• 100 ms cycle time, i.e. also suitable for fast control loops
• 20ms as shortest pulse for very fast / strong actuators (e.g. infrared heater or water cooling
• Freely configurable analog output, e.g. as process value output
• Customer-specific linearization for all sensors
• Extended temperature range up to 60°C allows mounting close to the process
• Easy 2-point or offset measurement correction
• Emergency operation after sensor break by means of the "output hold" function
• Logical combination of digital outputs, e.g. for general alarm
• Programmer with 16 x 16 segments and "end" signal
• RS 485 Modbus RTU interface
• Built-in transmitter power supply
• Splash-water proof front (IP 65)

APPLICATIONS
• Furnaces and ovens
• Burners and boilers
• Plastics processing
• Driers
• Climatic chambers
• Heat treatment plants

DESCRIPTION
The universal temperature controller is intended for precise and cost-effective control tasks in all branches of industry. The unit can provide simple 2-point (on/off) control, continuous PID control, or 3-point stepping control. The process value signal from a sensor is connected to the universal input. A supplementary analog input is available for heating current measurement or as an external setpoint signal.

The function "start-up" can be selected for increased lifetime of high performance electrical heating elements (e.g. hot runner moulds).

Self-tuning during start-up and to the setpoint
This function determines the optimum settings for fast ramp to setpoint with no overshoot. Using three-point controller configuration, the "cooling" parameters are determined separately, ensuring an optimum performance matched to the process.

On a single keypress the controller can determine the best PID control parameters at setpoint. This function does not require oscillation, and performs a minimal deviation of the process value.

Display and operation
Clear information is given by indicator LEDs in the front panel that displays operating mode and I/O states. An F key switches the controller into the several operation modes such as manual, latched alarm reset or activates the boost function directly.

Front interface and Engineering Tools
It is possible to adjust parameters in seconds in KS 20-1 via BlueControl software with simulation function, the required set-up for a specific control task can be determined without a detailed study of the operating instructions.

Additionally most adjustments can be made easily from the instrument front. (see page 7, BlueControl)

Password protection
If required, the various operating levels can be protected with a password to prevent unauthorized access.

KS 20-1 Universal Industrial Controller

• Configuration port and BlueControl software
• Maintenance manager and error list
• Start-up circuit and boost function
• Two switchable parameter sets
• Self-Tuning to the setpoint without oscillation
• Monitoring of heating current and output circuit
• 3-point controller for water, fan and oil cooling
  • 16 x 16 segment profiler
  • cULus
TECHNICAL DATA

INPUTS

PROCESS VALUE INPUT INP1

| Resolution: | > 14 bit |
| Decimal point: | 0 to 3 decimals |
| Digital input filter: | adjustable 0.000...9999 s |
| Scanning cycle: | 100 ms |
| Measured value correction: | 2-point or offset correction |

Thermocouples (Table 1)
Input impedance: 1 MΩ
Effect of source resistance: 1 V/Ω
Cold junction compensation
Max. additional error ≤ 0.5 K
Sensor break monitoring
Sensor current: ≤ 1 µA
Operating sense configurable (see page 4)

Resistance thermometer
Connection: 3-wire
Lead resistance: max. 30Ω
Input circuit monitor: Break and short circuit

Electrical Connections
Current and voltage signals
Span start, end of span: anywhere within measuring range
- Scaling: selectable -1999...9999
- Linearization: 16 segments, adaptable with BlueControl
- Decimal point: adjustable
- Input circuit monitor: 12.5% below span start (2mA, 1V)
- Resolution: > 14 bit
- Scanning cycle: 100 ms
- Accuracy: Better 0.1%

CURRENT INPUT INP2
Heating current measurement
- via current transformer
- Measuring range: 0...30 mA AC
- Scaling: adjustable
- Accuracy: 0.25%

Remote setpoint measurement
- Input resistance: approx. 60Ω
- Span: configurable within 0 to 20mA
- Scaling: adjustable -1999...9999
- Input circuit monitor: 12.5% below span start (4...20mA 2mA)

CONTROL INPUT DI1 & DI2
- Configurable as direct or inverse switch or push-button!
- Connection of a potential-free contact suitable for switching “dry” circuits.
- Switched voltage: 3.3 V
- Switched current: < 10mA

CONTROL INPUTS DI3 & DI4 (OPTION)
- Configurable as direct or inverse.
- Nominal voltage: 24 V DC, external

OUTPUTS
SURVEY OF THE OUTPUTS
Output used for:
- Relay – option 1-3
- Contacts: Potential free changeover
- Max contact rating: 2A@ 250V 48...62Hz
- Min contact rating: 6V, 1mA
- Duty cycle: I = 1A/2A
  250,000/150,000 @ 250V resistive
- Dual relay – option 2
- Contacts: 2 NO contacts with shared common
- Max contact rating: 2A@ 250V 48...62Hz
- Min contact rating: 6V, 1mA
- Duty cycle: I = 1A/2A
  500,000/200,000 @ 250V resistive
- SSR - option 1-3
- Voltage: 10 V into 500 Ω minimum

Start-up circuit
When the process is controlled towards the start-up setpoint, the output value is limited. The start-up setpoint is kept constant during the start-up holding time. After that, the main setpoint SP is controlled. If a disturbance reduced the process value, the start-up circuit is activated again.

Dual SSR - option 1-3
- Voltage: 10 V into 500 Ω minimum

Linear DC output option 1 & 3
- 0/4mA...20 mA, configurable.
- Signal range: 0...approx. 22 mA
- Load: ≥ 500 Ω
- Load effect: none
- Resolution: 0.1%
- Error: 0.2%
- 0-10 V
- Signal range: 0...11 V
- Load: ≥ 2X Ω
- Resolution: ≤ 0.1 %
- Error: ≤ 0.2 %

Transmitter supply
- Output: 22 mA / ≥18 V

FUNCTIONS
Control behaviour
- Signaler with adjustable switching differential (ON/OFF controller)
- PID controller (2-point and continuous)
- Delta / Star / Off or 2-point controller with switch over from partial to full load
- 2 x PID (heating/cooling)
- 3-point stepping controller

Two parameter sets for manual gain scheduling. Self-tuning control parameters or adjustable manually via front keys or BlueControl software.

Behaviour with 2- and 3-point controllers
- Standard behaviour:
  For precise matching of the required output value at the output signal limits, the controller changes the cycle times for heating and cooling automatically and continuously.
  With constant cycle times:
  The length of the shortest heating and cooling pulse is adjustable.

- Water cooling linear (heating = standard):
  To ensure a sufficient cooling effect, the cooling function starts only after reaching an adjustable temperature value. The pulse length is adjustable too and remains constant for all output values.
  Water cooling nonlinear (heating=standard):
  The general function is described above but the controller additionally takes in consideration that the water cooling is usually much stronger than the heating (thus preventing unfavorable behavior when changing from heating to cooling).

Setpoint functions
- Adjustable setpoint gradient 0,01...9999 °C/min
- Setpoint control
- Setpoint/cascade control
- Program controller with 16 x 16 segments (setpoint/section time)

Behaviour with sensor break or short circuit:
- Control outputs switched off
- Switch-over to a safe output value
- Switch-over to a mean output value (PID controller)

SPECIAL FUNCTIONS
Boost-Function
- The boost function provides a short-term increase of the setpoint, e.g. with hot runner control, in order to clear runners of “frozen” rests of material.

Start-up circuit
- For temperature control, e.g. with hot runners.
- High-performance heating elements with magnesium oxide insulation must be heated slowly, to remove any humidity and to prevent destruction.
**Modbus Master**
The KS 20-1 can be configured as Modbus Master. This enables it to transmit user-specified signals or parameters cyclically to all connected Slave controllers.

For example, the following applications are possible:
- Setpoint shifting relative to the setpoint adjusted in the Slave (see picture)
- Matching of control parameters, limit contacts, etc.
- Limiting the output value (override control OVC)

**LIMIT SIGNALLING FUNCTIONS**
Max., Min. or Max./Min. monitoring with adjustable hysteresis.

**Signals which can be monitored:**
- Process value
- Control deviation
- Control deviation with suppression during start-up or setpoint changes
- Effective setpoint
- Output signal Y
- Control deviation always compared to internal setpoint SP even if SP2 or SP.E is activated.

**Functions**
- Input signal monitoring
- Input signal monitoring with latch (reset via front key or digital input)
Several limit signals or alarms can be OR-linked before being output.

**ALARMS**
Heating current alarm
- Overload and short circuit
- Open circuit and short circuit
Limit value adjustable 0...9999 A

Control loop alarm
- Automatic detection if there is no response of the process to a change of output value.

Sensor break or short circuit
- Depending on selected input type, the input signal is monitored for break and short circuit.

**POWER SUPPLY**
Depending on version:

**AC SUPPLY**
Voltage: 90...260 VAC
Frequency: 48...62 Hz
Power consumption approx. 7 VA

**UNIVERSAL SUPPLY 24 V UC**
AC voltage: 20,4...26,4 VAC
Frequency: 48...62 Hz
DC voltage: 18...31 V DC
Power consumption: approx. 7 VA (W)

**BEHAVIOUR WITH POWER FAILURE**
Configuration, parameters and adjusted setpoints, control mode:
Non-volatile storage in EEPROM

**BluePort INTERFACE**
Connection of PC via PC adapter (see ‘Accessories’). The BlueControl software is used to configure, set parameters, and operate the KS 20-1.

**BUS INTERFACE (OPTION 3 & A)**
Galvanically isolated
Physical: RS485
Protocol: Modbus RTU
Transmission speed: 2400, 4800, 9600, 19.200 bits/s
Address range: 00...99
Number of controllers per bus: 32

Repeaters must be used to connect more controllers.
**ENVIRONMENTAL CONDITIONS**

*Protection modes*
- Front panel: IP 65
- Housing: IP 20
- Terminals: IP 20

*Permissible temperatures*
- For specified accuracy: 0...60°C
- Warm-up time: < 15 minutes
- Temperature effect: < 100ppm/K
- For storage: -20...70°C

*Humidity*
- 75% yearly average, no condensation

*Electromagnetic compatibility*
- Complies with EN 61326-1

**GENERAL**

*Housing*
- Material: ABS AF BO5
- Flammability class: UL 94 VO, self-extinguishing

*Plug-in module, inserted from the front*

*Safety tests*
- Complies with EN 61010-1
- Over voltage category II
- Contamination class 2
- Working voltage range 300 VAC
- Protection class II

*Certifications*
- cULus-certification - Applied for.

**BlueControl, versions and functionality**

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Mini</th>
<th>Basic</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter and configuration setting</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Controller and loop simulation</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Download: transfer of a configuration to the controller</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Online mode / visualization</td>
<td>SIM only</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Defining an application specific linearization</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Configuration in the extended operating level</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Upload: reading a configuration from the controller</td>
<td>SIM only</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Basic diagnostic functions</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Saving data file and configuration</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Printer function</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Online documentation, help</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Implementation of measurement value correction</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Data acquisition and trend display</td>
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<td>yes</td>
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<tr>
<td>Wizard function</td>
<td>yes</td>
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<tr>
<td>Extended simulation</td>
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<tr>
<td>Programmable: KS 90-1</td>
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<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

The “Universal BlueControl™” Software comprises all functions of the Expert-version. All BluePort devices can be triggered via this software.

**BlueControl (Engineering Tool)**

PC-based program for configuring, setting parameters, and operating (commissioning) the KS 20-1 controller.

All the settings are saved, and can be printed on demand.

A powerful data acquisition module is available, complete with trend graphics.

**Visibility mask**
The BlueControl software can be used to hide any parameters in the instrument. Only specific parameters can be changed.

Safety relevant parameters are invisible and cannot be modified!

**Simulation**
The built-in simulation serves to test the controller settings, but can also be used for general training and observing the interaction between controller and control loop.

**Software requirements:**

**Configurations that can only be implemented via the BlueControl software (not via the front-panel keys):**

- Customer-specific linearizations
- Enable "forcing" for inputs/outputs. Forcing allows to write the analog and digital inputs and outputs via Modbus interface.
- Adjustment of limits for operating hours and switching cycles
- Switch-over to 60 Hz mains frequency
- Master/slave configuration
- Disable operator actions and operating levels, plus password definition
- Prevent automatic optimization of cycle times T1, T2

**Hardware requirements:**

A PC adapter (see “Accessories”) is required for connecting the controller. Updates and demo software can be downloaded from: www.West-CS.co.uk

The BlueControl software comprises all functions of the Expert-version. All BluePort devices can be triggered via this software.
### Product Ordering Code (provisional)

<table>
<thead>
<tr>
<th>Model Code</th>
<th>KS20 - 1 x x - x x x x x x x - 03</th>
</tr>
</thead>
</table>

#### Model Type

1/16 Din Universal Industrial Controller

#### Supply Voltage

- 100-240V AC: 0
- 24VAC 50/60Hz or 18 to 30VDC: 1

#### Heater Current / Transmitter Power Supply

<table>
<thead>
<tr>
<th>Option 1</th>
</tr>
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<tbody>
<tr>
<td>Relay (switch over)</td>
</tr>
<tr>
<td>Single SSR</td>
</tr>
<tr>
<td>Dual SSR</td>
</tr>
<tr>
<td>Linear mA/VDC Output</td>
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</table>

<table>
<thead>
<tr>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not fitted</td>
</tr>
<tr>
<td>Relay (switch over)</td>
</tr>
<tr>
<td>Dual Relay</td>
</tr>
<tr>
<td>Single SSR</td>
</tr>
<tr>
<td>Dual SSR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not fitted</td>
</tr>
<tr>
<td>Relay (switch over)</td>
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<tr>
<td>Single SSR</td>
</tr>
<tr>
<td>Dual SSR</td>
</tr>
<tr>
<td>Linear mA/VDC Output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not fitted</td>
</tr>
<tr>
<td>RS485</td>
</tr>
</tbody>
</table>

#### Language

- No Manual: 0
- German (Full or Concise Manual): 1
- English (Full or Concise Manual): 2
- French (Full or Concise Manual): 3
- Italian (Concise Manual Only): 4
- Spanish (Concise Manual Only): 5

#### Packing Options

- Single pack with concise manual: 0
- Single pack with full manual: 5

For more details on the complete product range from West Control Solutions please visit [www.Wwest-CS.co.uk](http://www.Wwest-CS.co.uk).

Austria: +43 (0) 2236 691 121  
Email: Enquiries@West-CS.com  
China: +86 22 8398 8098  
Website: www.West-CS.co.uk  
France: +33 (1) 77 80 90 42  
Germany: +49 (0) 561 505 1307  
UK: +44 (0) 1273 606 271  
USA: +1 800 866 6659

Book your product demonstration now at [www.West-CS.co.uk/LP/KS20-1](http://www.West-CS.co.uk/LP/KS20-1)