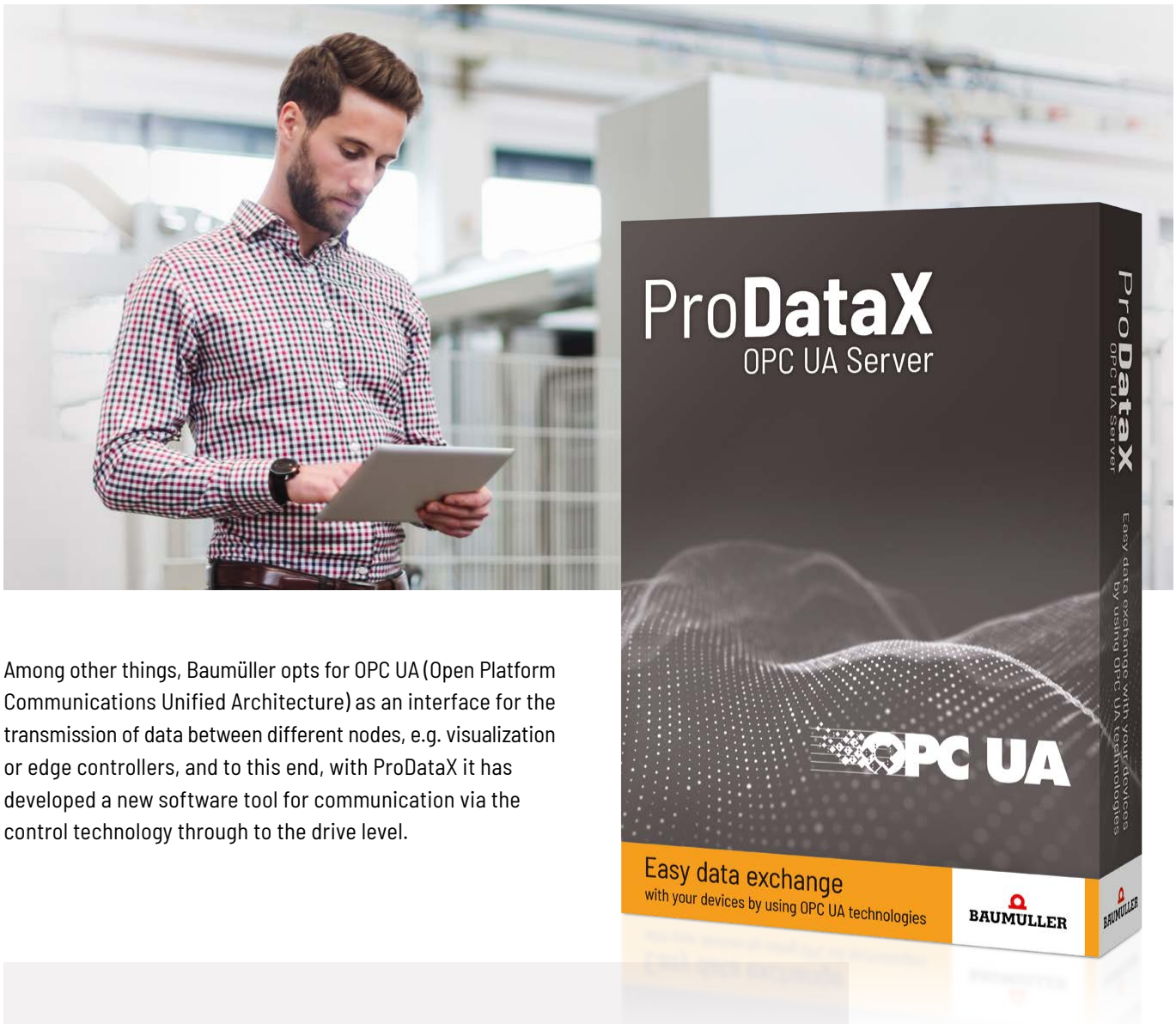
Couplers and I/O modules

Type	Description	E-Bus
Couplers	EtherCAT coupler, E-Bus	EC000E
	EtherCAT coupler with ID-Switch	EC001E
	EtherCAT coupler with integrated 4 DI + 4 DO	EC440E
	EtherCAT coupler with integrated 8 DI + 4 DO	EC840E
	EtherCAT coupler with integrated 4 DI + 8 DO	EC480E
Digital inputs	2 digital inputs, 24 V DC positive switching	DI200E
	4 digital inputs, 24 V DC positive switching	DI400E
	8 digital inputs, 24 V DC positive switching	DI800E
	16 digital inputs, 24 V DC positive switching	DI160E
Digital outputs	2 digital outputs, 24 V DC/ 0.5 A positive switching	DO200E
	4 digital outputs, 24 V DC/ 0.5 A positive switching	DO400E
	8 digital outputs, 24 V DC/ 0.5 A positive switching	DO800E
	16 digital outputs, 24 V DC/ 0.5 A positive switching	DO160E
Analog inputs	4 analog inputs 4 up to 20 mA	AI442E
	4 analog inputs 0 up to +10 V DC	AI401E
Analog outputs	4 analog outputs4 up to 20 mA	AO442E
	4 analog outputs up to +10 V DC	AO401E
System terminals	Bus end terminal	EK000E
	Feeding clamp 24 V DC	ES000E
	E-bus terminal on ECT (RJ 45)	EA000E
	E-bus adapter on K-bus	E2K000
Counter terminals	Incremental Encoder Interface 16-Bit; 5 V; differential input	ZK000E
Thermo elements	2 analog inputs PT100;16 Bit; 250 ms; 0.1° per digit; 0.5 mA, 2-3-wire system	AI2PTE
	2 analog inputs thermo element with wire break monitoring; 16 Bit; 250 ms; 0.1° per digit	AI2TEE

Subject to change

ProDataX

IoT data exchange – Baumüller control units with OPC UA server

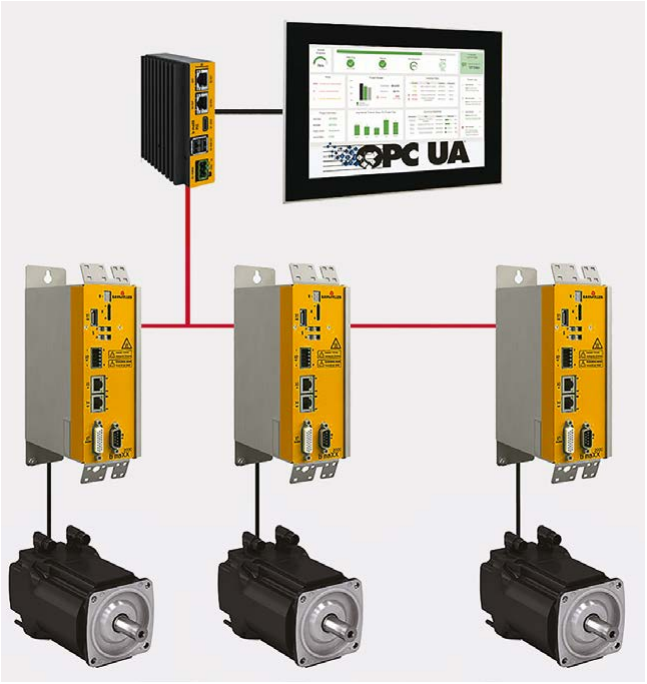


Among other things, Baumüller opts for OPC UA (Open Platform Communications Unified Architecture) as an interface for the transmission of data between different nodes, e.g. visualization or edge controllers, and to this end, with ProDataX it has developed a new software tool for communication via the control technology through to the drive level.

- DA (Data Access) for access to machine data and parameters
- Security via certificates for access to the OPC UA server
- Can be used by other providers via OPC UA methods

IoT data exchange with ProDataX

OPC UA serves as a common data exchange standard for secure, reliable, manufacturer and platform-independent communication in IoT, M2M and industry 4.0 environments. The requirement for communication between the components of different manufacturers via OPC UA to work is that each device involved in the communication must meet the current specifications of the OPC Foundation.

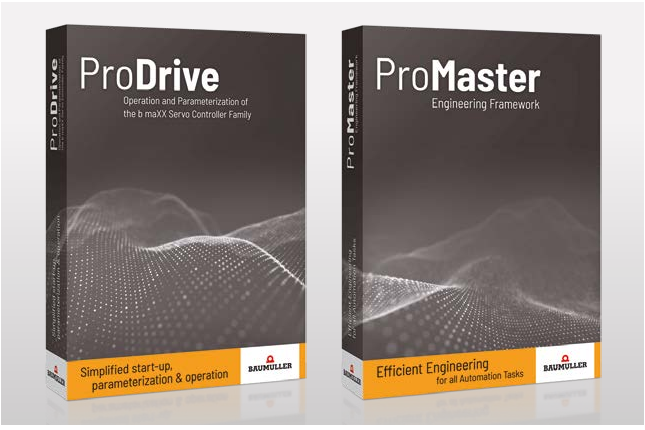


Baumüller has now implemented the three most important parts of the extensive catalog of OPC UA Foundation specifications for its applications:

- **DA (Data Access)** for access to machine data and parameters
- **Security** via certificates, to ensure that only authorized nodes have access to the OPC UA server
- With **OPC UA methods**, the oscilloscope function of the Baumüller devices can also be used for other suppliers, for example

Baumüller control units with OPC UA server

The basic idea of OPC UA is that all hardware manufacturers involved in a system provide an OPC UA server for their components connected to the communication. Baumüller offers the ProDataX software tool for this purpose.



ProDataX provides an OPC UA server interface that can run not only on the Baumüller control hardware but also on standard PCs with the Windows operating system. ProDataX can be configured using the Baumüller programming/ operating tools ProMaster and ProDrive, and among other things, enables the provision of machine data in its own and external systems. If the user also wants to write data in the machine, this is available as an option. To do this, tailored or coordinated security solutions should be provided in the existing IT infrastructure.

OPC® Unified Architecture

ProSimulation

Immediate access to simulation

ProSimulation simplifies the virtual design, optimization and commissioning of machines and plants. The software extends the range of functions of the ProDrive operating software, which allows for the simple and fast commissioning, parameterization and operation of all b maXX drives.

- Efficient machine development
- Fast commissioning
- Baumüller drive technology as controller models
- Extensive library of common mechanics
- CAD import from other tools available

Faster to market thanks to shorter development times

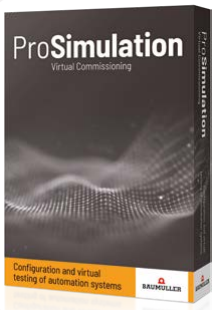
With Baumüller's ProSimulation simulation tool you shorten your development and commissioning times for machines and plants significantly. You can use Baumüller controller and mechanics models or your own mechanics models. Together with you or on your behalf, we design the optimum automation and drive components for your machine and test the settings. In doing so, we opt for risk-free, virtual design and virtual commissioning. This is also possible from the comfort of your own desk without detailed simulation knowledge.

Simulation platform in ProDrive

- ✓ Baumüller drive technology as verified controller models
- ✓ Extensive library of common mechanics
- ✓ Linking of various existing simulation models for the simulation of machine movements

Display of simulation results in oscilloscope with reference measurement

- ✓ Direct evaluation and comparison with reality



Parameter settings via virtual controllers

- ✓ Virtual commissioning
- ✓ Controller optimization and parameter set issuing for real drive

CAD import with 3D animation and machine movements

- ✓ Import of existing models from other simulation tools, e.g. Matlab® Simulink®, Modelica®, etc.

Advantages

Time and cost savings during development and commissioning

- ✓ The issuing of a real prototype can be optimized or completely replaced
- ✓ Easy import of existing models from other simulation tools
- ✓ Simple user interface and operation (ProDrive extension)
- ✓ License for further modeling software can be saved

Optimization of existing machines and plants

- ✓ Virtual troubleshooting and optimization

Development of simulation know-how in the company

- ✓ Easy introduction to the topic of "digital twin"
- ✓ Fast creation of own simulations

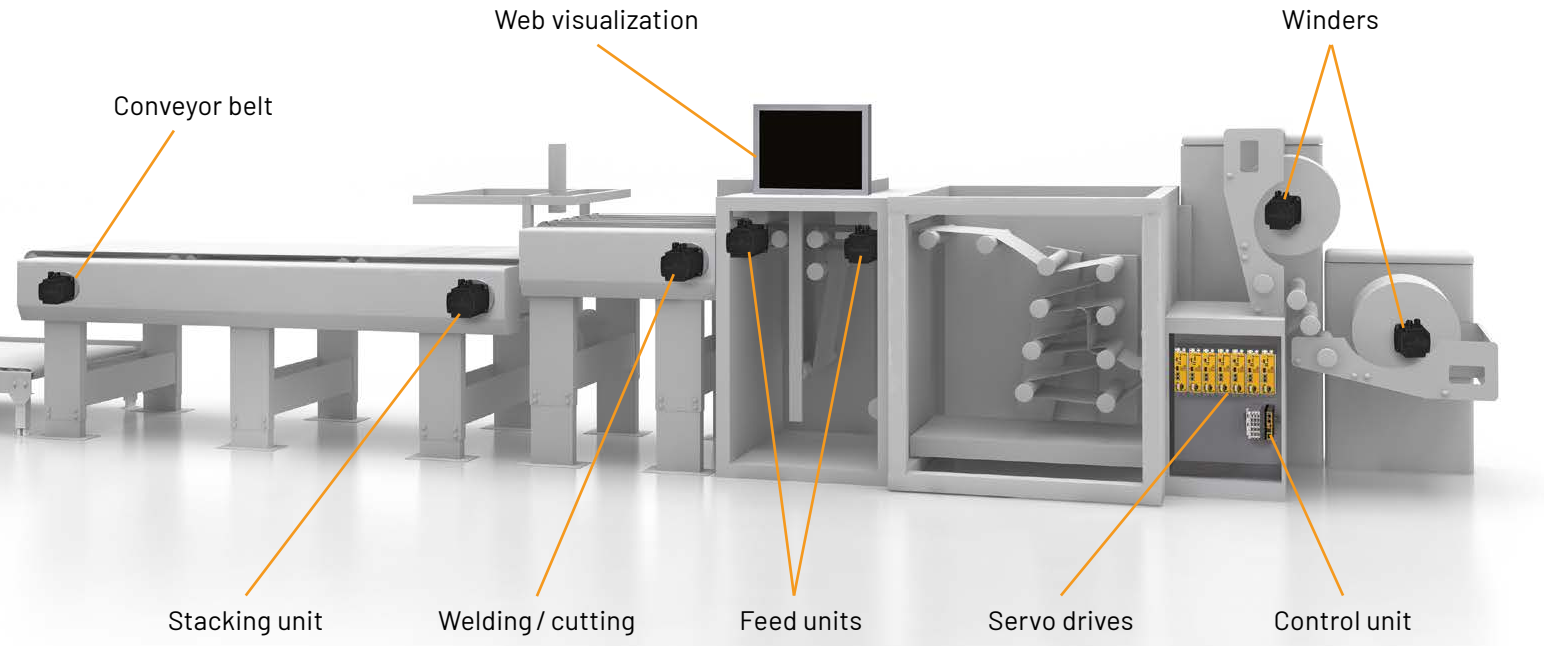
APPLICATIONS

Realized industry-specific automation solutions

Packaging machine

Baumüller offers a complete system consisting of a software template for the relevant control technology, machine visualization, b maXX servo drives as well as various motors for foil pouch machines including control cabinet construction. These machines product pouches for all kinds of different areas of use.

Baumüller's automation solution enables a higher number of cycles, a modular machine design and less maintenance.



Benefits of the electric drives and automation

Automation & technology functions

- Plausibility check: Automatic, systematic check of the user inputs
- Adjustable, constant welding time depending on the machine cycle time leads to increased product quality and safety due to high-quality sealing
- Energy-efficient drive package by using optimized movement profiles

Motors

- Extremely compact motors for minimum installation space
- Motors with excellent acceleration properties for high cycle rates

Servo drives

Clever drive topology by using the DC link system:

- Storage of energy in the DC link or in additional capacities to provide energy again when it is needed → higher energy efficiency with lower energy costs
- The electrical drive output can therefore be dimensioned to be smaller and more economical if necessary → Can be determined in advance by simulation
- Due to the energy stored in the DC link, controlled shutdown of the system in the event of faults such as power outages is possible
- Compact modular system saves space in the control cabinet

Web & Foil machine template

With the Web & Foil software template for web processing machines, developers save a lot of time, especially in the start-up phase of a project, and can therefore better concentrate on the important machine functions. For the machine manufacturer, this means a faster time-to-market and significantly reduced development costs.

The developer does not have to set up the **basic functions** again from scratch, since they are selected and parameterized directly. Routine tasks such as the instancing of motion modules or linking variables are no longer necessary.

The templates contain frequently used **machine functions** for paper and foil processing. These only have to be adjusted to the respective application.

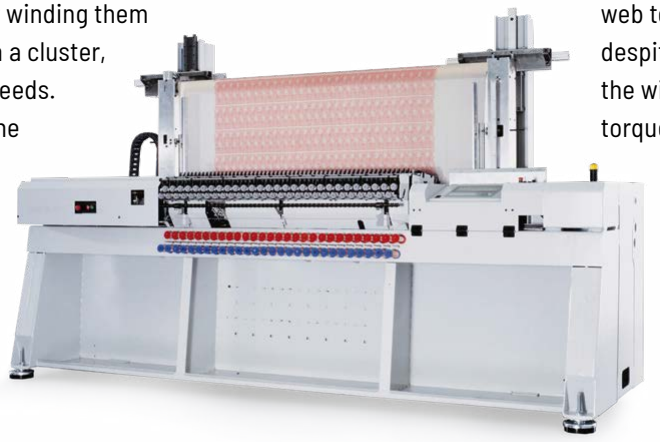
- Virtual master
- Cams
- Recipe management
- User-level management
- Monitoring
- Alarm handling
- Manual mode
- Version handling
- Singularization
- Register control
- Cam group
- Heating bar
- Cutting
- Stacking
- Feed

Textile quilting machine

System partner for the textile industry

As a system partner, Baumüller supplies complete, industry-focused solution concepts, starting with IPC, HMI and servo controllers all the way through to dynamic servo motors from a single source. Fully designed control cabinets belong to the spectrum of services for the textile industry just as much as well-engineered and customer-specific service concepts.

This system is a machine that unwinds bolts of fabric and combines materials such as wadding with each other (quilting) and provides an option for winding them back up. By using several needles in a cluster, wide webs can be quilted at high speeds. A built-in gripper adjuster adjusts the gripper to the needles when there are lateral movements of the transverse drive. A new calculation is performed for each stitch on the path to be traveled. The winding process must be torque and speed-controlled. The speed of the fabric webs and the web tensile force must be constant despite increased diameter. During the winding process, the motor torque must decrease in proportion to the increasing diameter to ensure a uniform material thickness on the roll.



Improved design

- Space and cost savings thanks to the use of side-by-side technology (smaller control cabinet)
- Complete system featuring drive technology, control technology and software
- Use of coordinated motion for "CNC control" of the machine movements via G-Code

Optimized operation

- Continuous start and dynamic cornering (splines) reduces mechanical stress
- Increased material throughput thanks to higher speeds
- Increased machine availability thanks to web technology

Rapid service

- Global access for updates and troubleshooting
- Evaluation and graphic presentation of shift and production data

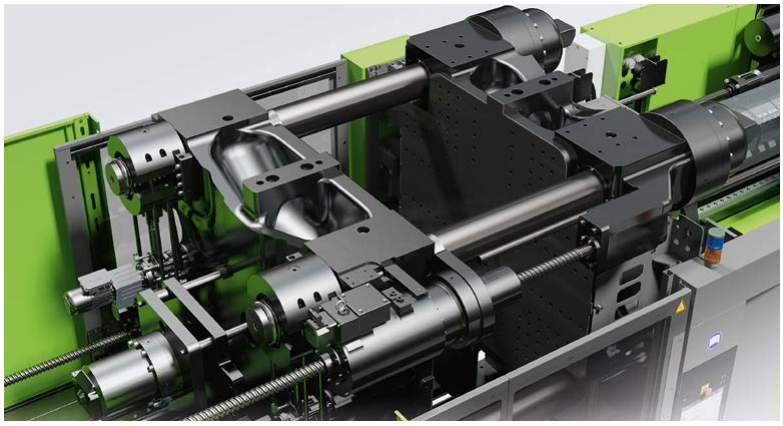
Flexibility in use

- Faster pattern creation using the editor with G-Code generator
- G-Code generation from graphic files

Injection molding machine

Baumüller offers a comprehensive portfolio for servo-hydraulic, hybrid, and fully electric injection molding machines.

With optional regenerative systems, intelligent software and simulation solutions, as well as efficient synchronous motor technology. The drive technology products make an important contribution to the energy-efficient and precise production of even highly complex injection molding parts.



Benefits of the electric drives and intelligent controller functions

Clamping drive

- Extremely compact type of construction and excellent dynamics for compact machine designs and short cycle times
- Intelligent "error response to encoder breakage" controller function protects against tool damage

Plasticizing drive

- High energy efficiency, even within the partial load range
- Shorter cycle times due to parallel functions
- Direct drives enable a compact machine construction even with multi-layer processes

Injection drive

- High accuracy due to precise control
- Intelligent "PWM frequency switchover" controller function enables longer dwell times for higher product quality
- Intelligent "gantry" controller function for modular electrification of the injection unit

Ejector drive

- Extremely compact type of construction and excellent dynamics for compact machine designs
- Prevention of oil contamination of end products in the tool space
- Flexible integration in the machine room

Servo-hydraulics

- Significantly lower energy consumption through control of the pump drive
- Lower noise emissions
- Higher process and product quality
- Monitoring of the thermal pump load

Servo drives

- Compact system saves control cabinet space
- Ethernet-based field buses enable vertical integration in the control architecture
- Flexible drive topologies up to 315 kW
- Intelligent controller functions

Engineering as a Service

As a specialist for highly synchronized motion control applications, we provide ready to use motion libraries, machine templates and machine modules, drive-based analysis functions, and IoT solutions.

We also offer **Engineering as a Service EaS** for optimum implementation in your machine. With our know-how, we can make a maximum contribution to the productivity and cost-effectiveness of your machines and plants and shorten your time-to-market.

PLC-based solutions
Templates and visualization
EaS

Drive-based solutions
Analytics/motion control
EaS

Solutions of third-party providers
Siemens library
EaS
B&R library

IoT solutions for
machine networking
EaS

Consultation | Support
Workshop | Training

Simulation
Software and models
EaS

b maXX servo drives

With its converters, Baumüller provides its customers with important advantages: From cost savings to higher dynamics to increased safety.

Together, the converter series of the b maXX family cover a wide power range up to 400 kW. The b maXX family includes both stackable devices and powerful mono units. With optional safety packs, all devices in this series can be easily adapted to meet your individual safety needs.

Motors

You are looking for the right motor for your application? We offer you a wide portfolio of motors from 0.3 to 530 kW.

Depending on your requirements, we equip your plants or your mobile application with disk motors, dynamic three-phase motors, high-torque motors or if necessary, direct current motors also.

Sheet metal working / control cabinet construction

For many years, we have been implementing custom solutions for renowned machine and plant manufacturers – from sheet metal parts to completely wired control cabinets. You receive everything from us, a single source that can therefore deal optimally with your needs and wishes.

Planning | design | sheet metal production | serial production | assembly | installation

Service / Retrofit / drive modernization

With our services we support maintenance personnel, who are responsible for the smooth running of machines and plants every day, in all topics of industrial maintenance – and regardless of the manufacturer.

Regardless of the manufacturer, we offer you tailored and multi-level solutions for the modernization of your electrical drive systems.

HOUSE OF AUTOMATION

BAUMULLER ANLAGEN-SYSTEMTECHNIK
System Engineering

BAUMULLER
Automation and Drive Systems

NÜRMONT
Installation and Relocation

BAUMULLER SERVICES
Intelligent Services

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