Automation solutions, control technology, field bus communication, ProMaster, Motion Control, b maXX HMI, I/O modules
Enabling Industrie 4.0
Baumüller Automation –
Added value for our customers

Make our experience your advantage
• More than 20 years of experience in automation and control technology
• Coordinated products
• Software libraries for fast time-to-market
• Scalable solutions
• Excellent degree of flexibility

www.baumueller.com

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Automation concepts</td>
</tr>
<tr>
<td>6</td>
<td>Automation solutions</td>
</tr>
<tr>
<td>14</td>
<td>ProSimulation</td>
</tr>
<tr>
<td>16</td>
<td>Motion Control – Motion libraries</td>
</tr>
<tr>
<td>20</td>
<td>Machine modules</td>
</tr>
<tr>
<td>22</td>
<td>b maXX-softdrivePLC</td>
</tr>
<tr>
<td>24</td>
<td>b maXX-drivePLC</td>
</tr>
<tr>
<td>26</td>
<td>b maXX-controllerPLC</td>
</tr>
<tr>
<td>28</td>
<td>b maXX-safePLC</td>
</tr>
<tr>
<td>30</td>
<td>b maXX PCC-04</td>
</tr>
<tr>
<td>32</td>
<td>Real-time Ethernet</td>
</tr>
<tr>
<td>34</td>
<td>Engineering Framework ProMaster</td>
</tr>
<tr>
<td>38</td>
<td>Operating and visualizing with b maXX HMI</td>
</tr>
<tr>
<td>42</td>
<td>I/O modules, motors and servo controllers</td>
</tr>
</tbody>
</table>
With a Baumüller solution, you can make your machines flexible and super-efficient. Our solutions are based on scalable components that can be freely combined and adapted perfectly to your machine topology. The use of standardized interfaces means that your automation solutions from Baumüller are always up to date, future-proof and scalable.
The choice is yours – you decide how much and how many of Baumüller’s components, modules and services you need. Benefit from the option of combining function blocks, technology modules and libraries at will and adapting them perfectly to your needs. Protection your automation expertise with libraries of your own; on new projects, call on your stored knowledge and reduce the amount of effort required for project planning.
Baumüller’s system solution is more than just a combination of components: We equip material handling systems with state-of-the-art control and drive components. The system’s hardware and software are perfectly attuned to one another and can be integrated with great flexibility into any machine concept. The system contains a range of functions that allow rapid commissioning and make work during ongoing operation significantly easier. The intuitive user interface is designed for all groups of users – from programmers to machine operators.
Your system partner for material handling

The broad range of servo motors from Baumüller provides the correct option for every handling system. All of the servo controllers allow various power parameters and functions to be selected. Decentralized servo controllers are provided as an option to minimize both the wiring and space requirements.

You also have a choice of PLCs: We provide BoxPCs with HMIs, safety or controller PLCs. You can operate the handling via the central machine control or alternatively via an independent unit.

Our comprehensive modular software system provides preprogrammed modules for all required functions. This removes the need for complicated programming and lets you put your handling system into operation by simply inputting the desired parameters.

<table>
<thead>
<tr>
<th>Intuitive operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Control and parameterization via intelligent operator control</td>
</tr>
<tr>
<td>• Easy diagnosis and quick fault correction</td>
</tr>
<tr>
<td>• Palletizing function even for tilted pallets</td>
</tr>
<tr>
<td>• Collision protection</td>
</tr>
<tr>
<td>• Error messages in clear text</td>
</tr>
<tr>
<td>• Multilingual operator guidance system</td>
</tr>
<tr>
<td>• Automatic consistency check</td>
</tr>
<tr>
<td>• Control using a mobile device is possible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flexible customization options</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Easily load, save and customize existing traverse distances without programming</td>
</tr>
<tr>
<td>• Traverse distances are freely definable</td>
</tr>
<tr>
<td>• Free definition of tolerances and restricted areas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quick commissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Plug&amp;Play: Rapid integration into existing systems</td>
</tr>
<tr>
<td>• Easy generation of the traverse distances without complex programming</td>
</tr>
<tr>
<td>• Use of predefined templates for standard procedures</td>
</tr>
<tr>
<td>• Control cabinet-free operation is possible thanks to decentralized technology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fast and precise operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Jerk-free and continuous movement</td>
</tr>
<tr>
<td>• Complete system including drive technology and software of the usual high quality from Baumüller</td>
</tr>
<tr>
<td>• Servo drives with high positioning accuracy as a part of the overall system</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Operation as an independent system via HMI or mobile device</td>
</tr>
<tr>
<td>• Operation is possible via the machine control</td>
</tr>
</tbody>
</table>
Robots have long since been assisting humans with the production of a wide range of goods. Robots are the epitome of total precision, speed, robustness and safety. As your system partner, we help you with state-of-the-art drive technology, intelligent servo controllers and high-performance control units featuring modern programs and software libraries – and all from a single source.
Your system partner for robotics

Baumüller’s scalable and flexible products are complemented perfectly in their various areas of application with extensive software libraries, and this is also true for the field of robotics. With technology modules and functions, tasks such as G-Code, track and cam control, as well as other functions for various robot systems, can be implemented brilliantly. It does not matter whether the robot is a single-station model or part of a collaborating multi-robot system: With us at your side as a system partner, you accomplish your tasks and challenges with total ease.

Flexibility in use

- Programming in accordance with DIN/ISO thanks to G-Code
- Support for various types of kinematics

Fast and precise operation

- Precision-positioning servo drives
- Complete system featuring drive technology, control unit and software in excellent Baumüller quality

Precise movement processes

- Jerk-free, continuous motion
- Implementation of torque of inertia adaptation and torque pre-control
- Track and cam control through libraries

Your benefits

- Maximum precision with Baumüller servo-motors with extremely low cogging torques
- Speed through the use of compact, intelligent controllers with a high power density
- Safety thanks to powerful safety control
- End-to-end integration of safety, motion and communication technology
In a state-of-the-art embroidery machine, 1,024 needles are punching up to 500 times per minute. The result: high-quality embroidery patterns made with precision. In part, the success is also due to Baumüller drives for textile machines. They provide an exact positioning within the (cycle) time and thereby a higher productivity of your machine.
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.

Example of a quilting machine
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
Automation solutions for the plastics industry

Innovative strength and expertise – just two of many reasons why numerous companies from a wide range of sectors in the plastics industry are relying on Baumüller. Innovative and tailored solutions are our hallmark, starting from the development of high-torque motors and intelligent servo controllers and control units to our all-inclusive servo pump solution. We offer you dynamic and precise application solutions from a single source.
Your system partner for the plastics industry

With Baumüller products and solutions, you stay innovative and can also reduce costs and effort. Energy-efficient direct drives allow considerable savings to be made on lifecycle costs thanks to the reduced amount of energy and maintenance required. The machine’s footprint can also be reduced thanks to the compact structure.

As well as reducing costs on one hand, using our products also offers other advantages:

- Greater precision
- Shorter cycle times
- Increased productivity
- Increased overall effectiveness

Baumüller’s servo pump combines the advantages of hydraulic power transmission with the benefits of electric servo drive technology. Integrated regulator functions allow simple connections to existing machine control units without changes having to be made to the software.

The combination of drive control and the lower power consumption of the components, especially in the partial-load range, creates a highly energy-efficient and cost-effective solution that can give you and your machines a decisive advantage.
ProSimulation
Immediate access to the simulation

ProSimulation

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

www.prosimulation.de
Faster to market thanks to shorter development times

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 controllers.

ProSimulation – Functions

**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
What is the Motion Library?

The motion library is a software library developed by Baumüller that can control motion sequences of a system. This is made possible by numerous pre-fabricated modules.
Basic libraries

The basic libraries form the basis of the motion control. More than 500 modules are already pre-installed on the Engineering Framework ProMaster free of charge. They contain basic functions that are useful for motion sequences of motor-based axes.

Axis
The basic library Axis offers all the functions for controlling an individual axis, such as switching on, positioning, reading out errors, etc.

Multi Axis
The basic library Multi Axis allows the programmer to synchronize motion sequences of two or more axes with high precision, for example with a cam. Master axes can also be created.

3D Axis
The basic library 3D Axis enables travel in three-dimensional space, i.e. in the X/Y/Z direction. G-code can be used to specify the motion control. Additional functions such as collision monitoring, tool management and others are also available.

Your benefits

- Cost reduction
  Prefabricated machine modules to reduce the initial effort and therefore the costs
- Industry knowledge
  Take advantage of our process expertise
- 3D motion
  Make your control system 3D-capable and use our G-code
- Simple programming
  From the motion component to the complete machine module
- Expertise from a professional
  Benefit from our knowledge and save valuable time
Advanced libraries

The advanced libraries of Baumüller are extensions of the basic libraries representing the individual machine functions. All of the libraries can be combined with one another. Your process stipulates the cycle for our technology modules. Machines working continuously or intermittently can implement a variety of tasks, such as dosing, sealing, stamping, transporting, shaping, filling, unwinding/rewinding and positioning, using our enhanced libraries. High process quality with time-optimized and smooth movement is achieved in this way.

The mechanics

Our enhanced libraries consider mechanical machine functions such as:
· Linear axes: linear motors, spindles, toothed racks
· Rotational axes: toothed belts, rotary tables, conveyor belts
· Eccentrics: knee levers etc.
· Linked drives, e.g. handling systems, robots

Individualize standardized machine functions

Each application is unique, but that doesn’t mean the whole thing should be totally reinvented from scratch — on the contrary. The whole idea behind modular engineering is to reuse the tried-and-true tested modules and concentrate on the specific task at hand. Baumüller libraries are programmed integrated and are optimally adapted for automation tasks and are based on one another. The combination of the different modules is facilitated by interfaces. Their acquired know-how can be filed, managed and reused anytime in own libraries. By using international standards (such as PLCopen Motion Control) and technology-specific extensions of Baumüller the greatest possible investment reliability is achieved.
Your benefits

- Concentration on the actual machine process
- Quick and efficient development
- Great flexibility thanks to the range of technology combination options
- A small number of machine parameters describe complex movements
- Templates for many applications

Your advantages

- Fast and efficient software creation
- One engineering template, adapted specifically for your plant
- Scalable in functional scope and drive power
- One customized solution from a combination of standard solutions
- Optimized in terms of time and cost
At the control level, Baumüller offers user-friendly and innovative machine modules to create optimal processes in a time-saving manner. The machine modules are available for different applications. The innovative and optimized solutions save a lot of time when parameterizing the machine. Complex motion controls can be configured in just a few steps. In the process, the customer can benefit from extensive process expertise, which is integrated into the individual machine modules.
Every application is unique, but that doesn’t mean having to reinvent everything – quite the contrary: In the sense of modular engineering, it is important to fall back on what is tried and true and focus on the specific task.

Your advantages – quick and efficient software creation

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

Our machine modules can easily be connected to your machine control systems. In this way, your system is ready in a short time without any major changes. In addition to saving time, with our pre-configured machine modules you can significantly reduce energy use as well as benefit from shorter cycle times, higher precision and less noise development.

Machine modules are available for the following applications:

**Servo pump**

**Servo press**

**Handling and robotics**
With the new b maXX-softdrivePLC Baumüller makes separate control hardware unnecessary for some applications. Due to the combination of motion control and SPS functions in the controller, Baumüller has created a decentralized control architecture for programming according to IEC 161131 which enables the simple structuring of distributed intelligence in the machine. Using the parameterization tool ProDrive, tasks such as the simple evaluation of digital inputs up to sophisticated control algorithms can be easily completed, without the need for complex control programming tools.

b maXX softdrivePLC runs as part of the firmware in the Baumüller drive concepts b maXX 5000, b maXX 3300 as well as in the decentralized drive concept b maXX 2500 and works with single axis applications as well as with double axis applications.
Programming via ProDrive for basic version

Using softdrivePLC means you no longer need elaborate tools for PLC programming. PLC tasks can easily be implemented locally in the controller via the ProDrive parametrization tool — from simple invoicing to highly complex control algorithms.

Integrated into ProMaster as an extended version

The extended version of softdrivePLC is fully integrated into the ProMaster Engineering Framework.

With softdrivePLC, programs run in the controller and are highly synchronized with the controller clock at cycle times of up to 125 µs. Simple, specialized filters can also be programmed, in addition to many other benefits:

- Cost savings due to elimination of PLC hardware
- Fieldbus communication between two axes is eliminated by using double axes
- Easy implementation of master-slave functionality
- Multi-axis access to parameters is possible
The b maXX-drivePLC module makes the drive intelligent. This in-drive control intelligence allows very fast access to the setpoints and actual values of the drive controller. Therefore, the functionality of the drive can be enhanced with complex motion, control and technology functions. This ensures that the application can be created quickly and economically.

**Clever. Fast. Effective.**

**Speed up your applications**
- Makes drives user-programmable
- Delivers excellent real-time performance
- Increases availability
- Reduces control cabinet size
- Ensures a consistently stable system
In-drive PLC

With a cycle time of 100 μs for 1,000 lines of STL, the b maXX-drivePLC is suitable for both comprehensive control and demanding motion control tasks. Through the use of our drivePLC, the PLC can be assisted, down-sized or even completely replaced. A new transparency and clarity is also created in the application via the clean decoupling of motion control applications from the machine program. The drivePLC can be integrated into the b maXX 4400 servo controller series and enables the uncomplicated creation of control technology programs with ProMaster or PROPROG.

A CANopen master is included with the CAN option module for b maXX-drivePLC. This enables up to 65,536 digital I/O points to be switched. With the existing EtherCAT master challenging and highly synchronized movement processes are controlled directly on the b maXX-drivePLC. The extensive product range includes decentralized analog and digital I/O modules.

The program memory of the b maXX-drivePLC is sufficient for typical 120,000 lines of IL. 2 MB of RAM are available for variables. The optional residual data memory of 100 KB is buffered battery-free with a NVRAM. This means there is enough memory available for sufficient code. Costly memory expansions can be dispensed with. The battery-free NVRAM means that data is available maintenance-free and after every time the system is switched off and on without any data loss.

- 32-bit Risc CPU 120 MHz
- 16 MB flash memory, of which 2 MB is reserved for the IEC program and 4 MB for cams
- 100 KB non-volatile RAM

IEC 61131-3  Axis  Multi Axis  3D Axis  Advanced library  Machine module  Safety

With their compact dimensions, the PLC-01 and PLC-02 control units are ideal for control cabinet installation. Depending on the requirement, the various CPU modules can be set up on a modular basis with up to five further communications modules for EtherCAT masters/slaves, CANopen masters and various Ethernet interfaces. Combined with I/O modules from our broad product portfolio, the result is industrial control that is coordinated perfectly with the customer’s needs.

- Modular control system for PLC and motion control tasks
- Expansion with up to 5 modules (e.g.: communications modules)
- Direct connection of I/O terminals
- IEC 61131-3 programming
Centralized, decentralized and hybrid control architectures

With flexible usage options for centralized, decentralized and hybrid control architectures, the devices in the controller PLC series offer a range of different processor power and memory options. One feature they all share is their integration into the Engineering Framework ProMaster, the support for libraries and their high real-time performance, made possible through highly synchronized real-time tasks.

All kinds of machine topologies can be created using EtherCAT as the field bus and the communication modules. Starting with the PLC as the EtherCAT master, through to cluster functionality in which the control unit acts as a slave to higher-level devices/command levels and as a master to the converters.

- 32-Bit Risc CPU 120 MHz
- 6 MB flash memory, of which 1 MB is reserved for the IEC-61131 runtime system, 1 MB for the IEC program and 4 MB for cams
- 8 MB SDRAM
- 56 KB non-volatile RAM

- 32-Bit Risc CPU 667 MHz
- 64 MB flash memory, of which 16 MB is reserved for the IEC-61131 runtime system, 16 MB for the IEC program and 32 MB for cams
- 128 MB DDR SDRAM PC 266 (optional 256 MB)
- 100 KB non-volatile RAM

- EtherCAT Master
  - Cluster + Ethernet
- EtherCAT Master + Ethernet
- CANopen Master + Ethernet
- Compact Flash
The b maXX-safePLC combines a standard control unit with a dual-channel safety control unit, complying with the requirements of IEC 61508 SIL3 and EN 954 Cat 4 / EN 13849 PI e. By using this control unit, complicated wiring can be dispensed with, cabling effort reduced and the amount of time and money spent on checking can be minimized. In combination with the EtherCAT communication module, even decentralized and hybrid safety topologies can be created with the safety protocol FSoE.

**b maXX-safePLC**
- 32-Bit Risc CPU 667 MHz
- 64 MB flash memory, of which 16 MB is reserved for the IEC-61131 runtime system, 16 MB for the IEC program and 32 MB for cams
- 128 MB DDR SDRAM PC 266
- 100 KB non-volatile RAM
Safety technology ensures that technical failure, incorrect handling or manipulation no longer present a danger to the employees’ safety. As well as increasing safety, the system’s productivity is also boosted. Safety systems feature more availability than comparable standard systems. As a result, the built-in diagnostic functions and hazard-free operation of the machine by the employee contribute to production faults and breakdowns being recognized and remedied early on. This avoids any expensive system downtime.

The safePLC is a powerful safety control unit that can be integrated into any machine topology. By combining a standard safety control unit with a dual-channel safety control unit, PLC and motion control tasks can be accomplished with ease. Strong real-time performance, highly synchronized real-time tasks and the integration of the EtherCAT-compliant safety communication stacks make the safePLC a compelling product. The control unit can also be expanded with up to five modules and combines safe I/Os with standard I/Os. With the universal integration of safety, motion, logic and communication technologies into the Engineering Framework ProMaster, the user can count on excellent performance and cost-effectiveness.

- Combination of standard and SIL 3 (PLe) control unit
- Safe I/Os can be integrated at will into standard I/Os (local or remote)
- Complete motion control function integrated
- Safety motion control (IEC 61800-5-2) interface
- Certified, EtherCAT-compliant safety communication stack (FSoE)
- Engineering Framework ProMaster for all programming (all function modules integrated in accordance with PLCopen Safety)
- Dispensation with the wiring between the safe and functional areas
- Reduced complexity
- Reduced testing workload
- Increased availability of the machine / system
- Rapid exchange in the event of maintenance without project planning effort or tools (CF card)
The b maXX PCC-04 is the latest 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.

Baumüller offers superb performance for motion control applications comprising a range of synchronous drives thanks to state-of-the-art processors. The demands for greater processing power while at the same time reducing power loss are met by the dual-core and quad-core CPUs from Intel®. Thanks to separate cores for Windows and the real-time operating system, the availability of the b maXX PCC-04 is also particularly high. Baumüller also provides the user with 4 GB RAM and 30 GB internal memory as standard.
Baumüller industrial PCs

Baumüller box PCs are based on open standards from the automation and IT world. In addition to programmability according to IEC 61131, all the possibilities that the Windows operating system offers are available.

The b maXX PCC-04 is equipped with a serial interface, a video output, two Ethernet ports and four USB connections by default. An integrated EtherCAT master makes it possible to use the new industrial PC at the highest control level.

Maximum performance at control and communication level

- For centralized and hybrid control architectures
- Windows 7 embedded operating system with integrated real-time kernel for demanding, highly synchronized control tasks and machine visualization on one module
- Based on industrial PC technology
- High-performance integrated EtherCAT master
- High-precision system synchronization through EtherCAT Distributed Clocks
- IEC 61131-3 programming
- Fully integrated into the ProMaster Engineering Framework

Your benefits

- Use the functions of a controller and the services of an open operating system
- One system for all tasks: PLC, HMI, IT connection
- Open hardware and software platform
- Windows operating systems are in use worldwide
- Backup and restore mechanisms for the entire automation system
- Multi-core processors for computing capacity with defined real-time properties
- Open communication interfaces
Real-time Ethernet and field bus 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 2000 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.

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

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.

Additional possible field bus systems
Your requirements

The increasing complexity of machines and systems also increases the requirements on automation. Larger data volumes need to be processed. In addition to functional aspects and changing customer requirements, regional regulations such as the Machine Directive must be taken into account.

The requirements for flexibility, minimum complexity and simultaneous reduction of the engineering effort can only be handled with an integrated approach and systematic procedures. This is the basis for innovative solutions for modern automation tasks.
Engineering with ProMaster

Our solution
The innovative engineering framework includes all the disciplines of an automation task: from drive design to parameterization, from programming of controllers and field bus parameterization to visualization. This applies to the entire life cycle, from planning and initial operation to maintenance.

Your benefit
An engineering framework helps you design more efficiently and systematically reduces effort, in spite of the increasing complexity of machines and systems. Defined interfaces, modular machine architectures and optional extensions lead to more efficient and flexibly useable automation solutions.

An engineering framework for all automation tasks makes processes more efficient, allows for fast production of systems, improves product quality, reduces fault probabilities and thus increases the productivity.
ProSafety – Safety with ProMaster

The ProSafety programming system, together with its real-time environment, was developed according to the IEC 61508 requirements and covers the entire range of safety functions up to Safety Integrity Level 3 (SIL 3). A machine can be operated safely with little expenditure thanks to ProSafety. A wizard guides the user to a safe control program in just a few steps.

Your benefit

• Full integration of the safety programming and configuration with a uniform project database in ProMaster
• Consistent and transparent integration of safety technology in the ProMaster engineering framework. Using ProSafety guarantees complete, safe configuration
• Combination of standard and SIL 3 programming on a controller fully possible and without any repercussions
• PLCopen Safety function modules are available as library elements for easy safety programming
• Configuration of safe devices, such as drives, sensors, relays and terminals
• In conjunction with our safe drives and bus terminals, safe systems can be implemented pursuant to IEC 61508 (up to SIL 3) and EN 13849 (up to PL e)
Our library concept

Our libraries are comprehensive, optimally matched to your automation tasks and build upon one another. Combining different modules is made easier thanks to interfaces. Your acquired expertise can be transferred to your own libraries, managed there and used again anytime. Thanks to the use of international standards (e.g. PLCopen Motion Control) and technology-specific enhancements from Baumüller, maximum investment security is guaranteed.

Your benefits

• Investment security
• Reduced complexity
• Quick and easy application thanks to the use of machine modules
• Maintainable, trainable and transparent, since the same program and axis modules structures are always used
• Templates for program structure and axis modules are used
Brilliant and adaptable

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

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.

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.
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, round off the package
Ubiquity, the innovative and convenient remote maintenance solution, not only simplifies the installation and commissioning of machines, but also offers a solution for the phase following sales, when customers need support and want to make changes or personalizations.

The Ubiquity solution comprises the control center, the software for managing the Ubiquity domain, the runtime and the server infrastructure. The control center is executed on the remote maintenance PC and allows the domain, users and their privileges and connections to be managed. The domain is the customer account for using the infrastructure and platform services.

- Industrial Security ensures the confidentiality of data and the secure exchange of data through asymmetric encryption, the SSL/TSL protocol and message authentication codes
- Superb productivity thanks to simultaneous multiple connections
- Compatibility with customer-specific security guidelines through the use of existing connections
- Security levels and user profiles guarantee flexible and controlled options only through authorized personnel
Local and remote I/O modules

Bus terminals not only ensure that control cabinets can be built even more efficiently, they have also proven themselves in many different industries worldwide, from machine construction to building control systems.

Baumüller I/O components provide users with a wide range of modules for optimum adaptation to their requirements. As required, terminals can optionally be arranged side-by-side in a modular and scalable way on bus couplers or on the b maXX-controllerPLC.

The use of EtherCAT terminals means that the EtherCAT protocol is maintained up to each individual terminal. With a maximum number of 65,535 users on the EtherCAT and a flexible topology, there are virtually no limits to the design of your machine with the E-bus terminals.

The new E-bus couplers with integrated digital I/Os are perfectly suited for applications with a low number of I/O points. The compact couplers offer various combinations of digital inputs and outputs and are also ideal for confined spaces. Baumüller offers HD terminals with 16 digital inputs or outputs as the ideal addition to these.
### Couplers

<table>
<thead>
<tr>
<th>Coupler Type</th>
<th>Type K-Bus</th>
<th>Type E-Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANopen coupler, automatic baud rate</td>
<td>CK0000</td>
<td>–</td>
</tr>
<tr>
<td>CANopen coupler, Sub-D 9-pin</td>
<td>CK0001</td>
<td>–</td>
</tr>
<tr>
<td>CANopen coupler</td>
<td>CK0002</td>
<td>–</td>
</tr>
<tr>
<td>EtherCAT coupler, Standard I/O</td>
<td>ECK000</td>
<td>–</td>
</tr>
<tr>
<td>EtherCAT coupler, E-Bus</td>
<td>–</td>
<td>EC000E</td>
</tr>
<tr>
<td>EtherCAT coupler, E-Bus with ID switch</td>
<td>–</td>
<td>EC001E</td>
</tr>
</tbody>
</table>

### I/O modules

#### Digital Input

<table>
<thead>
<tr>
<th>Type</th>
<th>Type K-Bus</th>
<th>Type E-Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 digital inputs, 24 V DC</td>
<td>DI2000</td>
<td>DI200E</td>
</tr>
<tr>
<td>4 digital inputs, 24 V DC</td>
<td>DI4000</td>
<td>DI400E</td>
</tr>
<tr>
<td>8 digital inputs, 24 V DC</td>
<td>DI8000</td>
<td>DI800E</td>
</tr>
</tbody>
</table>

#### Digital Output

<table>
<thead>
<tr>
<th>Type</th>
<th>Type K-Bus</th>
<th>Type E-Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 digital outputs, 24 V DC/0.5 A</td>
<td>DO2000</td>
<td>DO200E</td>
</tr>
<tr>
<td>4 digital outputs, 24 V DC/0.5 A</td>
<td>DO4000</td>
<td>DO400E</td>
</tr>
<tr>
<td>8 digital outputs, 24 V DC/0.5 A</td>
<td>DO8000</td>
<td>DO800E</td>
</tr>
</tbody>
</table>

#### Analog Input

<table>
<thead>
<tr>
<th>Type</th>
<th>Type K-Bus</th>
<th>Type E-Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 analog inputs, 4 to 20 mA</td>
<td>AI2420</td>
<td>–</td>
</tr>
<tr>
<td>4 analog inputs, 4 to 20 mA</td>
<td>AI4420</td>
<td>AI442E</td>
</tr>
<tr>
<td>2 analog inputs, 0 to +10 V DC</td>
<td>AI2010</td>
<td>–</td>
</tr>
<tr>
<td>4 analog inputs, 0 to +10 V DC</td>
<td>AI4010</td>
<td>AI401E</td>
</tr>
</tbody>
</table>

#### Analog Output

<table>
<thead>
<tr>
<th>Type</th>
<th>Type K-Bus</th>
<th>Type E-Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 analog outputs, 4 to 20 mA</td>
<td>AO2420</td>
<td>–</td>
</tr>
<tr>
<td>4 analog outputs, 4 to 20 mA</td>
<td>AO4420</td>
<td>AO442E</td>
</tr>
<tr>
<td>2 analog outputs, 0 to +10 V DC</td>
<td>AO2010</td>
<td>–</td>
</tr>
<tr>
<td>4 analog outputs, 0 to +10 V DC</td>
<td>AO4010</td>
<td>AO401E</td>
</tr>
</tbody>
</table>

#### System Terminals

<table>
<thead>
<tr>
<th>Type</th>
<th>Type K-Bus</th>
<th>Type E-Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal resistance</td>
<td>AI2PT0</td>
<td>AI2PTE</td>
</tr>
<tr>
<td>Thermo-element</td>
<td>AI2TE0</td>
<td>AI2TEE</td>
</tr>
<tr>
<td>Counter terminal: Incremental encoder with difference inputs</td>
<td>ZK0000</td>
<td>ZK000E</td>
</tr>
<tr>
<td>Bus end terminal</td>
<td>EK0000</td>
<td>EK000E</td>
</tr>
<tr>
<td>Feeding clamp 24 V DC</td>
<td>ES0000</td>
<td>ES000E</td>
</tr>
<tr>
<td>IO-Bus extension end terminal</td>
<td>KVE000</td>
<td>–</td>
</tr>
<tr>
<td>IO-Bus extension start terminal</td>
<td>KVK000</td>
<td>–</td>
</tr>
<tr>
<td>E-bus terminal on ECT (RJ 45)</td>
<td>–</td>
<td>EA000E</td>
</tr>
<tr>
<td>E-bus adapter on K-bus</td>
<td>–</td>
<td>E2K000</td>
</tr>
</tbody>
</table>

### Safety I/O modules

#### Series

<table>
<thead>
<tr>
<th>Series</th>
<th>Function</th>
<th>Type K-Bus</th>
<th>Type E-Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Input</td>
<td>4 fault-proof inputs, 24 V DC</td>
<td>SI4000</td>
<td>SI400E</td>
</tr>
<tr>
<td>Safety Output</td>
<td>4 fault-proof outputs, 24 V DC</td>
<td>SO4000</td>
<td>SO400E</td>
</tr>
</tbody>
</table>

Subject to alteration
Motors

DSD — Dynamic servo motors

The servo motors for highly dynamic applications with the highest requirements of acceleration capacity and the best start-stop qualities.
Sizes 28, 36, 45, 56, 71, 100, 132, power range 0.3–150 kW (0.4–200 hp), speeds up to 6000 min⁻¹, up to IP65 type of protection

DSP — For high speed performance

For applications requiring high rotary speeds, the DSP motors complete the existing DSD range.
Sizes 45, 56, 71, 100, power range 1.2–32 kW (1.6–43 hp), speeds up to 6000 min⁻¹, up to IP65 type of protection

DSC — Compact servo motors

The DSC 45–100 is a series of high-torque servo motors that are up to 30% more compact than conventional servo designs.
Sizes 45, 56, 71, 100, power range 0.5–18 kW (0.67–24 hp), speeds up to 6000 min⁻¹, up to IP65 type of protection

DSH — High precision motors

The DSH high-precision servo motors were developed specifically for applications with the highest standards for quality and smooth operation.
Sizes 45, 56, 71, 100, power range 0.5–8 kW (0.68–11 hp), speeds up to 6000 min⁻¹, up to IP65 type of protection
DS/DA — General purpose servo motors

The servo motor for all applications with strict energy efficiency requirements.
Type DS: Sizes 45, 56, 71, 100, 132, 160, 200, power range 0.25–295 kW (0.33–396 hp), speeds up to 6000 min⁻¹, type of protection: unventilated IP54, ventilated IP23/IP54, water-cooled IP54.
Type DA1: Sizes 100, 132, 160, 180, 225, 280, power range 3.5–400 kW (4.7–536 hp), speeds up to 8000 min⁻¹, type of protection: ventilated IP23/IP54, water-cooled IP54

DST2 — Powerful high-torque motors

The high-torque motor DST2 for application with maximum torque requirements.
Sizes 135, 200, 260, 315, 400, 560*, power range 2.7–1200 kW (3.6–1609 hp), speeds up to 2000 min⁻¹, torque up to 80,000 Nm, IP54 type of protection, water-cooled *) on request

GDM & DSM — Disc motors

Baumüller offers a wide range of disc rotors for use in a large number of different applications where installation space is at a premium.
GDM DC disc motors: Power range 16–3000 W (0.02–4 hp)
DSM brushless disc motors: Power range 180–6300 W (0.24–8.4 hp)

DSE — Embedded three-phase current synchronous motors

The DSE synchronous motors are available either as a housing version or as a built-in motor. The motor covering a rotational speed range of up to 9000 min⁻¹ features buried magnets and therefore impresses with a particularly high power density.

BPx — Planetary gear series

The BPx planetary gear series in combination with our servo motors are ideally suited for applications with high demands on torque and dynamic.

LSC — Coreless linear motors

The coreless LSC linear motors from Baumüller achieve maximum current and power rise rates. They are therefore ideal for highly dynamic applications with maximum resilience against disruptive forces.

DSDI/DSMI — Motors with integrated control/power electronics

The DSDI and DSMI servo motors with integrated control and power electronics meet the requirements of modern, decentralized drive architectures. The DSDI is a highly dynamic motor and the DSMI is a high torque servo drive. Power range 170–385 W (0.23–0.52 hp), speeds up to 6000 min⁻¹, type of protection up to IP65
b maXX Servo Controllers

News from the pioneer of direct drive technology: We present to you the new alignable drive system b maXX 5000 as supplement of our successful b maXX 4000 range. The new range offers a performance spectrum of 1 kW to 215 kW in a rack system and up to 315 kW as a mono output. With power supplied and regenerative systems, b maXX 5000 can be use worldwide as an energy efficient drive system. With its Connect Drive System, which enables you to commission our drives efficiently and economically, it displays the perfect expansion of our existing product range.

By simply plugging in the safety module the user can quickly and flexibly respond to new security requirements. The b maXX 5000 ideally met with the scalable safety functionality of the modules the guidelines of DIN EN ISO 13849 up to SIL 3.
Baumüller’s approved automation and drive solution b maXX can be adapted to the corresponding demands with respect to performance and equipment through its modularity and flexibility. b maXX 4000 offers a power spectrum from 1.1 kW up to 315 kW with different cooling concepts, such as air and water cooling or cold plate variants. With the series b maXX 4100 a regenerative system is at your disposal, which inserts itself smoothly into the automation solution b maXX. Functional safety relay integrated into the drive available as an option.

The servo inverter b maXX 3300 is a high-quality servo controller with integrated position control for power ratings up to 5 kW. b maXX 3300 excels through its compact, space-saving design. The field-oriented control provides for excellent performance. Higher-level speed and position control ensure dynamic and exact positioning. The servo controller is specifically designed for operation with servomotors of the DSC, DSP, DSH and DSD2 series and the pancake and linear motor series from Baumüller. Functional safety features integrated into the drive are available, as is a manual control device.

In the b maXX 2500 the established converters of the 3300 series are combined with the robust servo motors DSD2, DSP and DSC. This way, a compact drive including integrated electronic circuits for the high-end segment was developed.

The b maXX 2400 completes the b maXX generation of controllers within the low power range. Particularly, b maXX 2400 (< 60 V) was designed to be operated with the servo motors DSD 28–36 and with the disc motor series of Baumüller.

For a vector control of standard electric motors Baumüller added an high-efficient and easy to operate frequency converter into the program: The b maXX 1000 is available in three sizes with capacity ranges from 0.2 to 11 kW.

The DSDI and DSMI servo motors with integrated control and power electronics meet the requirements of modern, decentralized drive architectures. The DSDI is a highly dynamic motor and the DSMI is a high torque servo drive. Power range 170–385 W (0.23–0.52 hp), speeds up to 6000 min⁻¹, type of protection up to IP65.