

Control^{IT} Control Software and Tools

for AC 800M and AC 800C

with everything you need
to keep production at peak level



The software

Control Software Licenses

Control Software offers a wide range of industrial control functionality for your AC 800C, AC 800M and Advant Controller 250 industrial controllers from ABB. From binary logic to advanced regulatory control. From discrete process signals to high-level process objects.

An application, no matter how complex, can be downloaded from the engineering tool to the target controller(s) involved in minutes. Since all functionality has been designed, tested and debugged beforehand, the software quality becomes high, which reduces the commissioning time.

Control software is object-oriented in a structured way, which means that changes made to an object type or instance thereof – at any hierarchical level – only affects that type (and all of its instances) or that instance only. For this reason, subsequent bug fixes, updates, improvements, expansions etc. can be performed quickly and easily by so-called incremental downloads that only affect the part changed and no others.

Three alternative usage licenses

There are three alternative usage licenses for Control Software: Binary, Basic and Advanced Process Control. Each license unlocks a range of functionality that makes it possible to optimize each controller for its duties and minimize costs. Optional software licenses add further flexibility to the scheme.

Controllers supported

Control Software fits a number of process controllers from ABB, but during application software development, it can be seen as platform-independent.

This means that you can build your application to perfection in project form in your engineering system – even test-run and debug it there – before you decide on which controllers you need and how they need be equipped and configured.

In other words, Control Software lets you build your application first and decide on hardware later.

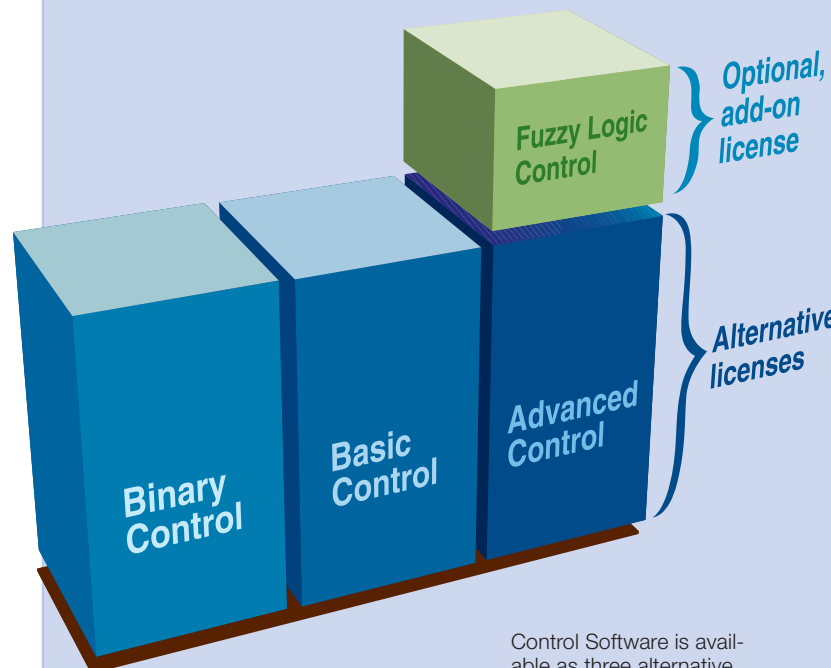
Binary Control License

This license enables the controller to collect and process data from the I/O section, manage basic data types and control outputs with the help of functions for data-type conversion, math, time management, logic gating, memorizing and counting. This license covers – by a good measure – the IEC 61131-3 standard.

The controller can communicate with its I/O section over its local electrical or optical system bus as applicable and/or over Profibus-DP field buses.

In addition to enabling the controller to work in stand-alone mode, the license also includes communication services allowing the controller to operate in a Control Network environment as server. This means that it can communicate with (respond to requests from) other system components such as other controllers, OPC servers, and the Control Builder M.

The services also support dually redundant Control Networks.



Control Software is available as three alternative licenses and one option to make it fit each application hand in glove.

Basic Control License

This license includes all the above plus additional communication, process object handling and PID control capabilities as follows:

- **Communications**

Client functionality, enabling the controller to issue read/write requests to other controllers and system stations (in a Control Network environment) by MMS over TCP-IP on Ethernet.

External communication with other makes of control systems and devices by offering support for a host of popular communication protocols, including Comli, SattBus, Modbus, Siemens 3964R and Foundation Fieldbus.

Serial protocol development, making it possible to define proprietary serial communication protocols to suit external devices such as terminals, printers and controllers.

- **Process object handling**

Object-oriented process control, offering ready-to use function blocks for frequently occurring plant devices such as motors and valves, presenting great benefits to both control engineers and plant operator in terms of efficiency and handling ease.

- **Basic PID control**

offering ready-to use function blocks for single and cascaded PID control loops, with digital or analog output. All with optional feed forward, tracking and autotuning functionality.

- **Batch control**

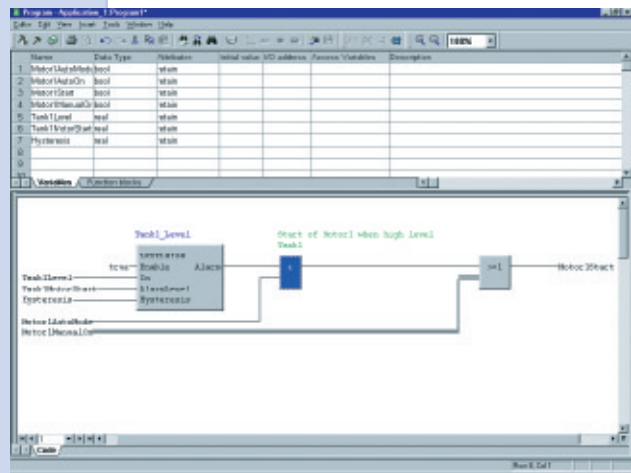
to the industry standards.

Advanced Process Control License

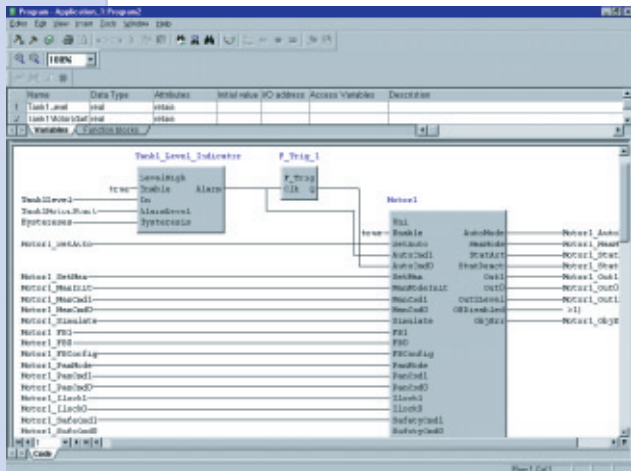
This license includes all the above plus:

- **advanced – multivariable – PID control** and adaptive regulatory control,
- **object-oriented process control**, making it possible to create higher-level function blocks – so-called Control Modules – for frequently recurring control tasks of a more complex nature.
- **integration with Operate IT Process Portal** man-machine communication software for live presentation of process data, command entry and alarm/event reporting.

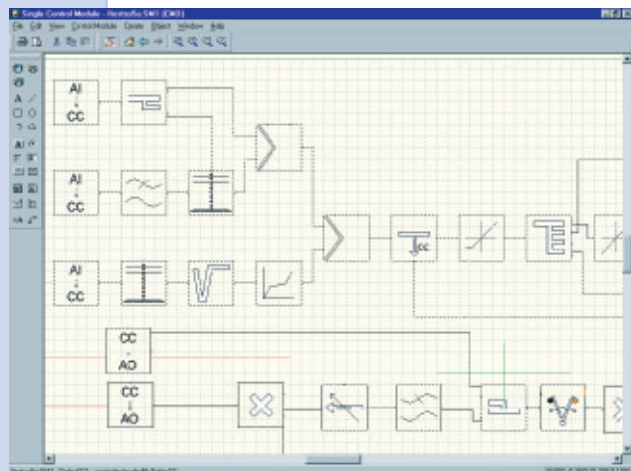
+ *Fuzzy logic control* is available as an option.



The Binary Control license lets you do “everything” in logic control, such as logic gating, timing, latching and counting.



The Basic Control license lets you encapsulate detailed complexity into higher level process and plant objects, which simplifies matters for both engineers and operators.



The Advanced Process Control license lets you develop typical solutions in terms of control and operator interaction to recurring problems and then use these consistently – standardization that all involved will benefit from.

The tools

Efficient engineering software

Control Software is managed with Control Builder M, fully Windows 2000-integrated software supporting ABB's controllers AC 800C, AC 800M and Advant Controller 250.

There are three variants of the toolbox; Basic, Standard and Professional. They are upwards compatible, meaning that a project, configured in a limited variant can always be edited in a more capable one.

Control Builder Basic is intended for small projects, while Standard is suitable for creating structured applications, solution libraries and multi-user applications. Control Builder Professional, finally, provides full functionality, including Operate^{IT} Process Portal integration.

Control Builder M supports all the five IEC 61131-3 standard languages, i.e. Instruction List, Structured Text, Function Block Diagram, Sequential Function Chart, and Ladder Diagram, plus Control Modules, ABB's own contribution to higher application engineering efficiency and ease of use.

A Project Explorer facilitates navigation through the entire project. Program segments can easily be searched for and edited. On-line and context-sensitive help speeds up data- and program-code entry.

Programs can be developed off line and execution simulated without having a controller connected.

Control Builder M offers a number of on-line facilities for testing, program modification and commissioning. And the status of I/O signals, variables, etc. can be inspected on line.

Integration with Operate^{IT} Process Portal

Control Builder Professional can be fully integrated alongside Operate^{IT} Process Portal as an Aspect System, allowing seamless navigation from the runtime environment to the configuration environment. With a click of the mouse you can go from the process flow representation of a plant section to its control program, to examine – even edit – it.



Control Builder Basic

- ◆ Full Windows ® 2000 Professional integration
- ◆ Navigation by Project Explorer
- ◆ Comes with libraries of ready-to-use functions and function blocks for efficient programming
- ◆ User-defined data- and function-block types
- ◆ Supports all the five IEC 61131-3 programming languages
- ◆ Simulation and on-line facilities for testing and troubleshooting
- ◆ Extensive on-line help
- ◆ Easy to use with data entry assistance
- ◆ Communicates with controller(s) by Ethernet or serial link



Control Builder Standard

Like Control Builder Basic, plus:

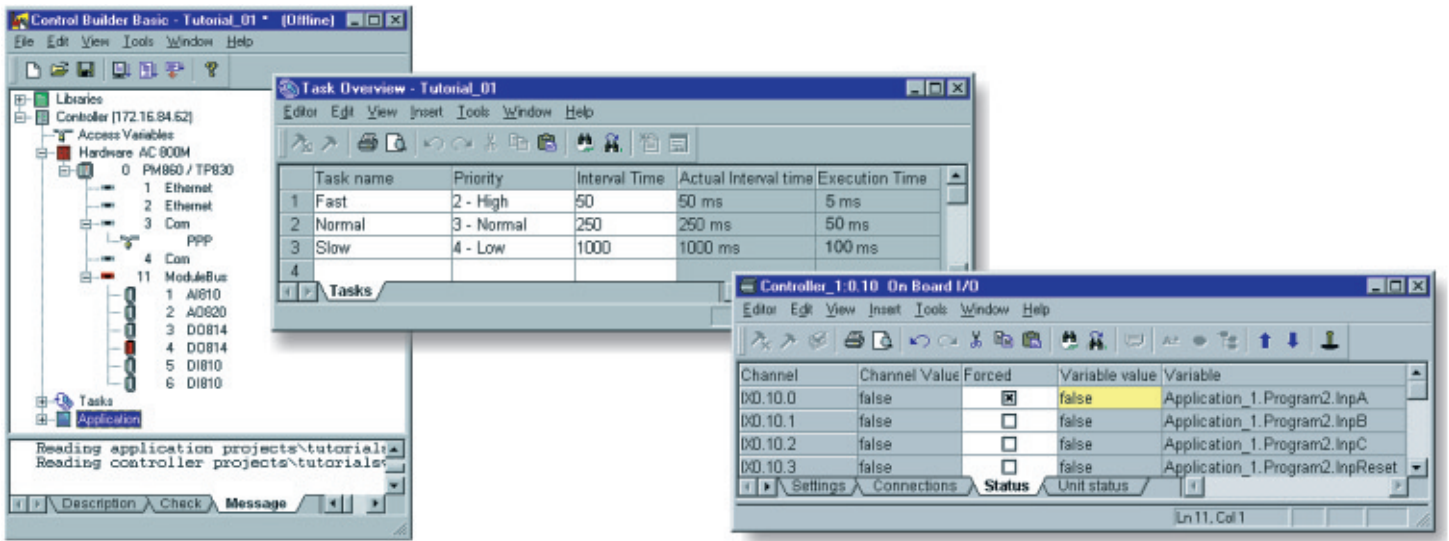
- ◆ Multiple user-configured applications, programs and tasks
- ◆ Multiple tasks per application
- ◆ Extensive re-use of code by means of user-defined libraries of data- and function-block types
- ◆ Supports multiple team members per application project
- ◆ Supports multiple controllers per project



Control Builder Professional

Like Control Builder Standard, plus:

- ◆ Control Modules for high-level configuration of control applications graphically
- ◆ Integration with Operate IT Process Portal.
- ◆ Distribution of applications across multiple controllers



Project Explorer, Task Overview and I/O inspection windows. Red color indicates error, yellow a forced input signal.

Projects

Project Explorer

Project Explorer is a tool for navigating, creating and editing a project. Using the explorer, all objects such as data types, functions, function block types and Control Module types can be selected and displayed. The controller software and hardware are configured in Project Explorer.

Tasks

A task determines the execution priority and interval time of a program, a function block or a Control Module.

In Control Builder Basic and Standard, one task controls each program, in Control Builder Professional, a task can be connected to a program, a function block or a Control Module, and several tasks can execute in a controller. A Task Overview window facilitates parameter settings.

Applications

A project in Control Builder M contains one (Control Builder Basic only) or several applications, each containing a set of Programs and/or Control Modules. Program code, functions, Function Blocks and Control Modules can be placed freely in any of these.

Users can create their own data,

function-block and control-module types when needed. These can be reused to increase engineering efficiency and application readability. Control Builder Standard and Professional make it possible to save user-defined types in libraries for use in other projects.

Hardware configuration

The controllers AC 800M, AC 800C and Advant Controller 250, and their I/O systems are easily configured with the Project Explorer. Hardware unit types and positions in the control system are defined to start with. Then the I/O signals are connected to variables in the application and finally all hardware settings, such as filter times and signal ranges, are defined.

In Online mode of the Project Explorer, hardware units are marked red if errors are detected, yellow if a channel is forced.

Project documentation

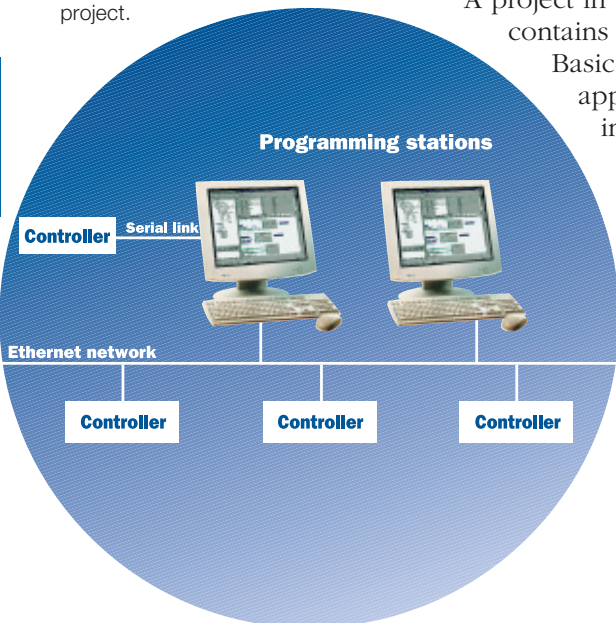
The entire user project, including libraries, applications and controller configurations, can be translated to MS Word™ documents. These documents can then be printed or further modified and reformatted. As can running configurations and programs in working controllers.

Sharing a project

In Control Builder Standard and Professional, a project can be divided into several applications and thus be shared among several programmers working on programming stations interconnected by Ethernet.

Target controllers can be accessed for program downloading, debugging, etc. by serial link or Ethernet network.

The latter arrangement enables multiple engineers to work in parallel on the same project.



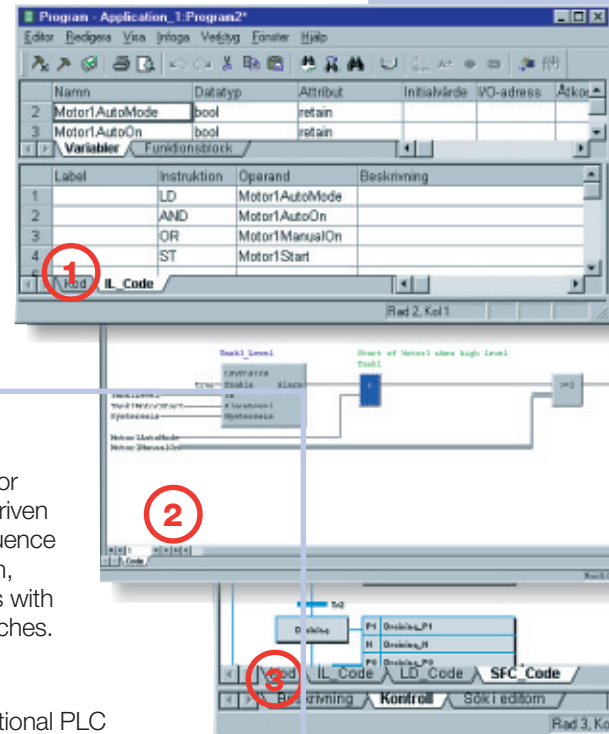
The programming

Variables and data types

Control Builder M supports data types like Booleans, integers, floating point numbers, strings, time, date, etc. All in accordance with IEC 61131-3.

The basic data types can be combined into new structured data types. Such a data type may contain other structured data types.

Variable identifiers may be up to 32 characters long.



Programming languages

Five languages, according to the IEC 61131-3 standard, are available, i.e.:

- Function block diagram (FBD)
- Structured text (ST)
- Ladder diagram (LD)
- Sequential function chart (SFC)
- Instruction list (IL)

There is actually a sixth language: ABB's own powerful Control Modules.

Function block diagram

A graphical language for depicting signal and data flows through function blocks and re-usable software elements. Function blocks and variables are interconnected graphically, which makes the resulting control diagrams easy to read.

Structured text

Structured text (ST) is a high-level programming language. It is highly structured and has a comprehensive range of constructs for assignments, function/function block calls, expressions, conditional statements, iterations, etc.

It is easy to write advanced, compact but perspicuous ST code, due to its logical and structured layout.

Ladder diagram

Ladder diagram (LD) is a graphical language based on relay ladder logic.

Sequential function chart

Sequential function chart (SFC) is a graphical language for depicting the sequential behavior of a

control system. It is used for defining time- and event-driven control sequences. A sequence is shown in flow-chart form, using steps and transitions with parallel and selection branches.

Instruction list

Instruction list (IL) is a traditional PLC language. It has a structure similar to simple machine assembler code.

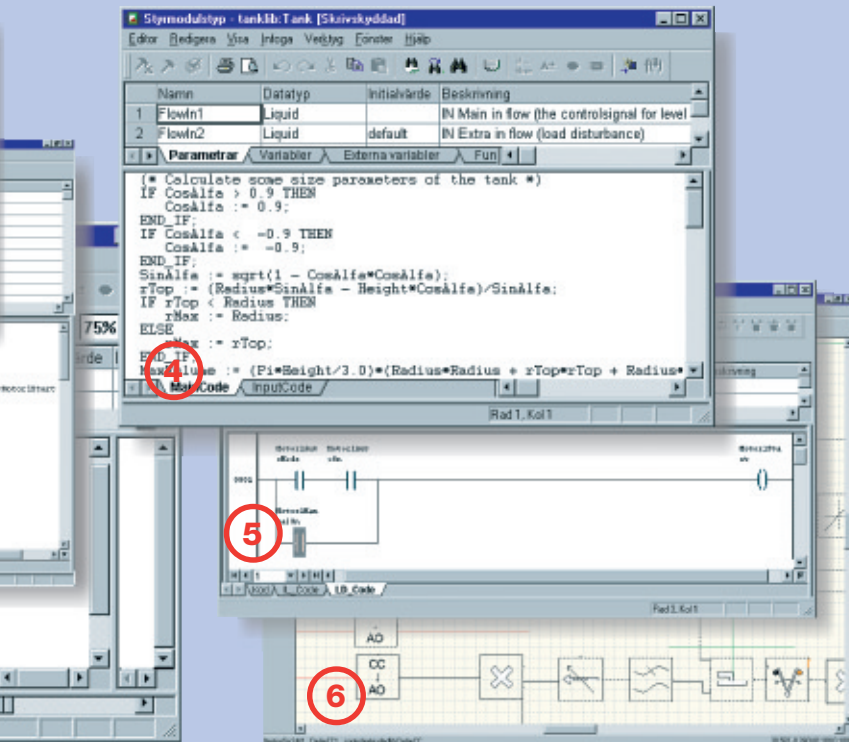
Control Modules

In Control Software, the IEC 61131-3 POU (Program Organization Units) types have been extended with Control Modules, a powerful concept for turning new solutions into "black boxes" that can be re-used over and over again. Control Modules can include program code, visual representation, interaction, data acquisition, communication, etc. These objects are stored in libraries and therefore ready for re-use in both current and future applications.

Control Module diagrams make it possible to program in an efficient object-oriented way thanks to features such as:

- ◆ Graphical representation of Control Modules and their interconnections.
- ◆ Automatic scheduling of program code for optimum execution order.
- ◆ Graphical definition of module interconnections or by variables.

languages



Examples of

1. Instruction list
2. Function-block diagram
3. Sequential function chart
4. Structured-text program
5. Ladder diagram
6. Control Module diagram

Program editors

The program editors offer ample functionality for efficient programming and debugging. There are functions such as syntax checking, cut and paste, drag and drop, search and replace.

Several windows may be open at the same time, offering a good overview of the entire application.

Compilation

An extensive program check is performed by the system when compilation starts. Errors are easily identified. A double-click on the error message brings the user to the error location in the application.

The user program is compiled to machine code and optimized for the controller involved before downloading takes place.

Simulation

Simulation mode is ideal for off-line testing of user programs. All tasks are executed locally in the Control Builder M; there is no need for a target controller at this stage.

On-line functions

Control Builder M contains a set of powerful functions for on-line testing.

• Status inspection

The status of I/O signals, variables, etc. can be inspected on line. Different views can be selected. No manual tagging is required.

• Force

I/O signals can be selected and forced to a chosen state.

• Overwrite

All variables can be overwritten on a single-cycle basis, whereafter the program takes over again.

• Tasks

Single-scan executions can be selected in the Task Properties window, which facilitates program debugging. Warnings, e.g. of a task having stopped or being overloaded, are indicated by a yellow-marked icon in the Project Explorer. Serious errors make the icon turn red.

Program changes

Changes can be made to a running application without loss of data. There is no limit to the size and number of changes that can be made.

Security features are built in to prevent unintentional downloads.

Configuring and downloading

All configuring, including application downloading and on-line functions, may be performed via a serial link or an Ethernet network.

As part of its Industrial^{IT} activities ABB has developed a long-term strategy of offering a comprehensive range of products and systems for industrial applications. At the heart of this strategy is the Aspect ObjectsTM concept which allows users access to all control and information systems within the enterprise and to assemble the information they require in a format best suited to their needs. Users are able to extend, modify and migrate their systems without difficulty.

ABB has developed a suite of human-system interfaces which combines comprehensive process know-how and experience with advanced software functionality. Based on the Windows[®] platform, these user interfaces provide a consistent method for accessing enterprise-wide systems and for launching multiple applications from any connected workstation in a plant or office.

Automation Technology Products within ABB offers a complete range of Industrial IT products, from individual programmable controllers to complete control systems for complex plants. These products are sold and supported by the worldwide network of ABB. If you would like to know more about the products please contact your local office or visit our website at www.abb.com/processautomation.



Automation Technology Products
SE-721 59 Vasteras, Sweden
Phone: +46 (0) 21342000
Fax: +46 (0) 21137845
www.abb.com/processautomation
e-mail: processautomation@se.abb.com

Automation Technology Products
29801 Euclid Avenue
Wickliffe, Ohio 44092, USA
Phone: +1 440 585 8500
Fax: +1 440 585 8756
www.abb.com/processautomation
e-mail: industrialitsolutions@us.abb.com

Automation Technology Products
Dudenstraße 44-46
D-68167 Mannheim, Germany
Phone: +49 (0) 1805 266776
Fax: +49 (0) 1805 776329
www.abb.de/processautomation
e-mail: marketing.control-products@de.abb.com

3BSE 021 361 R0201

Copyright © 2002 ABB. All rights reserved.

Specifications subject to change without notice. Pictures, schematics and other graphics contained herein are published for illustration purposes only and do not represent product configurations or functionality. User documentation accompanying the product is the exclusive source for functionality descriptions.

The Industrial^{IT} wordmark and all above-mentioned product names to the same format are registered or pending trademarks of ABB.