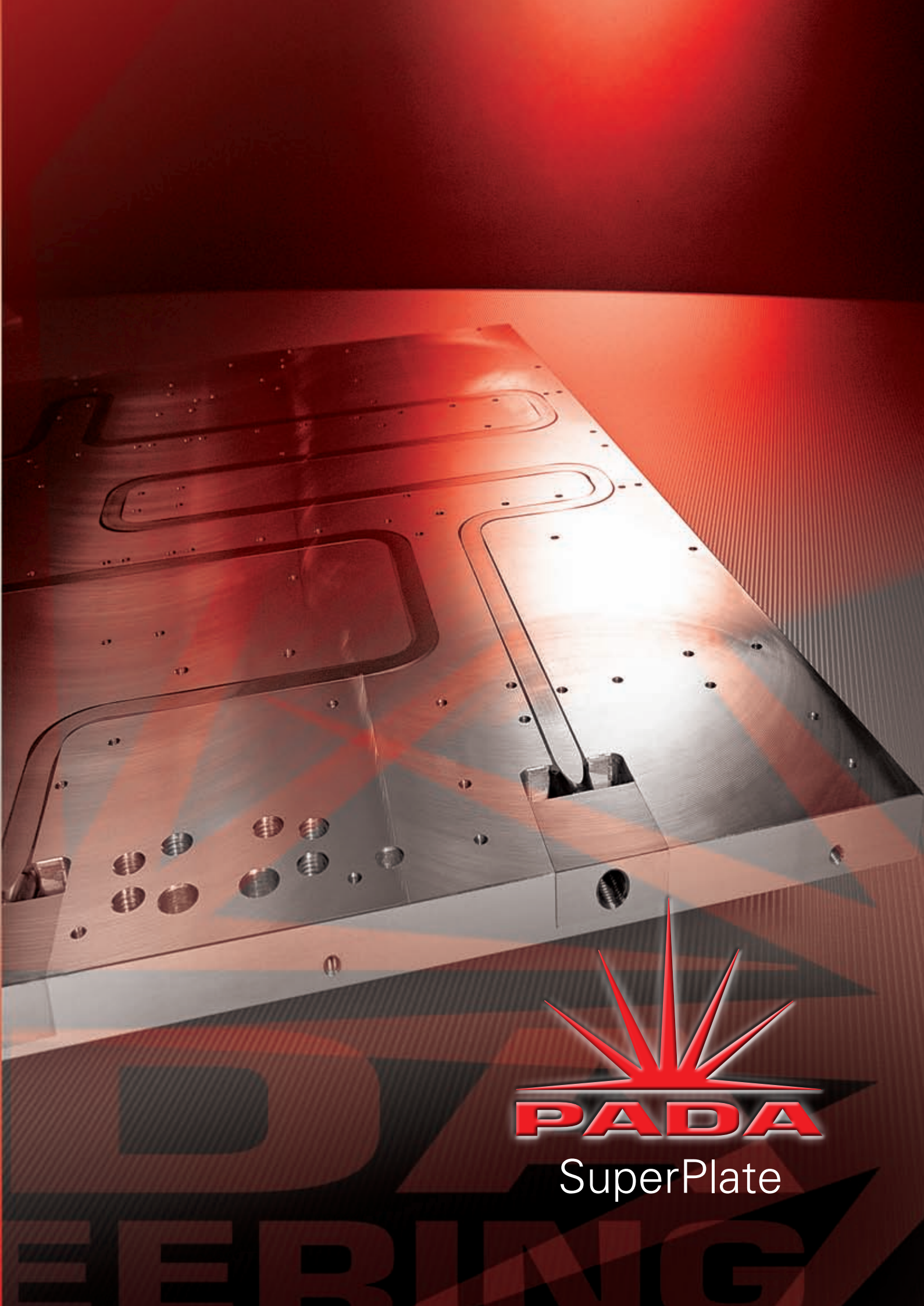


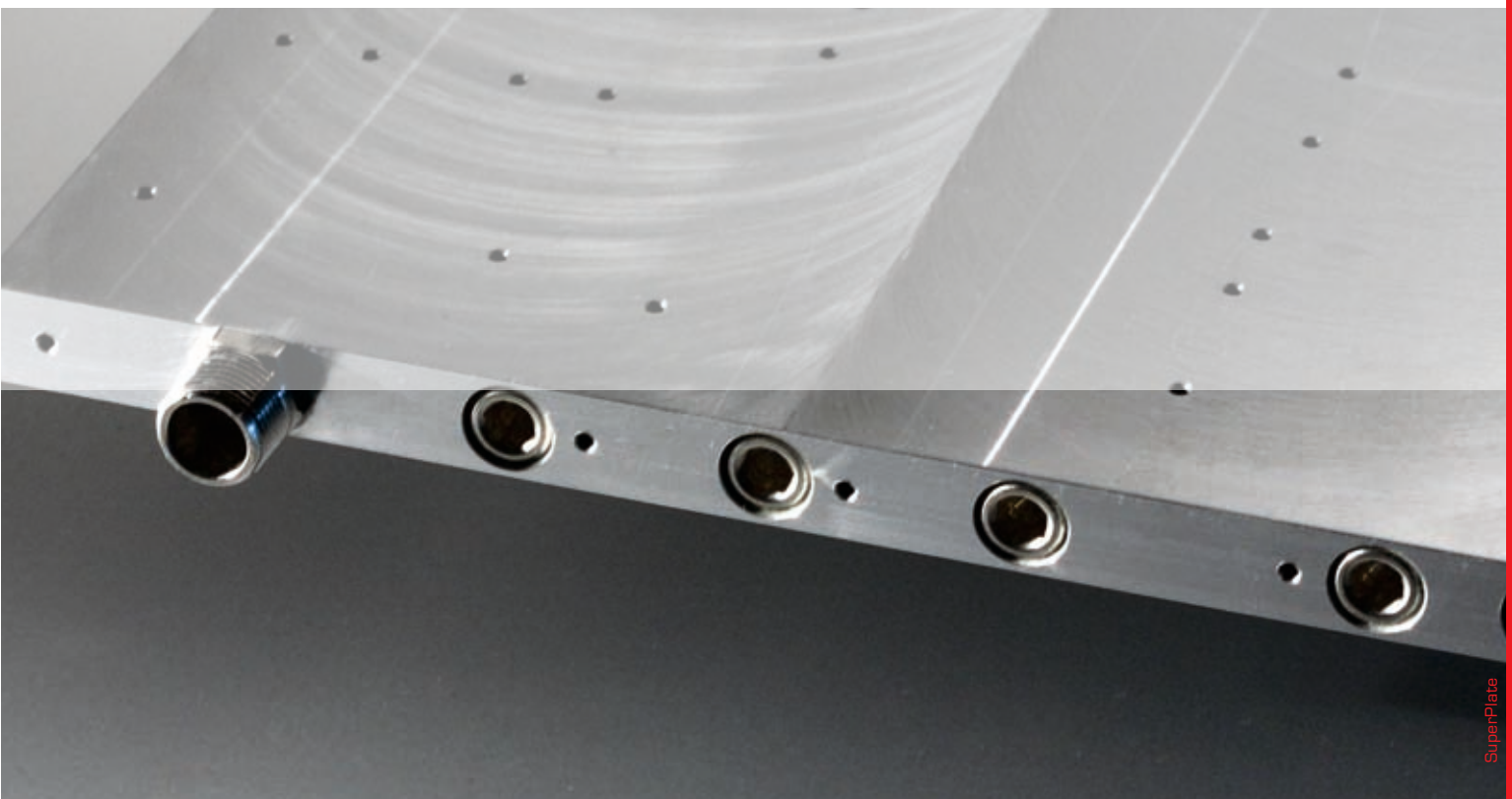
PADA

SuperPlate

SuperPlate: an efficient way to manage complex electronic systems having high concentrated power.

Water cooling is becoming more and more the solution to dissipate the high power of last generation power (IGBTs) modules: Pada is on your side with more than 10 years experience.

SuperPlate can be manufactured with copper tubes, stainless steel tubes or drilled through holes: contact us to find together the solution "tailored" to your needs.



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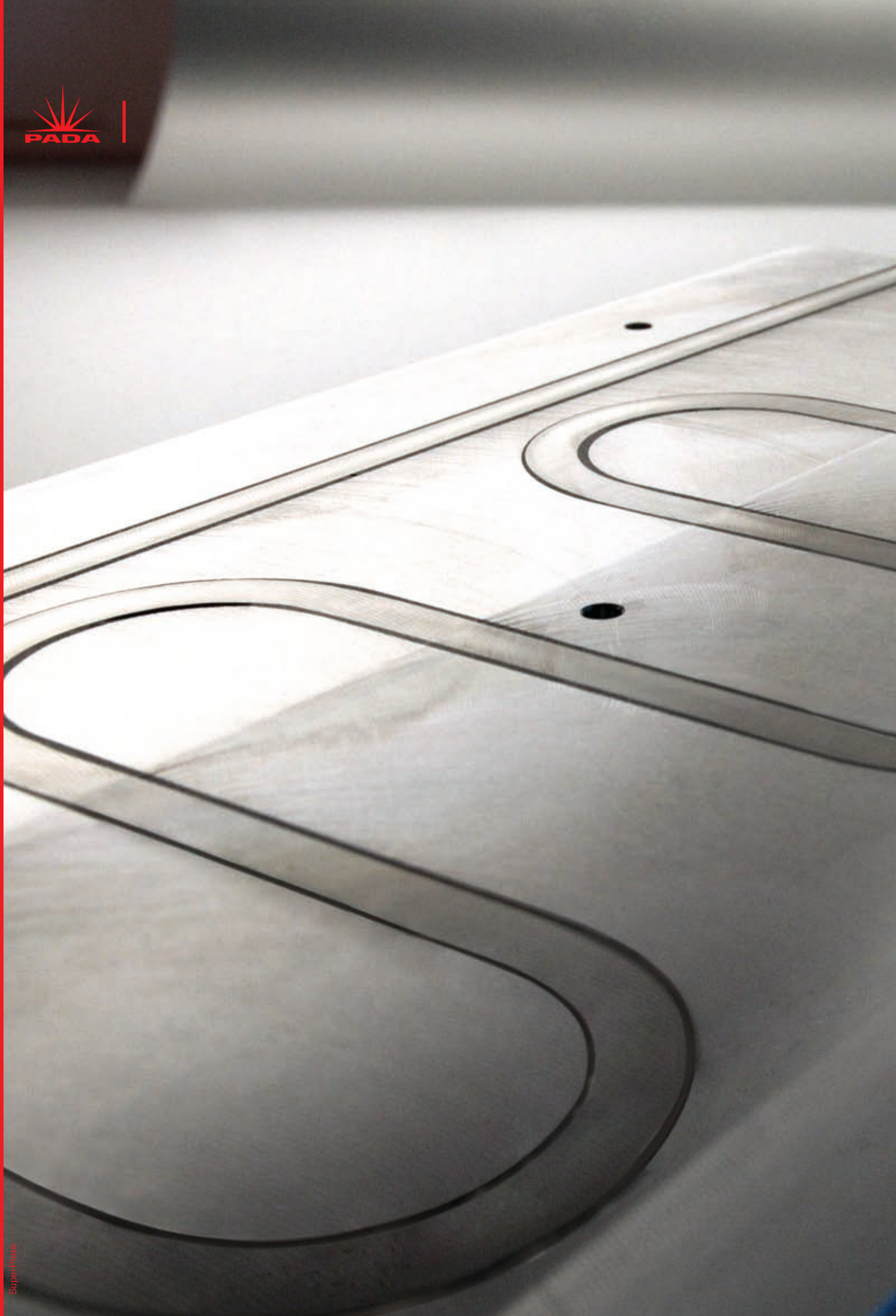


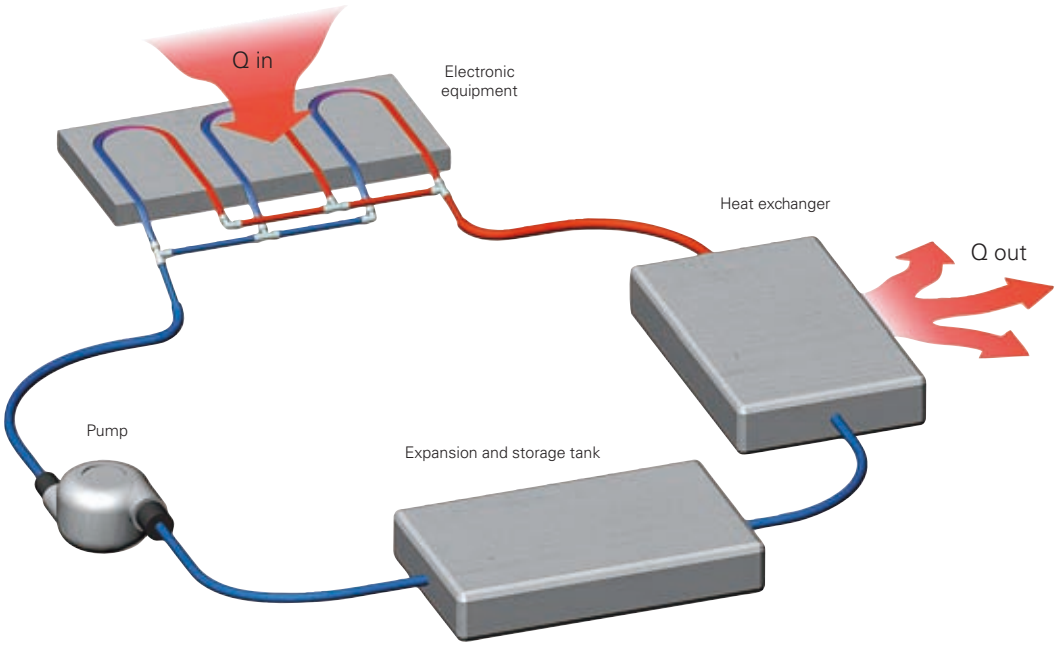
SuperPlate

Our forced water cooling system SuperPlate allows to manage complex electronic systems having concentrated power in an efficient and cost - effective way.

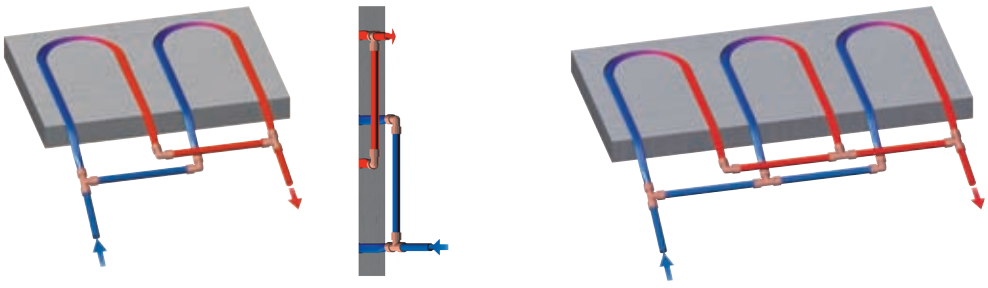
Among the advantages of our SuperPlate the most remarkable one is the possibility of separating the area where power is generated, which is generally narrow, from the dissipation area.
Furthermore, this system allows to avoid noise and problems due to vibration.

SuperPlate can be easily assembled in a typical cooling system consisting of the following: one pump, one expansion tank, one heat exchanger and, of course, SuperPlate.

Forced liquid cooler system



Usage diagram



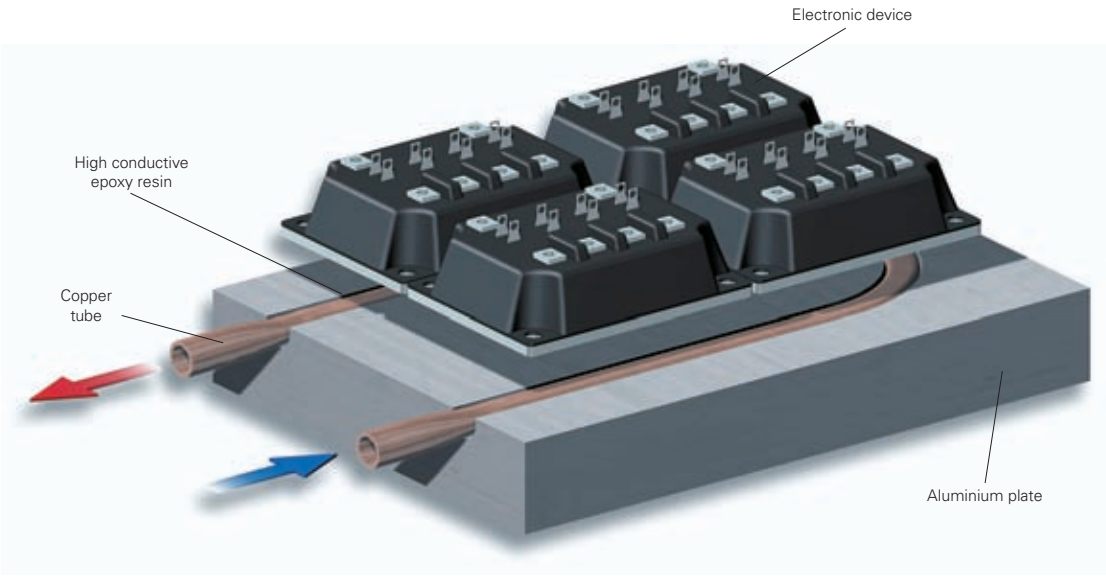
Our water cooled plates can dissipate high power on surfaces of limited area.

The plate can be used mounting the components on both sides of the plate itself.
The thermal performances of the heat sinks will be used at their best if the components are mounted on the tube side of the plate.

SuperPlate can be divided into three groups:
- Plates with tubes tecnology
- Plates with through holes technology
- Plates with milled channels technology

The plates with tubes technology can be realized using tubes made of:
- Copper
- Stainless Steel

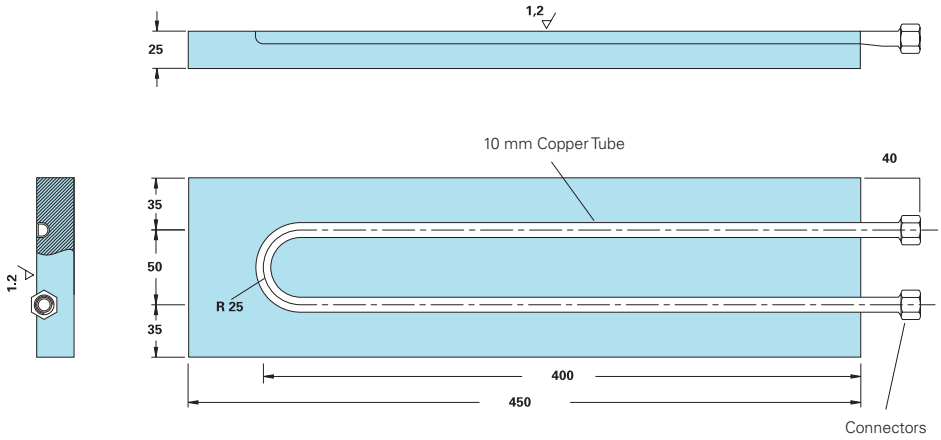
On the other hand, through holes can be:
- Drilled by means of special CNC machines
- Extruded.



Tubes Technology

Herebelow some simple plate layouts and thermal results.

Two pipes SuperPlate 450x120x25 mm

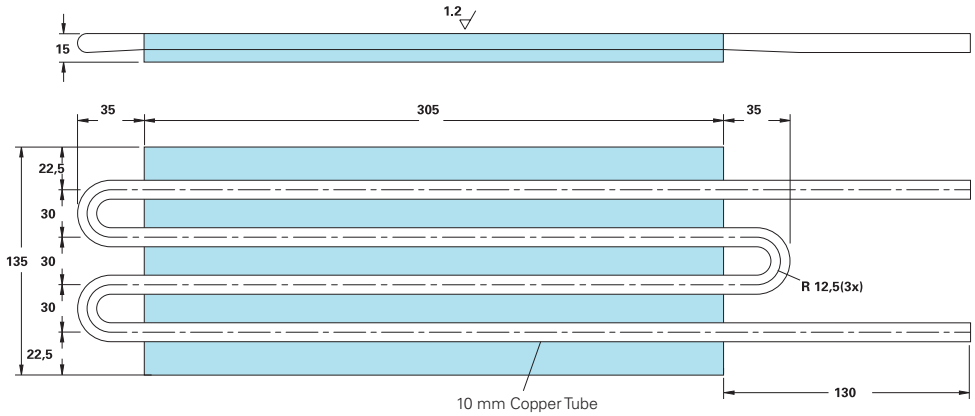


Thermal results

Power modules mounted on		1 side	2 sides
Waterflow	Q	8 L/min	8 L/min
Power dissipation	Pd	2000 W	2000 W
Tin water	Ti	16°C	16°C
Tout water	Tu	19,6°C	19,6°C
Tsurface max	Ts	35,6°C	35,2°C
Thermal resistance	Rth	0,0098	0,0096

Plate thickness: 25 mm

Four pipes SuperPlate 305x135x15 mm



Thermal results

Power modules mounted on		1 side	2 sides
Waterflow	Q	8 L/min	8 L/min
Power dissipation	Pd	2500 W	2500 W
Tin water	Ti	16°C	16°C
Tout water	Tu	20,5°C	20,5°C
Tsurface max	Ts	34,5°C	34,5°C
Thermal resistance	Rth	0,0074	0,0066

Plate thickness: 15 mm

Copper/Stainless Steel tube technology consists of:

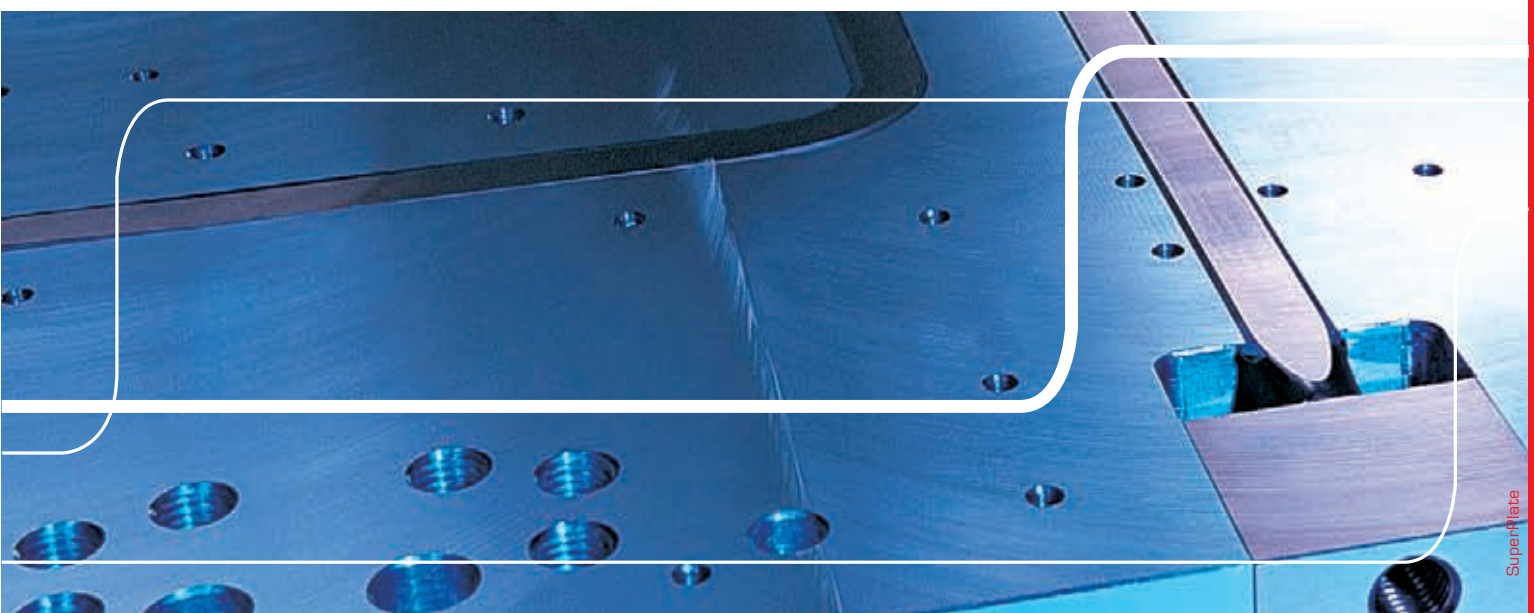
- One plate, usually of aluminium.
- One canalization system, with copper or stainless steel pipes, suitably bent and equipped with connectors.

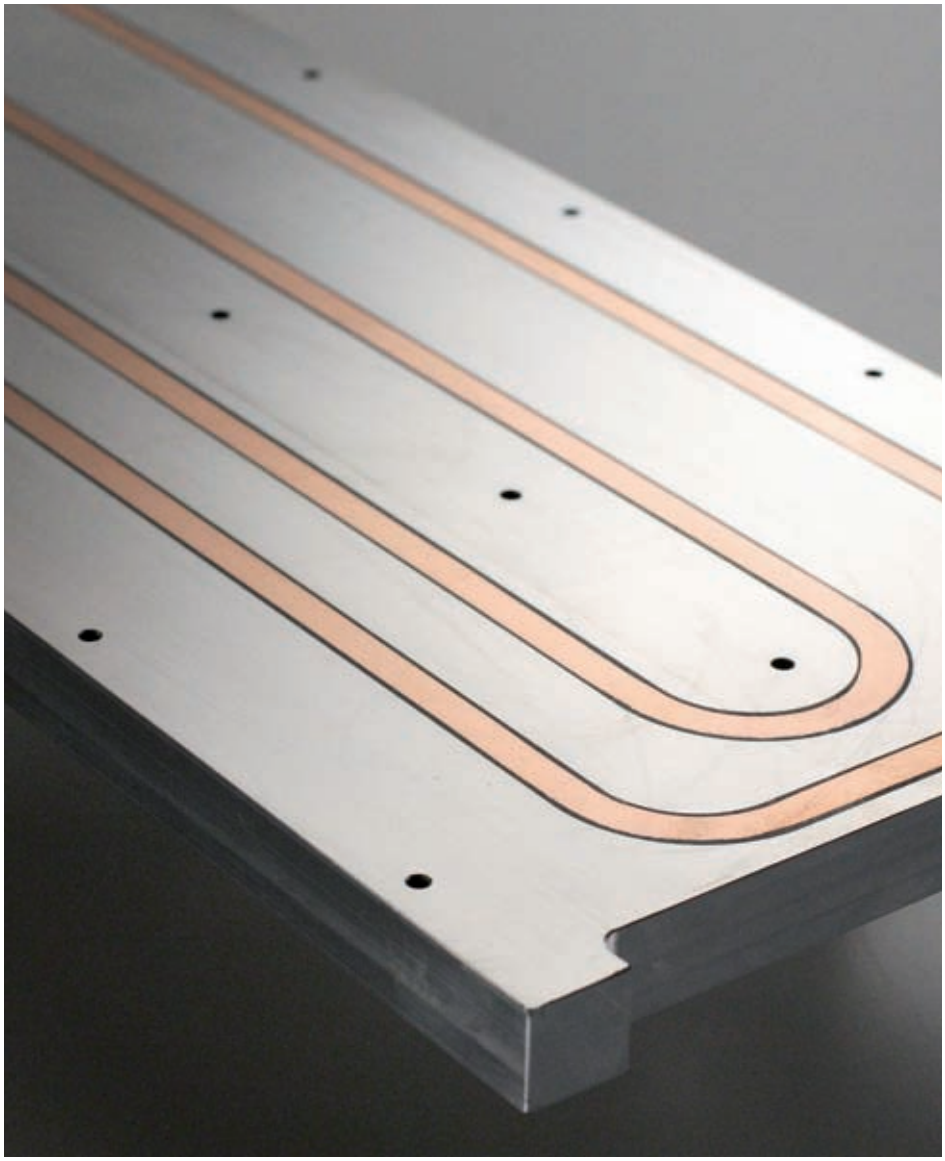
The realization process of a water cooled plate consists of the following steps:

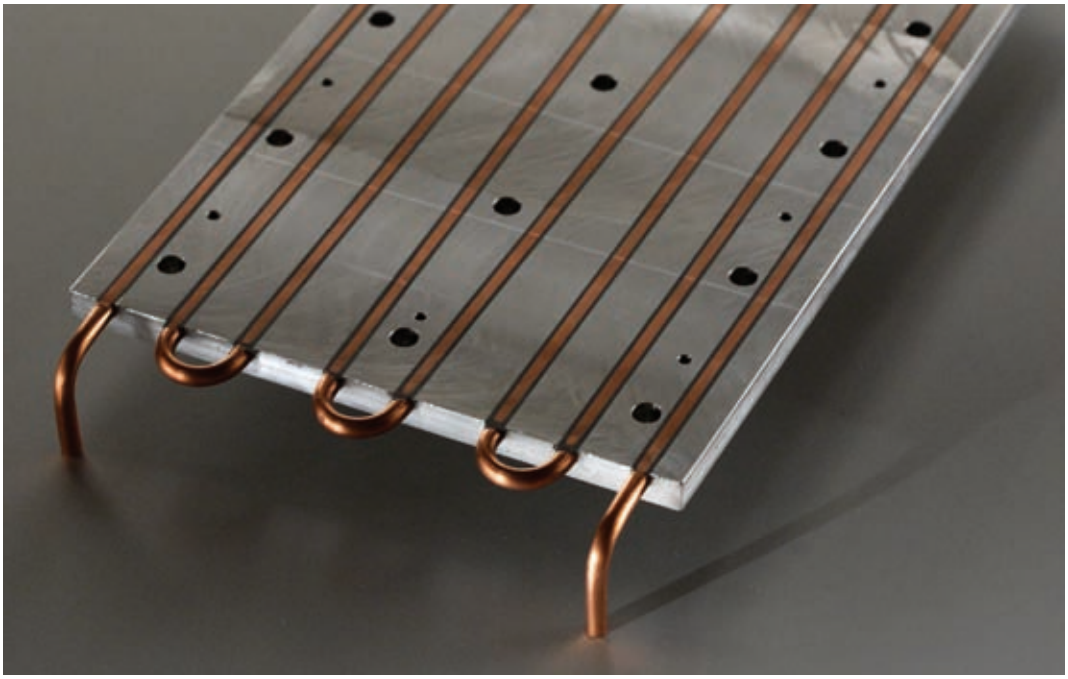
- Milling of the groove on the Aluminium Plate;
- Copper/Stainless Steel Tube bending;
- Tube insertion (pressing) in the special groove of the plate;
- Special resin application to eliminate possible thermal/mechanical discontinuities;
- Resin hardening;
- Final Plate surface milling (of both aluminium and tube).

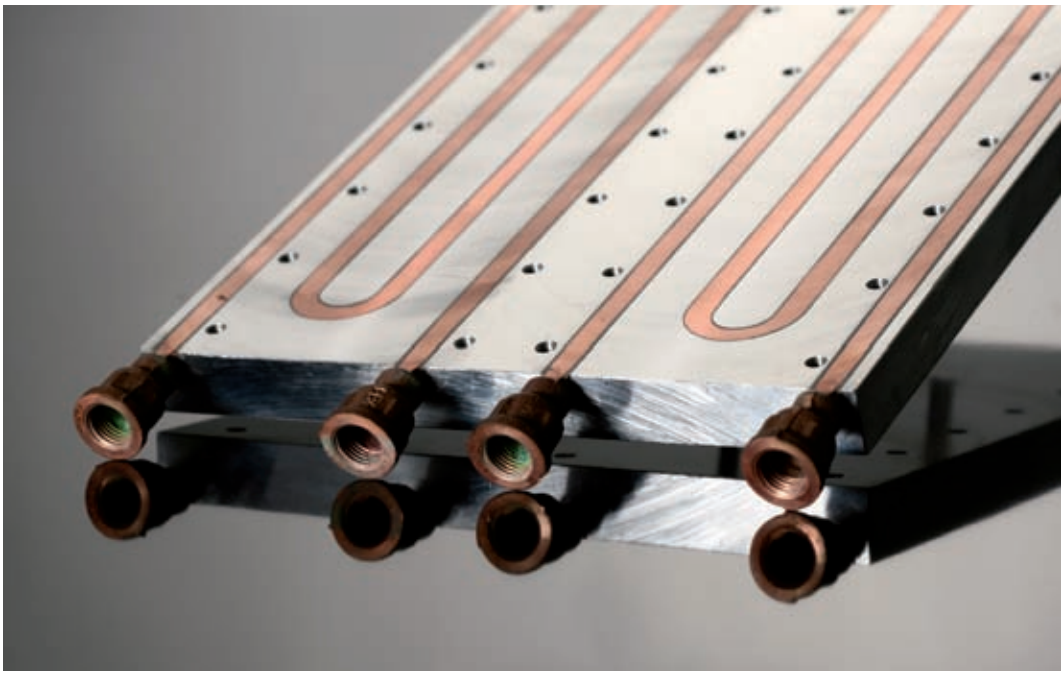
SuperPlate is normally used with water (glycol addition if necessary) as cooling fluid.
The system is normally tested at a pressure of 10 bar.
All the bearing surfaces of the components, side with holes, are suitably milled to obtain ideal flatness (0.01/150 mm) and roughness values (Ra = 1.2 µm).
SuperPlate, available in several dimensions and configurations, according to Customers' specific design, can be also manufactured with special terminals on the pipes and welded assembling flanges.
The stainless steel tubes technology, developed together with some of our major customers, is well suitable for food industry applications or where the cooling water flows on an open circuit. This application, even if steel is less conductive than copper, guarantees best resistance against corrosion.

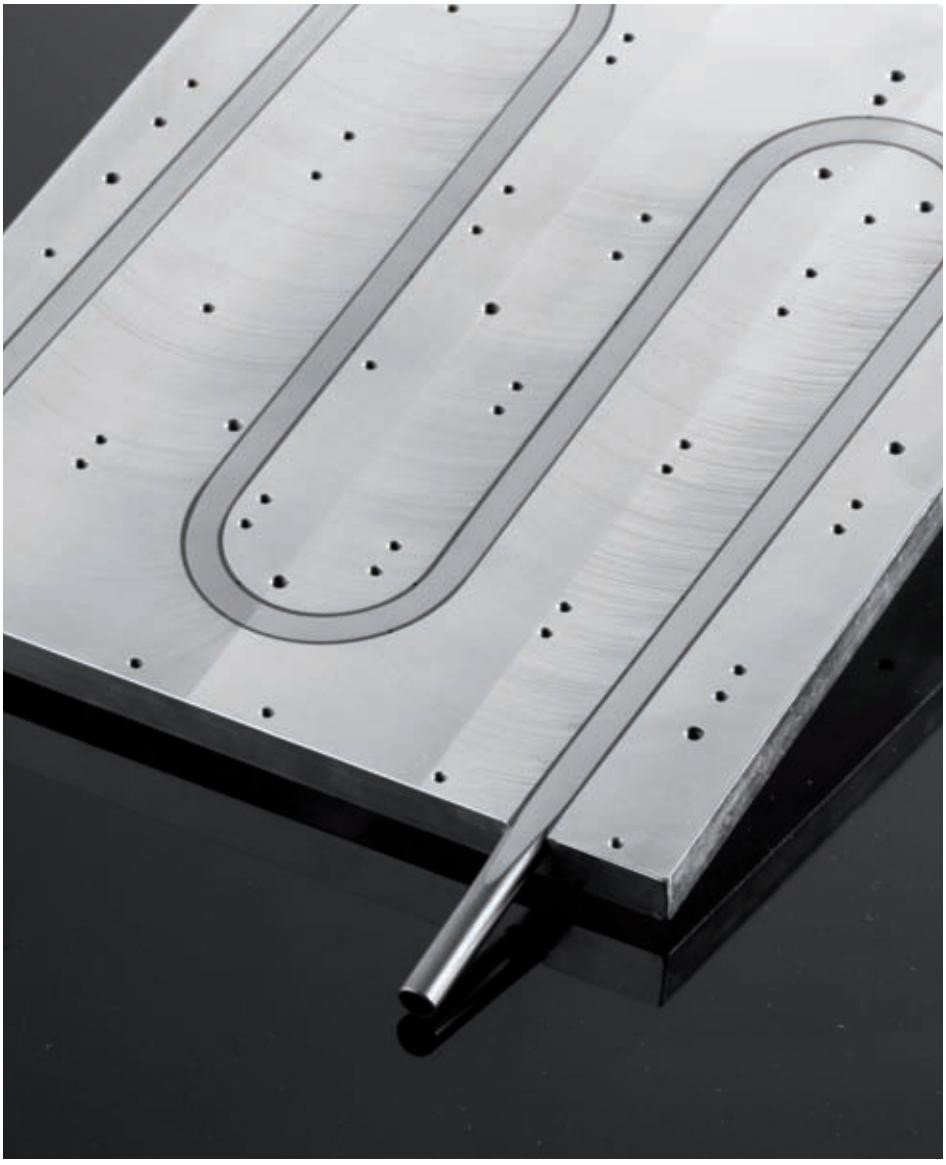
Pipes are made of copper/stainless steel, with outside diameter of 10 mm and thickness of 1 mm.
Plates used for assembling are made of aluminium, their thickness is between 12 mm and 30 mm.
We are able to develop customized solutions upon Customer's specific request.
GAS connectors can be brazewelded at the 10 mm pipes ends.

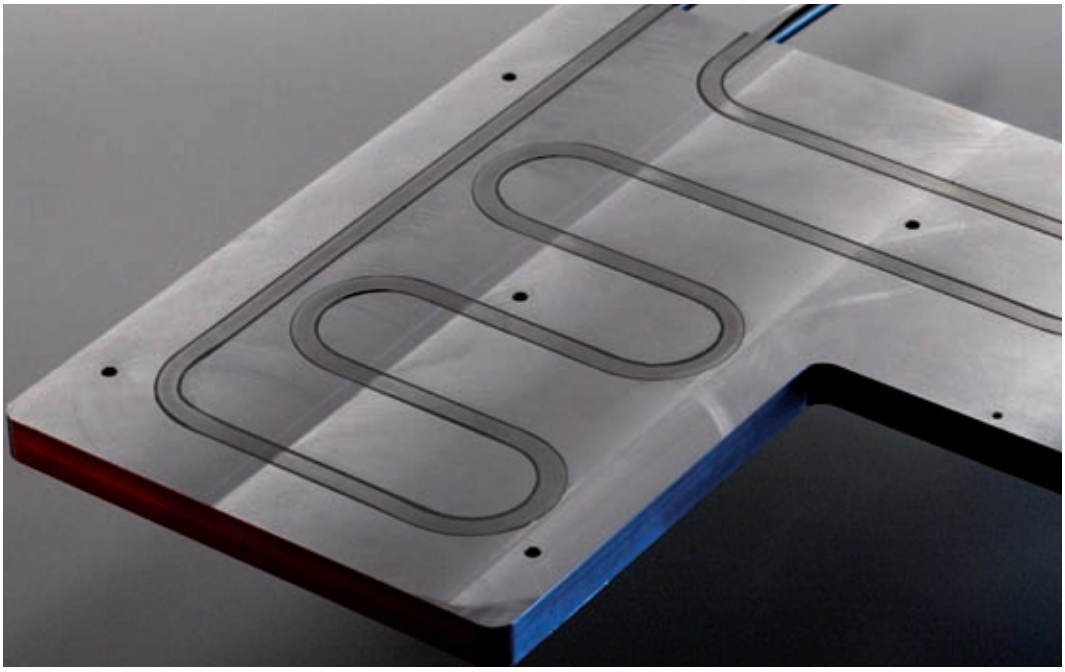


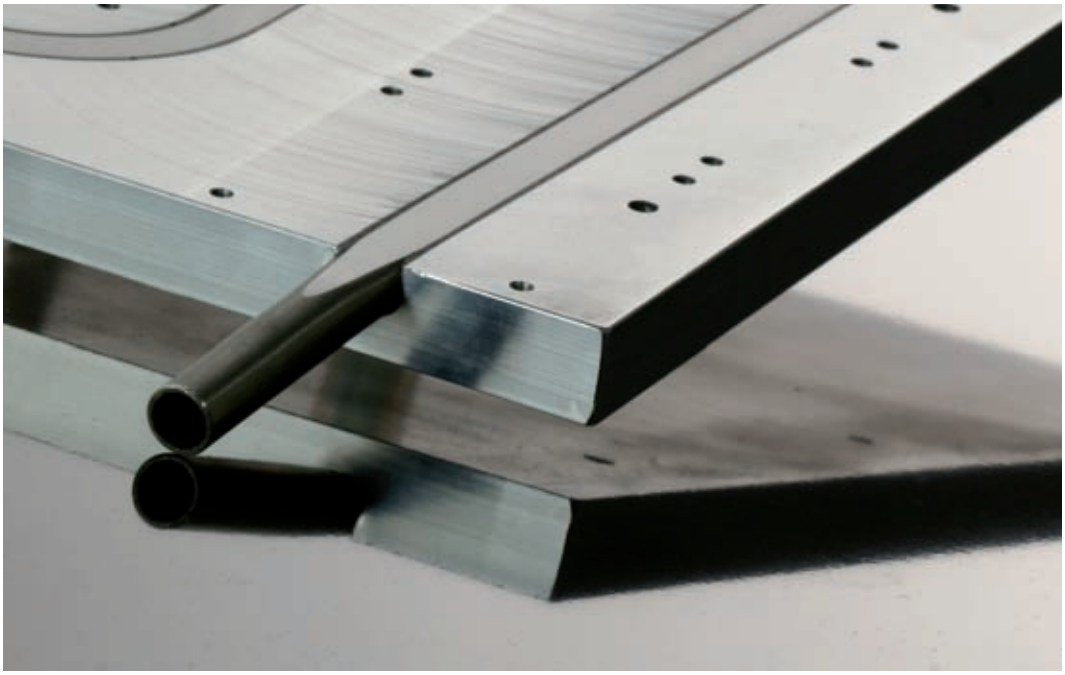








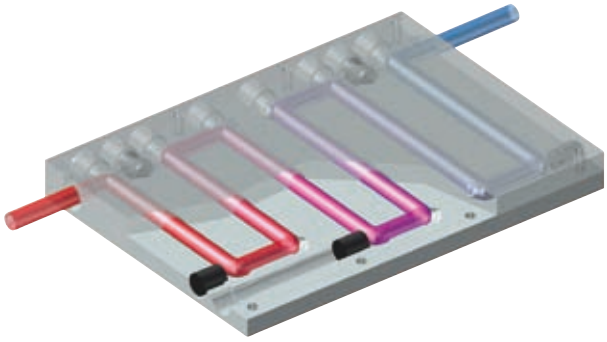




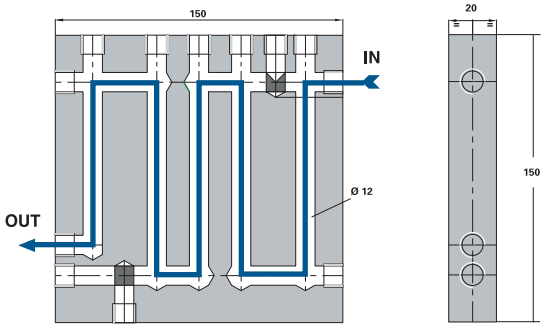
Through Holes Technology

Besides the technology already described with copper or steel tubes, we develop SuperPlate where the cooling medium flows through deep holes. The heatsink is entirely made of aluminium and the cooling water flows through a circuit consisting in holes drilled in the plate.

If this technology can be adopted, we would suggest to put a mechanical filtration unit to protect the moving parts from damages caused by possible residual burrs due to the drilling process. Through holes technology has to be used if components under voltage are mounted on the plate. Using this technology both water cooled plate sides will have equivalent thermal features.



Through Holes SuperPlate 150x150x20 mm

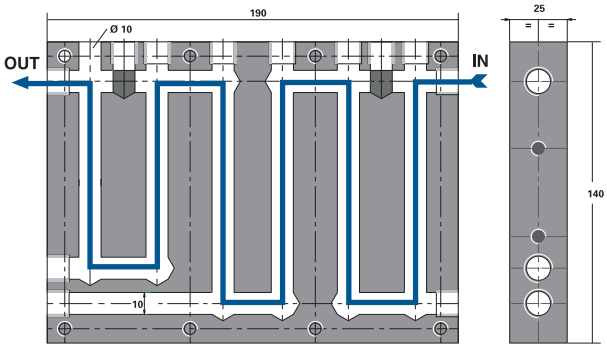


Thermal results

Power modules mounted on		1 side	2 sides
Waterflow	Q	10 L/min	10 L/min
Power dissipation	Pd	2500 W	2500 W
Tin water	Ti	16°C	16°C
Tout water	Tu	19,2°C	19,6°C
Tsurface max	Ts	54°C	47°C
Thermal resistance	Rth	0,0150	0,0120

Plate thickness: 20 mm

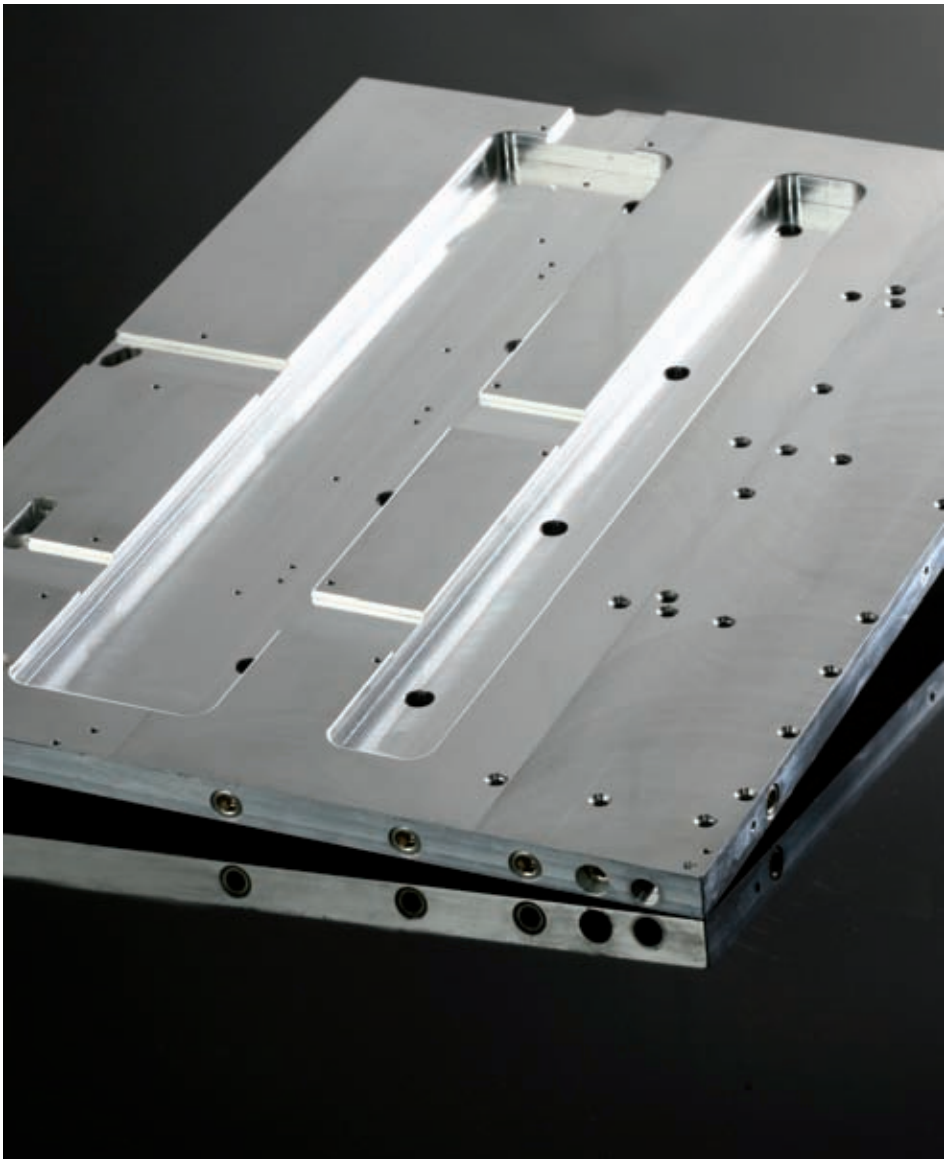
Through Holes SuperPlate 190x140x25 mm



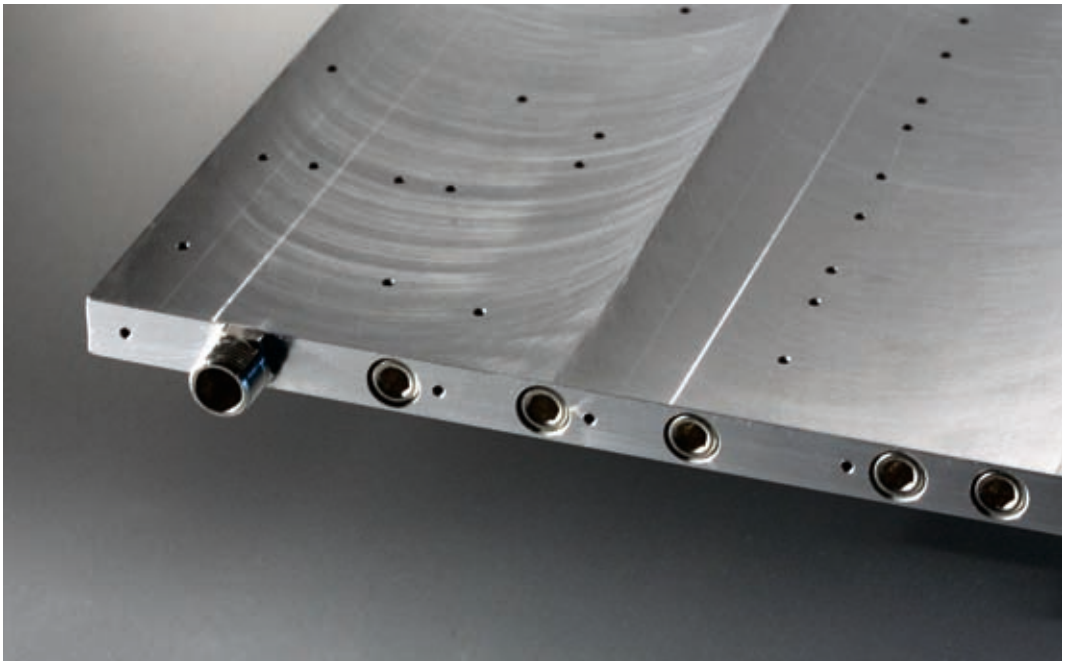
Thermal results

Power modules mounted on		1 side	2 sides
Waterflow	Q	10 L/min	10 L/min
Power dissipation	Pd	1800 W	1800 W
Tin water	Ti	16°C	16°C
Tout water	Tu	19,2°C	19,2°C
Tsurface max	Ts	36°C	33°C
Thermal resistance	Rth	0,0110	0,0094

Plate thickness: 25 mm



Through Holes Technology



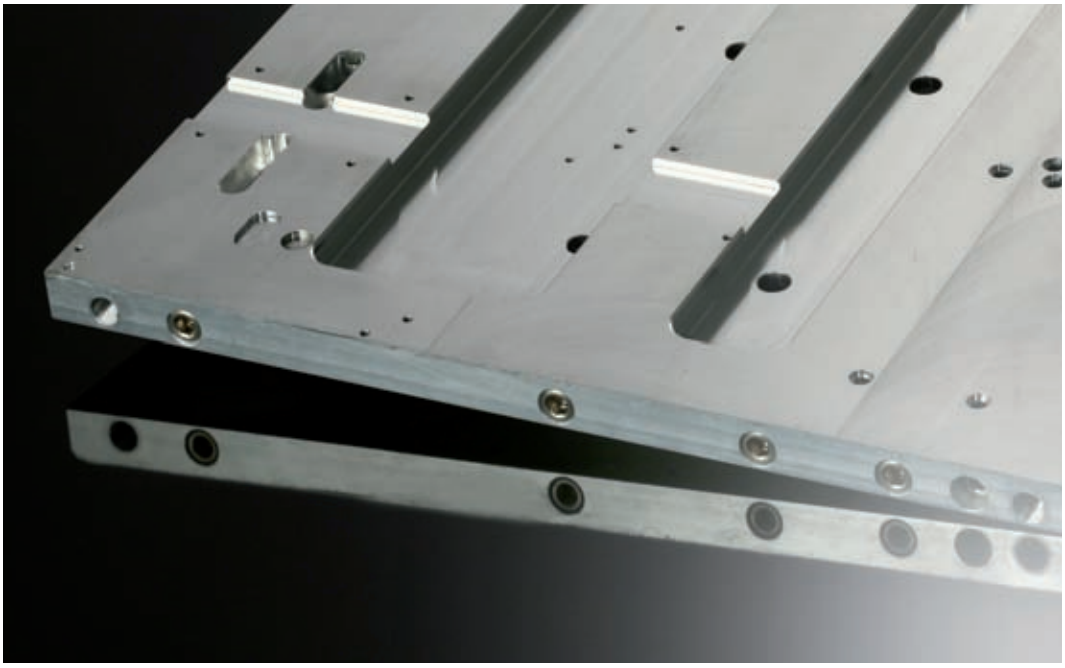
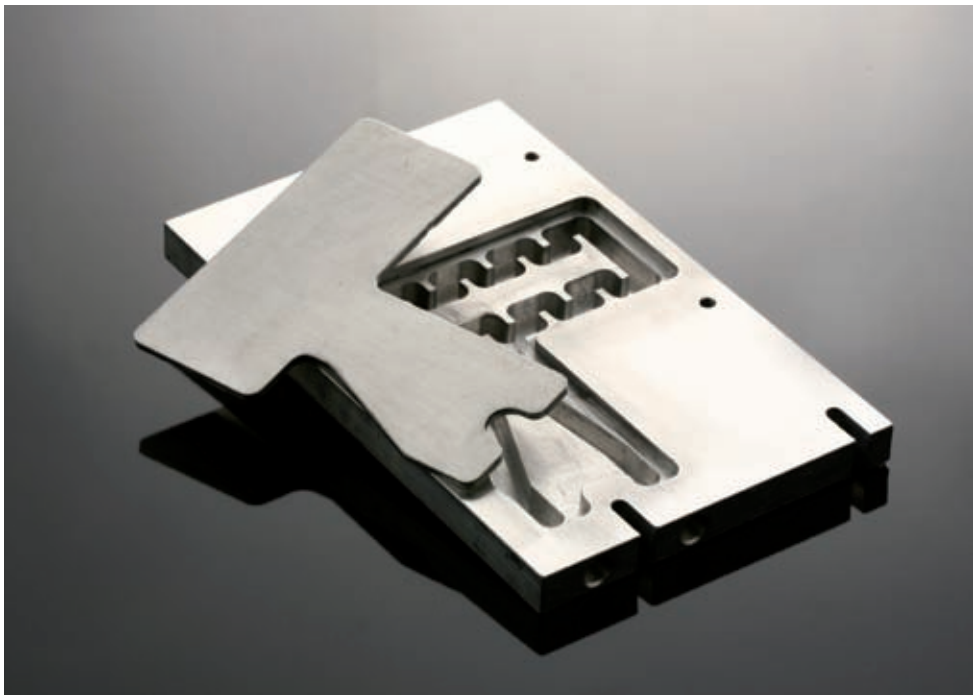


Plate with milled channels and welded cover.
New developed system to improve the temperature distribution on the plate under the power modules.
Channel layout to enhance the creation of a turbolent waterflow (better thermal conductivity).
Available in aluminium and copper.

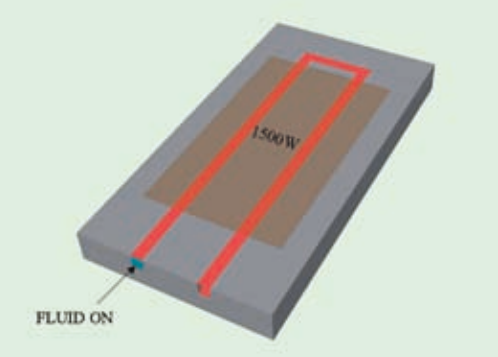


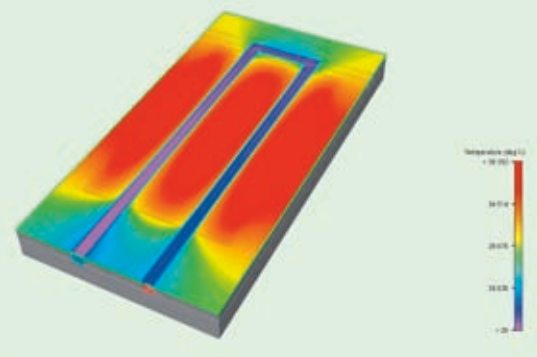
Thermal Analysis

Herebelow some SuperPlate thermal simulations carried out by Flotherm Software.

145x25/280mm with copper tubes (D=10mm).Cooling medium = 100% Water.

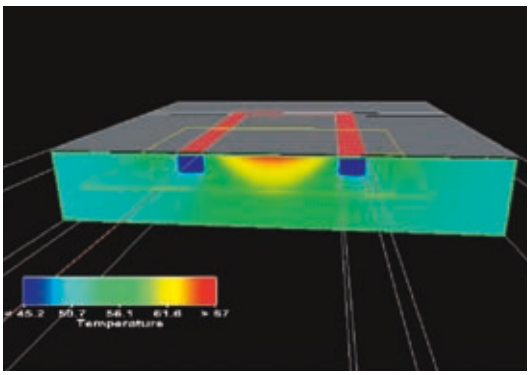
Total power loss Pd = 1500 W
T amb. = 30 °C
Water Flow: Q = 9 L/min
Tw = 20 °C
Maximum temperature on the cold plate: Ts = 40°C

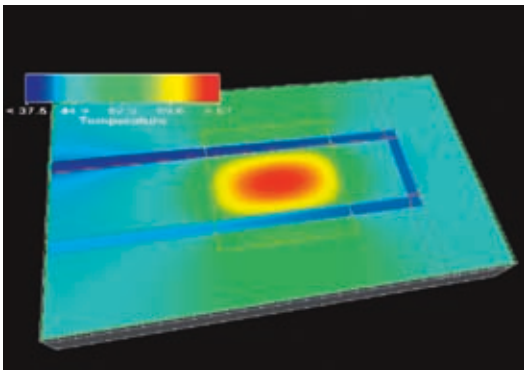




145x25/280mm with copper tubes (D=10mm). Cooling medium = 100% Water.

Total power loss Pd = 1000 W
T amb. = 35 °C
Water Flow: Q = 6 L/min
Tw = 40 °C
Maximum temperature on the cold plate: Ts = 66°C





Notes

pada superplate

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PADA

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