

## Peltier elements and accessories

Among other EURECA has specialised on technical support and sales of peltier elements and accessories. We supply a wide range of elements from various manufacturers, which we resell with our own designations. Complete cooling systems, many accessories and a first class technical support for our customers, as e.g. the simulation of new applications, complete our range of supply.

Peltier elements (thermoelectrical elements) are used when a reliable cooling without moving parts is needed. Peltier elements act as heat pumps and transport heat from one of their side to the other. In order to reach a maximum performance the pumped heat has to be transferred to the surrounding air or to a cooling circuit. For this normally heat sinks (sometime with fans) or heat exchangers with a water cooling circuit are used.

Special types of peltier elements can be used as thermoelectrical generators. Here a temperature difference on the two sides of a peltier element generates an electrical power, which can be used to drive electronic circuits.



The complete datasheets, as well as additional information about our products can be found on our internet pages at: <http://www.eureca.de>

### Peltier elements and thermoelectrical generators (TEG)

In order to get a better overview about the available peltier elements, we have sorted these devices in several classes:

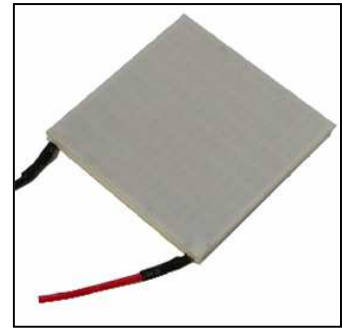
| Class      | Special features                                                                                                       | Page |
|------------|------------------------------------------------------------------------------------------------------------------------|------|
| INDUSTRY   | Very reliable; long life time, most types sealed                                                                       | 2    |
| HIGH POWER | Elements with high cooling power at rather low temperature differences                                                 | 3    |
| LOW COST   | Low cost elements for mass applications as e.g. cooling boxes                                                          | 3    |
| SCIENCE    | Many special types; some elements with high max. temperature differences                                               | 4    |
| TEG        | Generating electrical power out of a temperature difference                                                            | 5    |
| OEM        | Very large number of different types; available however only at higher volumes (OEM = Original Equipment Manufacturer) | 5    |

| Accessory / Service         | Application                                                                                                   | Page |
|-----------------------------|---------------------------------------------------------------------------------------------------------------|------|
| CUSTOMIZED PELTIER ELEMENTS | Development and production of elements optimized for a special application                                    | 5    |
| PROJECTING                  | Development and simulation of cooling applications                                                            | 6    |
| COOLING SYSTEMS             | Ready to use cooling systems with peltier elements, heat sinks and fans                                       | 6    |
| GLUES AND PASTES            | Pasting and sealing peltier elements, heat sinks and similar devices                                          | 6    |
| VOLTAGE SUPPLIES            | Driving our cooling systems; general applications                                                             | 7    |
| TEMPERATURE CONTROLLER      | To be used with our cooling systems; adjusting the current for peltier elements to hold a certain temperature | 7    |
| HEAT SINKS                  | Transferring heat to the surrounding air                                                                      | 7-8  |
| FANS                        | Increasing the performance of heat sinks                                                                      | 8    |

## Peltier elements

Peltier elements provide two parallel ceramic plates between which a large number of so called peltier pellets are located. These pellets are made of semiconductor materials and contain rather exotic materials as Indium, Bismut and Tellur. When an electric current flows through the pellets, a temperature difference is generated at their contact surfaces. By this one side of the peltier element is cooled down while the other heats up.

Due to the used lot, peltier elements have a certain maximum operation temperature, which must not be exceeded. In order to protect the element from the environment, some of our peltier elements can be supplied with a protective sealing.



### Peltier elements of the Industry class

These elements are produced regularly at higher volumes and provide a good price/performance ratio. Normally they can be supplied from stock also at lower volumes.

#### Square elements

| Designation                                                                | Size<br>L x B<br>[mm] | Maximum electrical / thermal values |             |             |                            |                            | Remarks                    |
|----------------------------------------------------------------------------|-----------------------|-------------------------------------|-------------|-------------|----------------------------|----------------------------|----------------------------|
|                                                                            |                       | Cooling Power [W]                   | Voltage [V] | Current [A] | Temperature Difference [K] | Operating temperature [°C] |                            |
| TEC1M-3.4-3.4-0.5/76-B                                                     | 3,4 x 3,4             | 0,5                                 | 1,0         | 0,9         | 75,7                       | 100                        |                            |
| TEC1M-5.0-5.0-1.1/76-B                                                     | 5,0 x 5,0             | 1,1                                 | 2,3         | 0,9         | 75,7                       | 100                        |                            |
| TEC1M-8.0-8.0-10/77-B                                                      | 8,0 x 8,0             | 10,2                                | 2,2         | 9,1         | 76,7                       | 100                        |                            |
| TEC1M-9.1-9.9-4.3/76-B<br>TEC1M-9.1-9.9-4.3/76-D<br>TEC1M-9.1-9.9-4.3/76-G | 9,1 x 9,9             | 4,3                                 | 8,7         | 1,0         | 75,6                       | 100<br>150<br>225          |                            |
| TEC1S-15-15-12/78-BS                                                       | 15,0 x 15,0           | 12,5                                | 2,3         | 11,1        | 77,8                       | 100                        | sealed                     |
| TEC1S-20-20-23/78-BS                                                       | 20,0 x 20,0           | 22,8                                | 4,1         | 11,1        | 77,8                       | 100                        | sealed                     |
| TEC1H-30-30-44/80-BS<br>TEC1H-30-30-44/80-DS<br>TEC1H-30-30-44/80-GS       | 30,0 x 30,0           | 44,3                                | 17,4        | 5,1         | 80,0                       | 100<br>150<br>225          | sealed<br>sealed<br>sealed |
| TEC1H-40-40-98/80-BS<br>TEC1H-40-40-98/80-DS<br>TEC1H-40-40-98/80-GS       | 40,0 x 40,0           | 98,5                                | 17,4        | 11,3        | 80,0                       | 100<br>150<br>225          | sealed<br>sealed<br>sealed |
| TEC1S-48-48-191/78-BS                                                      | 48,0 x 48,0           | 191,4                               | 16,9        | 22,6        | 77,8                       | 100                        | sealed                     |
| TEC1H-40-40-211/78-BS<br>TEC1H-40-40-211/78-DS                             | 40,0 x 40,0           | 211,1                               | 26,6        | 15,9        | 77,8                       | 100<br>150                 | sealed<br>sealed           |
| TEC1SE-55-55-280/78-BS<br>TEC1SE-55-55-280/78-DS                           | 55,0 x 55,0           | 280,0                               | 16,6        | 33,7        | 77,9                       | 100<br>150                 | sealed<br>sealed           |
| TEC2H-62-62-437/75-CS                                                      | 62,0 x 62,0           | 437,3                               | 26,7        | 32,8        | 74,5                       | 125                        | sealed                     |

#### Rectangular elements

| Designation             | Size<br>L x B<br>[mm] | Maximum electrical / thermal values |             |             |                            |                            | Remarks                |
|-------------------------|-----------------------|-------------------------------------|-------------|-------------|----------------------------|----------------------------|------------------------|
|                         |                       | Cooling Power [W]                   | Voltage [V] | Current [A] | Temperature Difference [K] | Operating temperature [°C] |                        |
| TEC1S-5.0-30.0-7.6/78-B | 5,0 x 30,0            | 7,6                                 | 3,0         | 5,0         | 77,8                       | 100                        | for CCD linear sensors |
| TEC1S-6.0-40.0-17/78-B  | 6,0 x 40,0            | 17,3                                | 4,2         | 8,2         | 77,8                       | 100                        | for CCD linear sensors |
| TEC1S-15-30-21/78-B     | 15,0 x 30,0           | 20,9                                | 8,4         | 5,0         | 77,8                       | 100                        |                        |
| TEC1S-20-40-46/78-B     | 20,0 x 40,0           | 46,4                                | 8,4         | 11,1        | 77,8                       | 100                        |                        |
| TEC1S-25-50-105/78-B    | 25,0 x 50,0           | 105,4                               | 26,0        | 8,1         | 77,8                       | 100                        |                        |

## High power peltier elements

| Designation           | Size<br>L x B<br>[mm] | Maximum electrical / thermal values |                |                |                               |                               | Remarks |
|-----------------------|-----------------------|-------------------------------------|----------------|----------------|-------------------------------|-------------------------------|---------|
|                       |                       | Cooling Power<br>[W]                | Voltage<br>[V] | Current<br>[A] | Temperature Difference<br>[K] | Operating temperature<br>[°C] |         |
| TEC1H-30-30-44/80-B   | 30 x 30               | 44,3                                | 17,4           | 5,1            | 80,0                          | 100                           |         |
| TEC1H-40-40-44/80-B   | 40 x 40               | 44,3                                | 17,4           | 5,1            | 80,0                          | 100                           |         |
| TEC1H-40-40-44/80-BS  |                       |                                     |                |                |                               |                               | sealed  |
| TEC1H-40-40-69/78-B   | 40 x 40               | 68,6                                | 16,9           | 8,1            | 77,8                          | 100                           |         |
| TEC1H-40-40-80/83-B   | 40 x 40               | 80,1                                | 17,9           | 9,0            | 83,4                          | 100                           |         |
| TEC1H-40-40-80/83-BS  |                       |                                     |                |                |                               |                               | sealed  |
| TEC1HE-40-40-80/84-B  | 40 x 40               | 80,2                                | 17,9           | 9,0            | 84,5                          | 100                           |         |
| TEC1H-40-40-98/80-B   | 40 x 40               | 98,5                                | 17,4           | 11,3           | 80,0                          | 100                           |         |
| TEC1H-40-40-147/78-B  | 40 x 40               | 147,2                               | 26,6           | 11,1           | 77,8                          | 100                           |         |
| TEC1H-40-40-161/78-B  | 40 x 40               | 160,0                               | 26,6           | 12,1           | 77,8                          | 100                           |         |
| TEC1H-40-40-211/78-B  | 40 x 40               | 211,1                               | 26,6           | 15,9           | 77,8                          | 100                           |         |
| TEC1H-48-48-98/80-BS  | 48 x 48               | 98,5                                | 17,4           | 11,3           | 80,0                          | 100                           | sealed  |
| TEC2H-55-55-333/63-CS | 55 x 55               | 332,7                               | 4,3            | 155,0          | 55,9                          | 125                           | sealed  |

## Low cost peltier elements

| Designation           | Size<br>L x B<br>[mm] | Maximum electrical / thermal value |                |                |                               |                               | Remarks |
|-----------------------|-----------------------|------------------------------------|----------------|----------------|-------------------------------|-------------------------------|---------|
|                       |                       | Cooling Power<br>[W]               | Voltage<br>[V] | Current<br>[A] | Temperature Difference<br>[K] | Operating temperature<br>[°C] |         |
| TEC2L-15-15-5.6/73-CS | 15 x 15               | 5,6                                | 4,0            | 2,8            | 73,4                          | 125                           | sealed  |
| TEC2L-15-15-8.6/73-CS | 15 x 15               | 8,6                                | 4,1            | 4,2            | 73,5                          | 125                           | sealed  |
| TEC2L-15-15-14/73-CS  | 15 x 15               | 14,1                               | 4,0            | 7,0            | 73,4                          | 125                           | sealed  |
| TEC2L-15-15-14/73-FS  |                       |                                    |                |                |                               | 200                           | sealed  |
| TEC2L-23-23-13/73-CS  | 23 x 23               | 12,8                               | 9,2            | 2,8            | 73,4                          | 125                           | sealed  |
| TEC2L-23-23-19/73-FS  | 23 x 23               | 19,3                               | 9,3            | 4,2            | 73,4                          | 200                           | sealed  |
| TEC2L-23-23-32/73-CS  | 23 x 23               | 32,2                               | 9,2            | 7,0            | 73,4                          | 125                           | sealed  |
| TEC2L-23-23-32/73-FS  |                       |                                    |                |                |                               | 200                           | sealed  |
| TEC2L-30-30-23/73-CS  | 30 x 30               | 23,0                               | 16,5           | 2,8            | 73,4                          | 125                           | sealed  |
| TEC2L-30-30-58/73-CS  | 30 x 30               | 57,6                               | 16,5           | 7,0            | 73,4                          | 125                           | sealed  |

## Peltier elements of the Science class

### Micro peltier elements

| Designation            | Size<br>L x B<br>[mm] | Maximum electrical / thermal values |                |                |                               |                               | Remarks |
|------------------------|-----------------------|-------------------------------------|----------------|----------------|-------------------------------|-------------------------------|---------|
|                        |                       | Cooling Power<br>[W]                | Voltage<br>[V] | Current<br>[A] | Temperature Difference<br>[K] | Operating temperature<br>[°C] |         |
| TEC1M-3.4-5.0-0.7/76-B | 3,4 x 5,0             | 0,7                                 | 1,5            | 1,0            | 75,6                          | 100                           |         |
| TEC1M-4.3-4.3-0.8/78-B | 4,3 x 4,3             | 0,8                                 | 0,9            | 1,8            | 78,1                          | 100                           |         |
| TEC1M-6.3-6.3-2.7/78-B | 6,3 x 6,3             | 2,7                                 | 2,3            | 2,4            | 77,8                          | 100                           |         |
| TEC1M-6.6-6.6-2.1/76-B | 6,6 x 6,6             | 2,1                                 | 4,2            | 1,0            | 75,6                          | 100                           |         |
| TEC1M-12-13-12/77-B    | 12,0 x 12,0           | 12,3                                | 8,5            | 2,9            | 76,8                          | 100                           |         |
| TEC1M-12-26-21/77-B    | 12,0 x 12,0           | 20,6                                | 14,3           | 2,9            | 76,8                          | 100                           |         |

### Square peltier elements

| Designation           | Size<br>L x B<br>[mm] | Maximum electrical resp. thermal data |                |                |                               |                               | Remarks |
|-----------------------|-----------------------|---------------------------------------|----------------|----------------|-------------------------------|-------------------------------|---------|
|                       |                       | Cooling Power<br>[W]                  | Voltage<br>[V] | Current<br>[A] | Temperature Difference<br>[K] | Operating temperature<br>[°C] |         |
| TEC2S-10-10-2.0/76-CS | 10 x 10               | 2,0                                   | 0,9            | 4,2            | 75,7                          | 125                           | sealed  |
| TEC1S-10-10-4.0/79-B  | 10 x 10               | 4,0                                   | 1,0            | 8,4            | 79,0                          | 100                           |         |
| TEC2S-10-10-4.1/76-CS | 10 x 10               | 4,1                                   | 0,9            | 8,7            | 75,7                          | 125                           | sealed  |
| TEC2S-10-10-7.3/70-CS | 10 x 10               | 7,3                                   | 1,0            | 14,8           | 70,4                          | 125                           | sealed  |
| TEC2S-10-10-9.9/68-CS | 10 x 10               | 9,9                                   | 0,9            | 21,0           | 68,0                          | 125                           | sealed  |
| TEC1S-15-15-12/78-B   | 15 x 15               | 12,5                                  | 2,3            | 11,1           | 77,8                          | 100                           |         |
| TEC1S-20-20-23/78-B   | 20 x 20               | 22,8                                  | 4,1            | 11,1           | 77,8                          | 100                           |         |
| TEC1S-22-22-13/81-B   | 22 x 22               | 12,5                                  | 2,3            | 10,6           | 81,2                          | 100                           |         |
| TEC1S-30-30-22/79-B   | 30 x 30               | 22,4                                  | 17,0           | 2,6            | 79,0                          | 100                           |         |
| TEC1S-30-30-23/81-B   | 30 x 30               | 23,0                                  | 4,3            | 10,7           | 81,1                          | 100                           |         |
| TEC1S-30-30-37/79-B   | 30 x 30               | 36,6                                  | 4,2            | 17,4           | 78,9                          | 100                           |         |
| TEC1S-30-30-41/79-B   | 30 x 30               | 41,0                                  | 9,6            | 8,6            | 78,9                          | 100                           |         |
| TEC1S-30-30-53/78-B   | 30 x 30               | 52,8                                  | 9,5            | 11,1           | 77,8                          | 100                           |         |
| TEC1S-30-30-69/78-D   | 30 x 30               | 68,6                                  | 16,9           | 8,1            | 77,8                          | 150                           |         |
| TEC2S-40-40-66/76-CS  | 40 x 40               | 65,8                                  | 17,5           | 7,5            | 75,9                          | 125                           | sealed  |
| TEC1S-40-40-74/79-B   | 40 x 40               | 73,6                                  | 4,3            | 34,2           | 78,9                          | 100                           |         |
| TEC1S-48-48-191/78-B  | 48 x 48               | 191,4                                 | 16,9           | 22,6           | 77,8                          | 100                           |         |
| TEC1SE-55-55-280/78-B | 55 x 55               | 280,0                                 | 16,6           | 33,7           | 77,9                          | 100                           |         |
| TEC1SE-62-62-188/77-B | 62 x 62               | 188,4                                 | 16,9           | 22,3           | 76,7                          | 100                           |         |

### Rectangular peltier elements

| Designation           | Size<br>L x B<br>[mm] | Maximum electrical / thermal values |                |                |                               |                               | Remarks |
|-----------------------|-----------------------|-------------------------------------|----------------|----------------|-------------------------------|-------------------------------|---------|
|                       |                       | Cooling Power<br>[W]                | Voltage<br>[V] | Current<br>[A] | Temperature Difference<br>[K] | Operating temperature<br>[°C] |         |
| TEC1S-15-30-11/79-B   | 15 x 15               | 11,1                                | 8,4            | 2,6            | 79,0                          | 100                           |         |
| TEC2S-30-40-137/68-CS | 30 x 30               | 137,2                               | 21,4           | 12,8           | 68,0                          | 125                           | sealed  |

### Square peltier elements with hole

| Designation             | Size<br>L x B<br>[mm] | Maximum electrical / thermal values |                |                |                               |                               | Remarks |
|-------------------------|-----------------------|-------------------------------------|----------------|----------------|-------------------------------|-------------------------------|---------|
|                         |                       | Cooling Power<br>[W]                | Voltage<br>[V] | Current<br>[A] | Temperature Difference<br>[K] | Operating temperature<br>[°C] |         |
| TEC1R-10-60-2.0-42/78-B | 10 x 60               | 41,7                                | 10,3           | 8,1            | 77,8                          | 100                           |         |
| TEC1R-17-22-9.5-23/78-B | 17 x 22               | 23,3                                | 5,7            | 8,1            | 77,8                          | 100                           |         |

## Thermoelectrical generators (SEEBECK elements)

Thermoelectrical generators are in principle identical compared to peltier elements. Here the Seebeck effect is used to generate an electrical power out of a temperature difference, which is applied to the element. The following tabular shows elements for a maximum operating temperature of up to 150 degree celcius. The indicated values are measured at a temperature difference of 100K.

| Designation            | Maximum voltage [V] | Short circuit current [A] | Maximum Power [W] | Maximum operating temperature [°C] | Size L x B x H [mm] |
|------------------------|---------------------|---------------------------|-------------------|------------------------------------|---------------------|
| TEG1-9.1-9.9-0.2/100   | 2,7                 | 0,3                       | 0,2               | 150                                | 9,1 x 9,9 x 2,3     |
| TEG1-30-30-2.1/100     | 5,4                 | 1,6                       | 2,1               | 150                                | 30,0 x 30,0 x 3,6   |
| TEG1-40-40-4.0/100 (s) | 10,4                | 1,6                       | 4,0               | 150                                | 40,0 x 40,0 x 3,6   |
| TEG1-40-40-4.0/100 (p) | 5,2                 | 3,1                       |                   |                                    |                     |
| TEG1-40-40-4.7/100     | 5,4                 | 3,5                       | 4,7               | 150                                | 40,0 x 40,0 x 3,4   |
| TEG1-40-40-10/100      | 8,2                 | 4,9                       | 10,1              | 150                                | 40,0 x 40,0 x 3,2   |

(The element TEG2-40-40-4.0/100 provides four connectors and two individual current circuits, so that it can be used in two different modes (s = serial, p = parallel).)

The following table shows elements for maximum operating temperatures of up to 150 degree celcius. The indicated values are measured at a temperature difference of 200K.

| Designation          | Maximum voltage [V] | Short circuit current [A] | Maximum Power [W] | Maximum operating temperature [°C] | Size L x B x H [mm] |
|----------------------|---------------------|---------------------------|-------------------|------------------------------------|---------------------|
| TEG1-9.1-9.9-0.8/200 | 5,4                 | 0,6                       | 0,8               | 225                                | 9,1 x 9,9 x 2,3     |
| TEG1-30-30-8.5/200   | 10,8                | 3,2                       | 8,5               | 225                                | 30,0 x 30,0 x 3,6   |
| TEG1-40-40-19/200    | 10,8                | 7,0                       | 18,9              | 225                                | 40,0 x 40,0 x 3,4   |
| TEG2-50-50-40/200    | 10,3                | 15,3                      | 39,6              | 250                                | 50,0 x 50,0 x 3,4   |

## OEM peltier elements

The peltier elements described on the previous pages are only a small selection out of the complete range of available elements. For this overview we have focused on elements, which are sold in higher volumes and which are so in regular production.

In addition to these elements there are a large number of other elements, which are produced time by time for special customers, or which are even completely out of production at the moment. These types can however be produced again quite fast, since all necessary tools are still available. There is however a minimum order volume of at least 100 elements. For lower volumes the initial cost for a new production are too high. A list of all so called OEM elements (OEM = Original Equipment Manufacturer) can be found on our internet pages at <http://www.eureca.de>

Normally one of these OEM peltier elements provides suitable specifications for a new planned application. So please contact us, if you do not find a suitable element type in this overview. We will gladly help you to find a suitable alternative.

## Customized peltier elements

In some cases even in our large supply of OEM peltier elements a suitable product cannot be found. At a certain volume the development of a customized element makes sense, which fits the needed specifications as good as possible. EURECA possesses all necessary tools and experiences to develop such customized peltier elements or thermo electrical generators. Before starting a respective development, the final technical specifications can be simulated.

In principle nearly all geometries can be used for a new Peltier element. There are however some limitations to be considered as e.g. the thermal expansion of the element. Because of the the production of larger elements make no sense, since such devices can be damaged very easily while heating up or cooling down caused by mechanical stress. Here it is better to use several smaller elements.

After the first design steps for a new element the internal needed number of peltier pellets is known. There are now several possible ways to connect them among each other using a suitable combination of serial or parallel lines. So the final values for the voltage and current supply of the new element can be adjusted to fit the given specifications. If the new application provides e.g. a certain voltage supply, the internal structure of the peltier element can be chosen respectively, so that the element can work with this voltage.

## Developing of cooling applications

Similar to the above described development of peltier elements EURECA can also design complete cooling applications (e.g. combinations of peltier elements, heat sinks and fans) for all areas of industry, medical or science. Again we possess many simulation tools, which can be used to predict the final technical specifications of a new cooling device without building several expensive prototypes. Further we offer the optimisation of existing cooling devices. Often the performance can be increased, or the needed electrical power reduced by some rather simple changes.

## Thermo electrical cooling systems

EURECA offers thermo electrical cooling systems, which provide a maximum cooling power at a very small size. These modules consist of a sealed peltier element, a heat sink with fan, a spacer with isolation, as well as a connector pcb with temperature sensor.

The following tabular shows all available standard modules. An request we can also offer customized cooling systems with even higher cooling power.



| Designation        | Isothermic Cooling Power [W] | Size [mm]<br>L x B x H | Weight [kg] | Remarks      |
|--------------------|------------------------------|------------------------|-------------|--------------|
| Peltier-XS         | 12,9                         | 50 x 50 x 64           | 0,2         |              |
| Peltier-S          | 25,8                         | 87 x 62 x 88           | 0,5         |              |
| Peltier-M-Compact  | 48,1                         | 105 x 80 x 101         | 1,0         | Compact size |
| Peltier-M          | 56,6                         | 150 x 125 x 91         | 1,8         |              |
| Peltier-L-Compact  | 72,0                         | 152 x 120 x 137        | 2,9         | Compact size |
| Peltier-L          | 85,5                         | 213 x 188 x 91         | 3,6         |              |
| Peltier-XL-Compact | 113,7                        | 185 x 160 x 106        | 3,2         | Compact size |
| Peltier-XL         | 120,5                        | 213 x 188 x 96         | 3,8         |              |
| Peltier-XXL        | 139,9                        | 272 x 240 x 142        | 9,8         |              |

## Thermal conducting glues, pastes and sealing materials

EURECA offers also a series of thermal conducting glues and pastes, as well as sealing materials. You can find further information in the datasheets of these products on our internet pages.

| Designation                                                                                      | Thermal Conductivity [W/Km] | Temperature Range [°C] | Final Consistence | Electical Insulation [kV/mm] | Remarks                        |
|--------------------------------------------------------------------------------------------------|-----------------------------|------------------------|-------------------|------------------------------|--------------------------------|
| <b>Good thermal conductivity for mounting heat sinks to peltier elements or other components</b> |                             |                        |                   |                              |                                |
| TCSC-1700                                                                                        | 1,70                        | -55 / +200             | Paste             | 35                           | One component silicone paste   |
| TCSA-1530                                                                                        | 1,53                        | -55 / +200             | Hard              | 13                           | One component silicone glue    |
| TCSG-1500                                                                                        | 1,50                        | -60 / +200             | Gel               | 10                           | One component silicone gel     |
| TCSA-0770                                                                                        | 0,77                        | -150 / +350            | Hard              | 26                           | Two component silicone glue    |
| TCAF-0450                                                                                        | 0,45                        | -40 / +200             | Hard              | 6                            | One component adhesice foil    |
| <b>Low thermal conductivity for e.g. sealing of peltier elements</b>                             |                             |                        |                   |                              |                                |
| PUSA-0100                                                                                        | 0,10                        | -40 / +150             | Hard              | 5                            | One component polyuretan paste |

## Switching power supplies

For the use with out cooling systems, or for general purposes, we offer a series of compact and powerful switching power supplies.

Available are table top devices as well as modules for use in industrial environments.

For these power supplies we offer also temperature controllers (see below). With such a combination the temperatures of peltier elements or complete cooling systems can be regulated.



| Designation  | Voltage [V] | Max. Current [A] | Remarks                                                    |
|--------------|-------------|------------------|------------------------------------------------------------|
| SPS-9400     | 3 - 15      | 40               | Table top                                                  |
| SPS-9600     | 1 - 15      | 60               | Table top, programmable output voltage                     |
| SPS-9602     | 1 - 30      | 30               | Table top, programmable output voltage                     |
| PBA-300F-15  | 15          | 20               | For industrial use, programmable output voltage            |
| PBA-600F-15  | 15          | 40               | For industrial use, programmable output voltage            |
| PBA-1000F-15 | 15          | 70               | For industrial use, programmable output voltage            |
| PBA-1500F-15 | 15          | 100              | For industrial use, programmable output voltage            |
| LNT-500      | 0 - 15      | 30               | Table top, For industrial use, programmable output voltage |
| LNT-1000     | 0 - 15      | 60               | Table top, For industrial use, programmable output voltage |
| LNT-1500     | 0 - 15      | 90               | Table top, For industrial use, programmable output voltage |

## Temperature controller

For the use with our power supplies we offer a series of suitable temperature controllers. These provide suitable outputs to drive the power supplies, to build up also complex applications.

The measurement of the temperature to be controlled is done via PT-100 thermal resistors, which have to be mounted close to the cooled object.

Some of our compact cooling systems (as already described above) provide already the suitable temperature sensor.



| Designation      | Sensor | Output     | Remarks                             |
|------------------|--------|------------|-------------------------------------|
| P6100-1500002-30 | PT-100 | 0-5 V      | to be used with SPS960x and PBAxxxx |
| P6100-1550002-30 | PT-100 | 2 x 0-5 V  | to be used with SPS960x and PBAxxxx |
| P6100-1300002-30 | PT-100 | 0-10 V     | to be used with LNTxxxx             |
| P6100-1330002-30 | PT-100 | 2 x 0-10 V | to be used with LNTxxxx             |

## Heat sinks

For transferring heat to the surrounding air we offer a wide range of different heat sinks. These are made out of aluminium (E-AlMgSi<sub>0,5</sub>) and can be delivered in different lengths. Beside some standard length of e.g. 50mm, 100mm, 150mm, 200mm also customized lengths are available.

The following pages show the thermal resistance for some standard lengths. More detailed datasheets with the respective values for other lengths are available on request.

In order to increase the cooling power of heat sinks, fans can be achieved for getting a stronger convection.



### Heat sinks for axial fans

| Designation    | Width x Height [mm] | Thermal Resistance in K/W<br>(with forced convection of 5m/s) |               |              | Weigth [kg] |
|----------------|---------------------|---------------------------------------------------------------|---------------|--------------|-------------|
|                |                     | 100 mm Length                                                 | 200 mm Length | 300 m Length |             |
| HFHS-A-60/1/1  | 62 x 75             | 0,23                                                          | 0,17          | 0,15         | 5,7         |
| HFHS-A-60/2/1  | 125 x 75            | 0,12                                                          | 0,09          | 0,07         | 11,1        |
| HFHS-A-60/3/1  | 188 x 75            | 0,08                                                          | 0,05          | 0,05         | 16,5        |
| HFHS-A-80/1/1  | 80 x 85             | 0,17                                                          | 0,12          | 0,11         | 8,7         |
| HFHS-A-80/2/1  | 160 x 85            | 0,08                                                          | 0,06          | 0,05         | 16,9        |
| HFHS-A-80/3/1  | 240 x 85            | 0,06                                                          | 0,04          | 0,03         | 25,5        |
| HFHS-A-120/1/1 | 120 x 121           | 0,10                                                          | 0,07          | 0,05         | 19,6        |
| HFHS-A-120/2/1 | 240 x 121           | 0,07                                                          | 0,05          | 0,05         | 36,9        |
| HFHS-A-125/1/1 | 125 x 136           | 0,13                                                          | 0,08          | 0,06         | 19,9        |
| HFHS-A-92/1/2  | 92 x 96             | 0,13                                                          | 0,10          | 0,08         | 12,5        |
| HFHS-A-92/2/2  | 184 x 96            | 0,07                                                          | 0,05          | 0,04         | 24,5        |
| HFHS-A-120/1/2 | 122 x 122           | 0,08                                                          | 0,07          | 0,05         | 21,3        |
| HFHS-A-120/2/2 | 243 x 122           | 0,04                                                          | 0,03          | 0,03         | 42,4        |
| HFHS-A-155/1/2 | 155 x 160           | 0,05                                                          | 0,03          | 0,03         | 32,7        |

### Heat sink for free convection

| Designation       | Width x Height [mm] | Thermal Resistance in K/W<br>(with free convection) |        |        |        | Thermal Resistance in K/W<br>(with forced convection of 5m/s) |        |        |        | Weight [kg] |
|-------------------|---------------------|-----------------------------------------------------|--------|--------|--------|---------------------------------------------------------------|--------|--------|--------|-------------|
|                   |                     | 100 mm                                              | 200 mm | 300 mm | 400 mm | 100 mm                                                        | 200 mm | 300 mm | 400 mm |             |
| HPHS-C 200/84/13  | 200 x 84            | 0,30                                                | 0,21   | 0,17   | 0,15   |                                                               |        |        |        | 17,0        |
| HPHS-C 250/84/10  | 250 x 84            | 0,34                                                | 0,20   | 0,15   | 0,12   | 0,10                                                          | 0,06   | 0,05   | 0,04   | 22,9        |
| HPHS-C 300/84/13  | 300 x 84            | 0,30                                                | 0,19   | 0,15   | 0,13   | 0,08                                                          | 0,04   | 0,03   | 0,03   | 31,0        |
| HPHS-C 300/84/10  | 300 x 84            | 0,30                                                | 0,17   | 0,13   | 0,10   | 0,08                                                          | 0,05   | 0,05   | 0,04   | 27,2        |
| HPHS-C 400/84/13  | 400 x 84            | 0,24                                                | 0,15   | 0,12   | 0,10   | 0,06                                                          | 0,03   | 0,02   | 0,02   | 40,8        |
| HPHS-C 400/84/10  | 400 x 84            | 0,23                                                | 0,14   | 0,10   | 0,08   | 0,06                                                          | 0,04   | 0,03   | 0,03   | 35,9        |
| HPHS-C 500/84/13  | 500 x 84            | 0,19                                                | 0,12   | 0,09   | 0,08   | 0,05                                                          | 0,03   | 0,02   | 0,02   | 50,6        |
| HPHS-C 500/84/10  | 500 x 84            | 0,19                                                | 0,11   | 0,08   | 0,07   | 0,05                                                          | 0,03   | 0,03   | 0,02   | 44,5        |
| HPHS-C 600/84/13  | 600 x 84            | 0,16                                                | 0,10   | 0,08   | 0,07   | 0,04                                                          | 0,02   | 0,02   | 0,01   | 60,4        |
| HPHS-C 600/84/10  | 600 x 84            | 0,165                                               | 0,09   | 0,07   | 0,05   | 0,04                                                          | 0,03   | 0,02   | 0,02   | 53,2        |
| HPHS-C 750/84/13  | 750 x 84            | 0,13                                                | 0,08   | 0,06   | 0,06   | 0,04                                                          | 0,02   | 0,01   | 0,01   | 75,1        |
| HPHS-C 750/84/10  | 750 x 84            | 0,12                                                | 0,07   | 0,05   | 0,04   | 0,03                                                          | 0,02   | 0,02   | 0,01   | 66,2        |
| HPHS-C 300/135/13 | 300 x 135           | 0,16                                                | 0,13   | 0,10   | 0,09   | 0,08                                                          |        |        |        | 30,9        |
| HPHS-C 400/135/13 | 400 x 135           | 0,12                                                | 0,09   | 0,08   | 0,06   | 0,06                                                          |        |        |        | 40,7        |
| HPHS-C 500/135/13 | 500 x 135           | 0,10                                                | 0,08   | 0,06   | 0,05   | 0,05                                                          |        |        |        | 50,4        |
| HPHS-C 600/135/13 | 600 x 135           | 0,08                                                | 0,06   | 0,05   | 0,05   | 0,04                                                          |        |        |        | 60,3        |
| HPHS-C 750/135/13 | 750 x 135           | 0,07                                                | 0,05   | 0,04   | 0,04   | 0,03                                                          |        |        |        | 74,9        |

(All indicated values were measured with a heat sink temperature of 85°C and a surrounding air temperature of 35°C)

## Heat sinks for radial fans

| Designation       | Width x Height [mm] | Thermal Resistance in K/W<br>(with forced convection of 5m/s) |        |        |        |        |        |        | Weight [kg] |
|-------------------|---------------------|---------------------------------------------------------------|--------|--------|--------|--------|--------|--------|-------------|
|                   |                     | 100 mm                                                        | 150 mm | 200 mm | 250 mm | 300 mm | 400 mm | 500 mm |             |
| HFHS-R-165.85.11  | 165 x 85            | 0,08                                                          |        | 0,06   |        | 0,05   |        |        | 18,0        |
| HFHS-R-200.84.13  | 200 x 84            | 0,07                                                          |        | 0,05   |        | 0,04   |        |        | 20,1        |
| HFHS-R-200.84.9   | 200 x 84            | 0,07                                                          |        | 0,05   |        | 0,04   |        |        | 17,5        |
| HFHS-R-215.77.10  | 215 x 77            |                                                               | 0,06   | 0,04   | 0,038  | 0,03   | 0,03   | 0,03   | 21,5        |
| HFHS-R-250.84.13  | 250 x 84            | 0,06                                                          |        | 0,04   |        | 0,03   |        |        | 25,2        |
| HFHS-R-250.84.10  | 250 x 84            | 0,07                                                          |        | 0,04   |        | 0,03   | 0,03   |        | 24,2        |
| HFHS-R-300.127.11 | 300 x 127           | 0,03                                                          |        | 0,02   |        | 0,02   |        |        | 53,6        |
| HFHS-R-300.84.13  | 300 x 84            | 0,05                                                          |        | 0,03   |        | 0,02   |        |        | 29,9        |
| HFHS-R-300.84.9   | 300 x 84            | 0,05                                                          |        | 0,03   |        | 0,02   |        |        | 26,1        |
| HFHS-R-300.84.10  | 300 x 84            | 0,05                                                          |        | 0,04   |        | 0,02   | 0,03   |        | 28,8        |
| HFHS-R-400.88.13  | 400 x 88            | 0,04                                                          |        | 0,03   |        | 0,02   |        |        | 43,8        |
| HFHS-R-400.84.10  | 400 x 84            | 0,04                                                          |        | 0,03   |        | 0,02   | 0,02   | 0,02   | 38,0        |
| HFHS-R-500.84.10  | 500 x 84            | 0,03                                                          |        | 0,02   |        | 0,02   | 0,02   | 0,01   | 47,3        |
| HFHS-R-600.84.10  | 600 x 84            | 0,03                                                          |        | 0,02   |        | 0,01   | 0,01   | 0,01   | 56,5        |
| HFHS-R-750.84.10  | 750 x 84            | 0,02                                                          |        | 0,01   |        | 0,01   | 0,01   | 0,01   | 70,4        |

## Fans

For improving the performance of heat sinks special fans are used, which are optimized for a permanent operations. Some of the above described heat sinks have already a suitable size for mounting such fans.

Although there are many manufacturers of fans, we have chosen the products of PAPST, since the products of this manufacturer provide an excellent cost/performance ratio and a very long life time.

The most fans are available with Sintec bearing as well as with ball bearing.



| Designation           | Flow [m3/h] | Voltage Supply [VDC] | Power Consumption [W] | Turns [min -1] | Remarks           |
|-----------------------|-------------|----------------------|-----------------------|----------------|-------------------|
| Fan size 60x60x25mm   |             |                      |                       |                |                   |
| 612NGHH               | 56          | 8-15 (12)            | 3,0                   | 6850           | Sintec bearing    |
| 612NHH                | 56          | 8-15 (12)            | 3,0                   | 6850           | Ball bearing      |
| 614NGHH               | 56          | 18-26 (24)           | 3,0                   | 6850           | Sintec bearing    |
| 614NHH                | 56          | 18-26 (24)           | 3,0                   | 6850           | Ball bearing      |
| Fan size 80x80x25mm   |             |                      |                       |                |                   |
| 8412NG                | 69          | 8-15 (12)            | 2,0                   | 3100           | Sintec bearing    |
| 8412NH                | 79          | 8-13,5 (12)          | 2,2                   | 3600           | Ball bearing      |
| 8414NG                | 69          | 18-28 (24)           | 2,0                   | 3100           | Sintec bearing    |
| 8414NH                | 79          | 18-28 (24)           | 2,4                   | 3600           | Ball bearing      |
| Fan size 92x92x25mm   |             |                      |                       |                |                   |
| 3412NGHH              | 102         | 8-13,2 (12)          | 3,2                   | 3250           | Sintec-Gleitlager |
| 3414NGHH              | 102         | 18-26 (24)           | 3,2                   | 3250           | Sintec-Gleitlager |
| Fan size 119x119x32mm |             |                      |                       |                |                   |
| 4312NGN               | 166         | 7-14,5 (12)          | 4,0                   | 3000           | Sintec-Gleitlager |
| 4312NHH               | 198         | 7-14,5 (12)          | 6,5                   | 3600           | Kugellager        |
| 4314NGN               | 166         | 12-28 (24)           | 4,3                   | 3000           | Sintec-Gleitlager |
| 4314NHH               | 198         | 12-28 (24)           | 6,0                   | 3600           | Kugellager        |
| 4318NGN               | 166         | 36-56 (48)           | 4,1                   | 3000           | Sintec-Gleitlager |

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