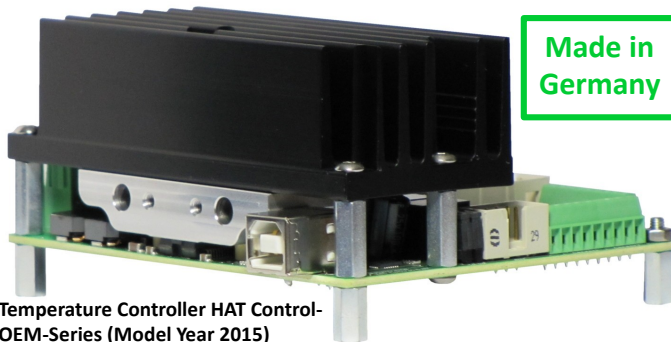


## OEM temperature controller with extended peripherals

The innovative temperature controller series HAT Control-OEM from BelektroniG are perfectly suitable for integration into measurement devices, ovens/furnaces and experimental setups where heating or peltierelements need to be controlled. Available in six different configurations these OEM controllers come with resolutions ranging between 0.1, 0.01 and 0.001°C. The integrated micro controller offers many extended functions for buttons, LED, Displays, current state requests and analog measurement inputs with no additional hardware effort. Adapting of the OEM controller to specific needs is possible as well as later upgrades to a higher configuration.



Temperature Controller HAT Control-OEM-Series (Model Year 2015)

- ✓ Temperature resolution: 0.1°C, 0.01°C, 0.001°C
- ✓ PWM control output up to 360W
- ✓ Fan control output
- ✓ Analog measurement inputs
- ✓ Digital switching in- and outputs
- ✓ Free usable command set
- ✓ Including user software HAT Soft Pro

### Configuration

Name of configuration: HAT Control-OEM-...	K10	K20	M10	M20	B10	B20
Temperature resolution [°C] / accuracy [°C]	0.1 / ±0.1		0.01 / ±0.01		0.001 / ±0.003	
Number of temperature sensors and fan control outputs	1	2	1	2	1	2
Number of analog measurement inputs	1	3	1	3	1	3

### Technical Data

#### Temperature measurement

- Type of sensors: Pt1000/Pt100
- Measurement range: -200...+400°C
- Resolution: 0.1°C, 0.01°C, 0.001°C
- Sample rate: 4Hz
- Measurement uncertainty: ±0.05°C (absolutely, add uncertainty of temperature sensors)
- Additional temperature sensors like NTC/PTC on request

#### Temperature control

- PWM output voltage: -36...36V, max. 10A
- PWM frequency: 20kHz
- Fan control output: 0...12V DC, max. 0.3A
- Optimized PIDT1 control algorithm
- Automated switch off if overshooting temperature limits

#### Operational modes

- 4 operational modes using Peltierelements
  - (1) meas. only/manual (2) heating only
  - (3) cooling only (4) heating & cooling
- 2 operational modes using heating elements
  - (1) meas. only/manual (2) heating only

#### Measurement of electric current at PWM output channel

- Resolution: 0.03A
- Limitation of output current using OEM-LC-Filter
- Current measurement active from 12.6% output power

#### Analog measurement inputs

- Analog in: 0...1.17V
- Resolution: 16bit
- Sample rate: 1Hz

#### Interface

- USB 2.0 incl. drivers for virtual COM-Port
- Free available command set allows programming the oem-controller using own programs e.g. written LabView, HP Vee
- Alternative to USB: UART (TTL level 0V, 5V)

#### Switching inputs and outputs

- 9x Digital In or Digital Out
- 16x Digital out
- TTL level: 0V, 5V

#### User software HAT Soft Pro

- Set and read HAT control settings via USB interface (set point, PID parameter, limits, ...)
- Con. displaying of temperatures, output power
- Upgrade dialogue for actualizations/ upgrades

#### Dimensions / operation conditions / compliance

- Dimensions (L x B x H), weight: 100 x 80 x 44mm<sup>3</sup>, 275g
- Operating temperature: 10...45°C
- Humidity: 0...80%
- Compliance: RoHS compliant

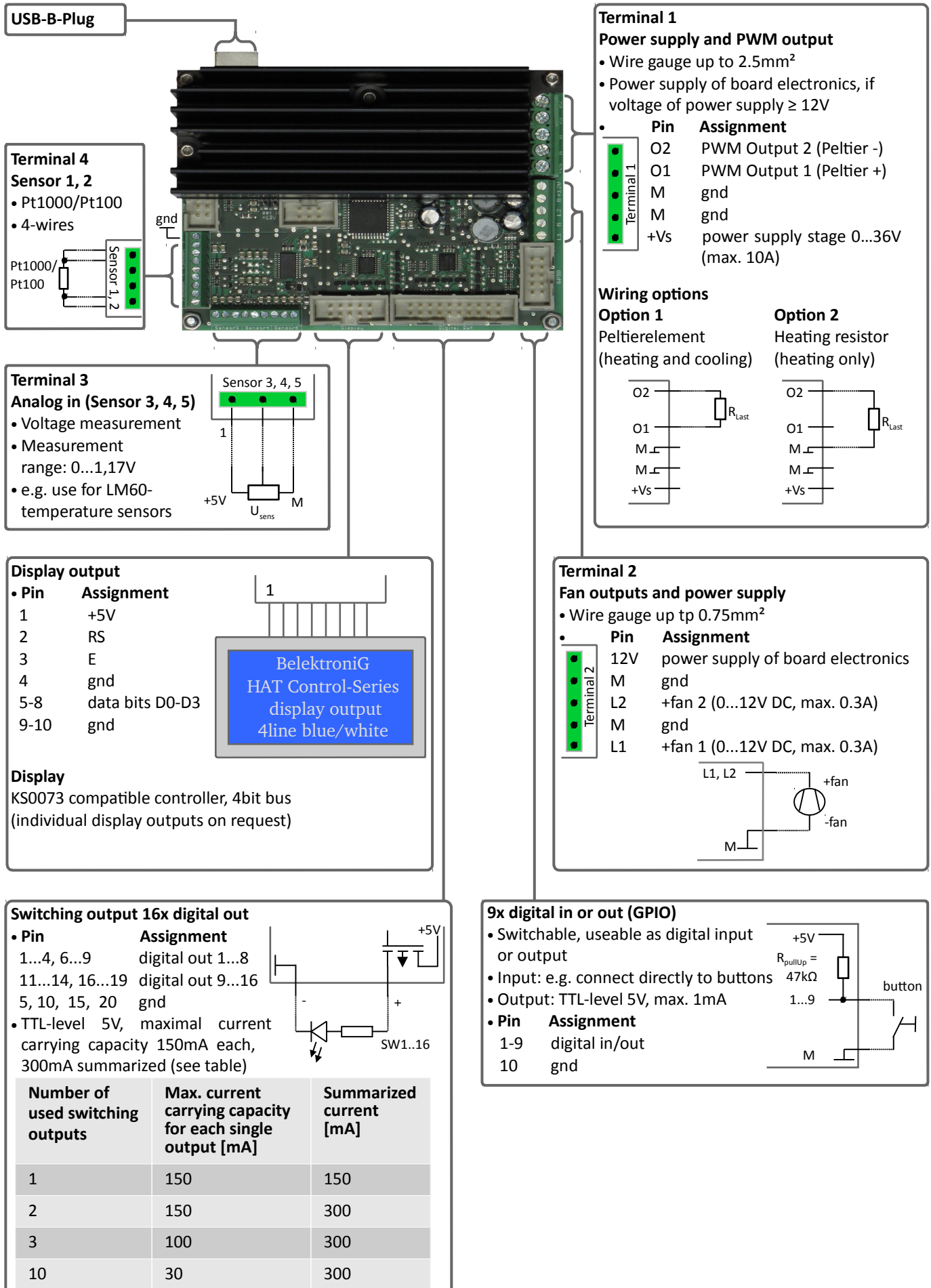
#### Scope of delivery

- OEM temperature controller board incl. mounted heat sink and M3x14mm distance bolts
- User software HAT Soft Pro for download

#### Accessories

- OEM-LC-Filter for linearization of PWM output voltage
- Peltiermodule Air-Air, Air-Plate
- 4line display blue/white

## Pin Assignment



## Power supply – examples of wiring

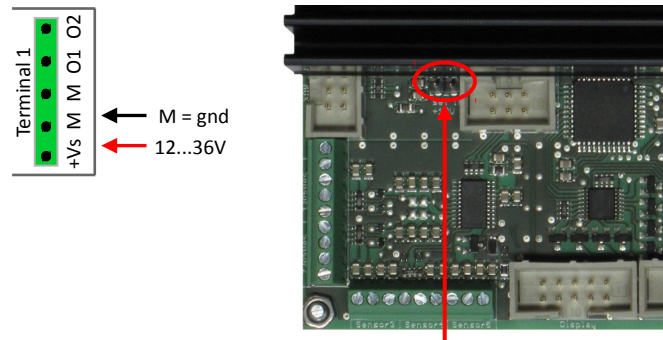
**Note:** The OEM temperature controller board has separate voltage supplies for:

- Control output: 0...36V
- Board electronics: 12V

This leads to two different variants for connecting power supplies.

### Option A (1 power supply with 12V or 15...36V)

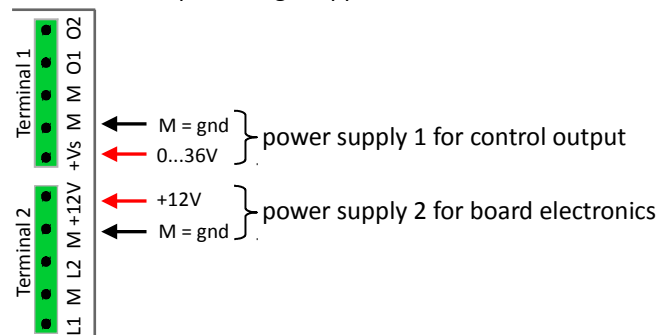
Use if power supplies have output voltages  $\geq 12V$ . Operating the oem controller board using voltages ranging from 13.2 to 14.8V is not possible.



**Note:** Connect these two pins named "Set if 12V" with a jumper when operating the controller with a 12V power supply on "+Vs" and "M" of terminal 1.

### Option B (2 separate power supplies)

Use if PWM output voltage supposed to be  $< 12V$ .



**Note:** A jumper as described in variant A is not needed when operating the controller board using one single power supply with 12V on "+12V" and "M" of terminal 2!

## Voltage ranges, maximum values

**Note:** To exceed the stated limits might cause a serious damage and destroying of the controller board leading to the loss of warranty!

### Recommended voltage ranges

Connector	Min.	Rated value	Max.
+Vs zu M	0	0...36V	42.0V
12V zu M	11.4V	12V	13.2V

### Maximum values

Pin connected to gnd M	Maximum value
+Vs	-0.3...42V
12V	-0.3...13.2V
O1, O2	-0.3...65V
L1, L2	-0.3...13.2V
Sensor 1, 2 (Pt1000/ Pt100)	-0.3...5.5V
Sensor 3, 4, 5 (analog in)	0...1.17V
Digital in/out	-0.3...5.5V
USB D+, D-, VBUS	-0.3...5.8V

### ESD protection

Connector	Norm
Sensor 1...5	IEC61000-4-2, MIL-STD-3015.7
Digital in	IEC61000-4-2
USB	IEC61000-4-2

## Upgrade to higher configurations

Upgrading the OEM temperature controller to higher configurations is possible using a special upgrade code which is transferred to the controller by the user software HAT Soft Pro. The following upgrad options are available:

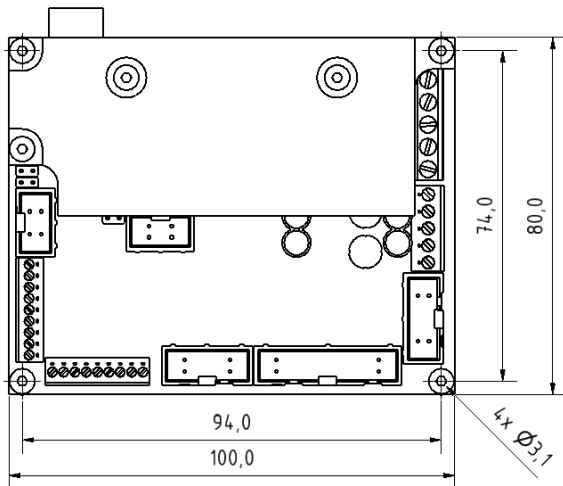
	to	K20	M10	M20	B10	B20
from						
K10		✓	✓	✓	✓	✓
K20		-	✓	✓	✓	✓
M10		-	-	✓	✓	✓
M20		-	-	-	✓	✓
B10		-	-	-	-	✓

### Note

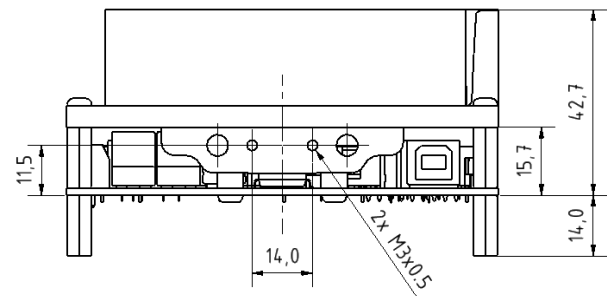
- The maximum continuously applicable electrical current without active cooling of the board is 5A, the short time applicable maximum current is 10A ( $t < 15\text{min}$ ). For applying continuously 10A use active cooling of controller board (e.g. fan). Overshooting controller boards temperature limits causes a shut down of the output stage.
- **Never** use the controller board for controlling temperature without any mounted heat sink!
- The minimum voltage supply for the controller board using 12V power supplies is 11.3V. The stage might be switched off at lower values, giving the error message: "Error stage".

## Dimensions (mm)

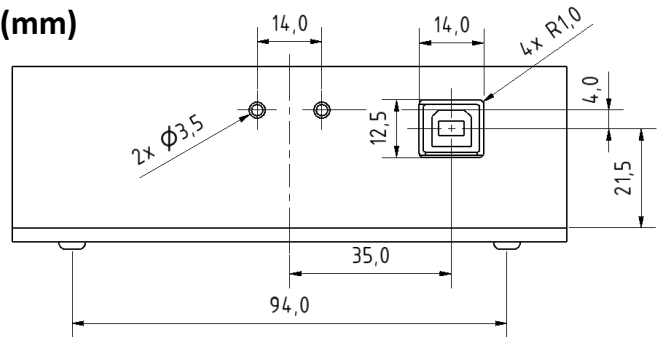
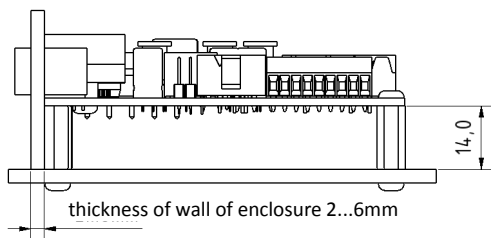
Top view



Back view



## Installation drawing for mounting on enclosures (mm)



- Cooling of output stage over wall of enclosure
- Additional cooling effort may needed (e.g. heat sink outside of the enclosure, fan)
- Distance bolts with other length on request (minimum distance OEM controller board to bottom: 5mm)

## Wiring example

