



## ATeC Adaptive Temperature Controller

### For identification, parameter determination and intelligent control of thermal processes

Stable thermal process conditions provide the basis for complex production systems. The adaptive temperature controller ATeC supports rapid implementation of this task with the highest control quality. In parallel with other control sequences, a single ATeC module operates up to 256 temperature control loops simultaneously on the M1 real-time system.

### Determining parameters automatically

The ATeC is designed for heating systems as well as for combined heating and cooling systems. Using integrated identification routines, the system is able to determine the characteristics of different process lines automatically. The calculated control parameters enable reference-variable response to be optimized and interference suppression for each individual task without the need for in-depth control know-how. Time-consuming test series are thus no longer necessary. This reduces costs considerably, especially for processes with very long time constants or when fully automatic adjustment is required during operation after a tool was changed.

### Energy-optimized control

Multiple channels can be combined into a group and controlled in a coordinated manner. Pulses generated to control actuators by means of PWM or PFM are distributed automatically within a period. Thus, almost constant power consumption is achieved. Through start-up optimization, control of each loop is initiated in a way that allows all zones to reach their set point temperature almost simultaneously. This makes it possible to save valuable energy without additional effort or expenses. If necessary, power and energy management limits the total power released. In this way, control of actuators is adapted to the existing power supply connection without the need for further adjustments.

Part type designation	Part number
ATeC 16 RT	00031376-63
ATeC 32 RT	00031377-63
ATeC 64 RT	00031378-63
ATeC 128 RT	00031379-63
ATeC 256 RT	00031380-63



## Handling coupled systems

If multiple heating and cooling systems have a mutual effect on one another, isolated consideration of individual controlled systems is no longer sufficient. By adaption in its operating point, the controller is tuned exactly to these conditions. Moreover, known disturbance variables can be taken into account for feedforward control. In doing so, optimal results are reachable even under production conditions.

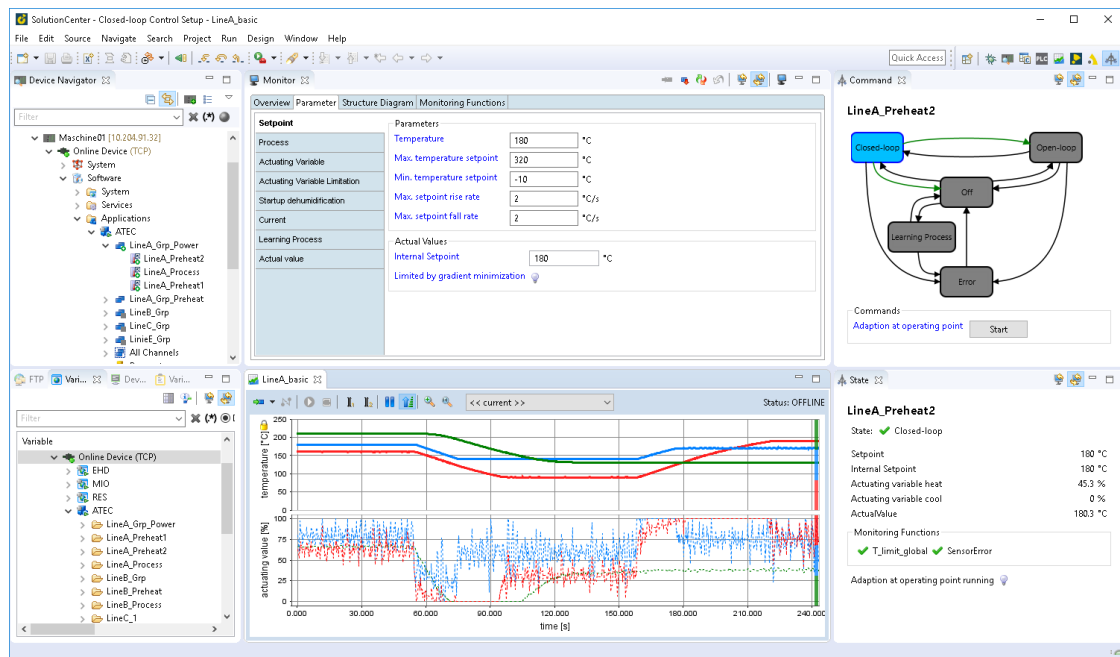
## Monitoring included

If a control loop does not behave as intended, the controller is able to diagnose this beforehand. Monitoring of temperature limits, control deviation or a temperature tolerance band are included as standard functions. Through verifying the heating current, a pending or possibly already started heater failure is detectable. In case of an error, the desired reaction can be selected on the basis of process requirements. If material would harden in a feed screw, heating is maintained at a constant power level. If, on the other hand, exceeding a permitted maximum temperature limit is expected, heating is shut off.

## Fully integrated into the engineering tool

Maximum convenience during commissioning and operating mode is assured by full integration of the adaptive temperature controller ATeC into the Bachmann SolutionCenter. A dedicated commissioning interface enables configuration and parameterization of the ATeC software module.

Alternatively, the adaptive temperature controller ATeC can be integrated into an application. This is enabled by libraries, available in C/C++ as well as IEC 61131-3. All temperatures and manipulated variables can be observed in Recorder Scope3 besides other application variables. This allows a quick capture and graphical display of temperature control behavior at any time, even during real-time operation.



## Adaptive Temperature Controller ATeC

General product features	
Channel configuration	Heating and cooling closed-loop control within one channel
Number of possible channels	256
Grouping through group functions	Available
Sampling times	20 ms to 100 s
Temperature units	°C, K, °F
Excerpt of available functionality	
Identification of temperature control systems	Automatic parameter identification for different types of controlled systems
Automatic determination of control parameters	Calculation is based on identified control path model. Desired controller type is selectable.
Consideration of coupled systems	Take interaction into account during system identification as well as in operation, above all during heat-up phase
Power management	Dynamic or continuous power limitation for a partial area or the entire system on the basis of local electrical power supply connection
Optimization of start-up time	Start time of the individual controls is selected so that all temperature control systems reach their set value simultaneously.
Heat current monitoring	Plausibility check of the measured currents based on the manipulated variable outputs for identification of heating elements that have failed partially or totally. Initial measurement of electric current automatically.
Startup dehumidification	Heating elements are held at a selectable startup temperature for a specified length of time. In this way, any humidity present can escape slowly without damaging the heating elements.
Multiple monitoring functions	Temperature limits, tolerance band, updating of measured values, sensor fault, etc.
Signal interfaces	
Digital signals	All Bachmann modules in category DI All Bachmann modules in category DO
Analog signals	AIO20x/SI, AIO208, AIO216, GIO212, AI208/SI All Bachmann modules in category AO
Temperature measurement	GIO212, AIO20x/SI, AIO208, AIO216, TCO2xx-C: Temperature sensor and thermocouple as listed in the respective product data sheet
Power measurement	GM260, GMP232/x, GSP274
Fieldbus modules	All corresponding Bachmann modules
Actuator control	
Analog control	0 % to 100 %, scalable at desired output
Digital control	<ul style="list-style-type: none"> <li>● Pulse width modulation (PWM)</li> <li>● Pulse frequency modulation (PFM)</li> <li>● Continuous actuation via 2 outputs (open, close)</li> </ul>
Software interfaces	
User interface API	IEC 61131-3 as well as C/C++ libraries for parameter assignment, operation and diagnostics triggered in other application program
Process communication	Provision of all values via the SVI (Standard Variable Interface)
ATeC configuration, parameter assignment and operation	
SolutionCenter	Full integration
Application programs	Libraries: IEC 61131-3, C/C++
External processes	Operation enabling via DI channels

Installation	
Shipping	Supplied as part of the M-Base
Licensing	Number of configurable channels depends on license
License protection	License file depending on hardware
System requirements	
Real-time system	<ul style="list-style-type: none"> <li>• Bachmann M200 processor modules of the MH, MC, MX, MPC series</li> <li>• M-Base V3.95 and higher</li> <li>• Cpp library V4.1</li> <li>• RAM: 8 MB of free memory for first channel approx. 220 kB for each additional channel</li> </ul>
Engineering computer	Processor requirements see SolutionCenter product data sheet
Engineering software	SolutionCenter V2.30 or higher (M-Base V4.30)

## Order data

Part type designation	Part number	Description
ATeC 16 RT	00031376-63	Runtime license for ATeC software multi-channel temperature controller. Enables configuration, parameterization and operation of up to 16 controlled systems. License bounded to target device.
ATeC 32 RT	00031377-63	Runtime license for ATeC software multi-channel temperature controller. Enables configuration, parameterization and operation of up to 32 controlled systems. License bounded to target device.
ATeC 64 RT	00031378-63	Runtime license for ATeC software multi-channel temperature controller. Enables configuration, parameterization and operation of up to 64 controlled systems. License bounded to target device.
ATeC 128 RT	00031379-63	Runtime license for ATeC software multi-channel temperature controller. Enables configuration, parameterization and operation of up to 128 controlled systems. License bounded to target device.
ATeC 256 RT	00031380-63	Runtime license for ATeC software multi-channel temperature controller. Enables configuration, parameterization and operation of up to 256 controlled systems. License bounded to target device.