

**VÆSKE KØLEDE  
PROFILER**

# SERIE PR

BRAZED FINS HEAT SINK

**EMBEDDED TUBE**



**CAB BRAZED**



**GUN DRILLED**



**FRICTION STIR WELDING**



**FUSION**



# SERIE PR

BRAZED FINS HEAT SINK

## EMBEDDED TUBE

Using copper, stainless steel and aluminum tubes, pressed in base plates made from in-house manufactured aluminum alloys, we can design and produce an unlimited number of custom solutions for each individual project requirement. Our range also offers a series of plates with established dimensions usable for simpler applications already sized to include almost all the commercially available active components.



## GUN DRILLED

Liquid cooled plates with through holes, the internal channels being obtained directly by extrusion or by deep drilling of solid plates. The channel circuit, whether extruded or tailordesigned, is created by sealing the channels both externally and internally at specific points with the use of watertight plugs positioned to define the desired circulation of the liquid within the plate.



## CAB BRAZED

Using Controlled Atmosphere Brazing, we can achieve the most efficient heat dissipation for the more extreme projects and design. This product range uses different aluminum alloys and is designed and manufactured entirely within the engineering division of the company, customizing the fine detail of every single part produced with the use of the most sophisticated and up-to-date Computational Fluid Dynamics (CFD) design software.



## FRICION STIR WELDING

Using Controlled Atmosphere Brazing, we can achieve the most efficient heat dissipation for the more extreme projects and design. This product range uses different aluminum alloys and is designed and manufactured entirely within the engineering division of the company, customizing the fine detail of every single part produced with the use of the most sophisticated and up-to-date Computational Fluid Dynamics (CFD) design software.



## FUSION

The most recent product line introduced, currently in the process of evolution and development, Fusion combines production technologies unique to us. Continuous fusion of specific aluminum alloys, combining with copper, stainless steel, aluminum tube coils and empty channels inside molds are all characteristics of Fusion. Beyond the limits of available technology until recently, but now achieved.



# TECHNICAL INFORMATION

## MATERIAL AND MECHANICAL PROCESSING

The lightness (2.7 g/cm<sup>3</sup>), thermal conductivity (120-229 W/m·K) and high workability are the features that make aluminum the main material used for the construction of our LCPs.

Depending on the technology for the design of the liquid-cooled plate, the possible types of material usable for the base plate are:

- EN AW-1050A aluminium alloy
- EN AW-5083 aluminium alloy
- EN AW-6060 aluminium alloy
- EN AW-6082 aluminium alloy
- EN AW-6101B aluminium alloy
- EN AW-42100 aluminium alloy
- HCP CW021A copper alloy

In addition to the most common extruded solution, the raw material is available in hot rolled casting slabs. Maximum flexibility in size and the absence of additional costs for the construction of dedicated dies.

Unless otherwise specified in the drawing, the products are mechanically processed in compliance with general tolerances specified by ISO 2768-mK.

## HOW TO CHOOSE A LIQUID COOLED PLATE

Liquid-cooling is the most effective way to dissipate the heat generated by electronic components, offering performance not achievable with air-cooling and at the same time limiting the overall dimensions. As it is for an air cooled heat sink, the thermal performance of a LCP is measured using thermal resistance  $R_{TH}$  [K/W] which describes how much warmer the surface becomes ( $T_{MAX}$ ) in relation to the coolant temperature ( $T_{IN}$ ), which flows inside for a given thermal load represented by the power dissipated by the electronic devices to be cooled ( $P_D$ ).

$$R_{TH} = \frac{T_{MAX} - T_{IN}}{P_D}$$

It is therefore necessary to design and identify a LCP with a thermal resistance equal to or lower than the calculated one. The thermal performance of a LCP depends on the coolant flow that goes through it. To increase its performance, we offer the option to assemble special accessories - turbulators or offset fins layers - capable of increasing the fluid turbulence for greater efficiency in heat dissipation.

In the technology selection for the construction of a LCP, particular attention should be paid to the type and quality of the coolant used to prevent corrosion. If the aggressiveness of the coolant increases, it is necessary to switch from aluminum channels to copper or stainless steel ones.

Equally important for the design of a liquid-cooled plate is the identification of the maximum allowable pressure drop value, identified by the liquid cooling system at the outlet of the LCP. If the value of the liquid flow that goes through the LCP increases, the thermal resistance value decreases, while the pressure drop value increases.

## THERMAL RESISTANCE AND PRESSURE DROP MEASUREMENT CONDITIONS

The catalog shows the graphs of the thermal resistance and pressure drop values while the coolant flow is varying. Graphs referring to some of the many possible configurations of the different manufacturing technologies. Each LCP is designed and manufactured according to the design specifications to obtain

an optimized product right from the prototyping stage. Our Technical and Design Department makes use of modern computing systems such as CFD (Computational Fluid Dynamics) - SolidWorks Flow Simulation - which for different cooling channel configurations allow to check the reliability of the design specifications in terms of thermal resistance and pressure drop.

The values shown in the graphs come from thermal simulations and laboratory tests according to the assembly layout shown in the drawing and considering the maximum point value of temperature reached on the surface of the LCP. The coolant used is water with no additive at an inlet temperature of 40°C and at a pressure of 202,650 Pa.

In Embedded Tube technology, the tube coils of the tested LCPs are made of copper, with a diameter of 10mm and wall thickness of 1.5 mm. For different tube materials and sizes please refer to the "Tube Material Correction Factor" and "Tube Dimension Correction Factor" graphs to determine the multiplication factor to apply to the thermal resistance and pressure drop values shown.

The design flexibility of the liquid-cooled technologies offers various possibilities for the positioning of the coolant inlet and outlet terminals. In addition there are various types of connectors that can be assembled.

### Standard connectors:

- Welded brass fittings with male/female GAS threaded or hose adapter
- Stainless steel or brass push-on connectors with ogiva

### Customized connectors:

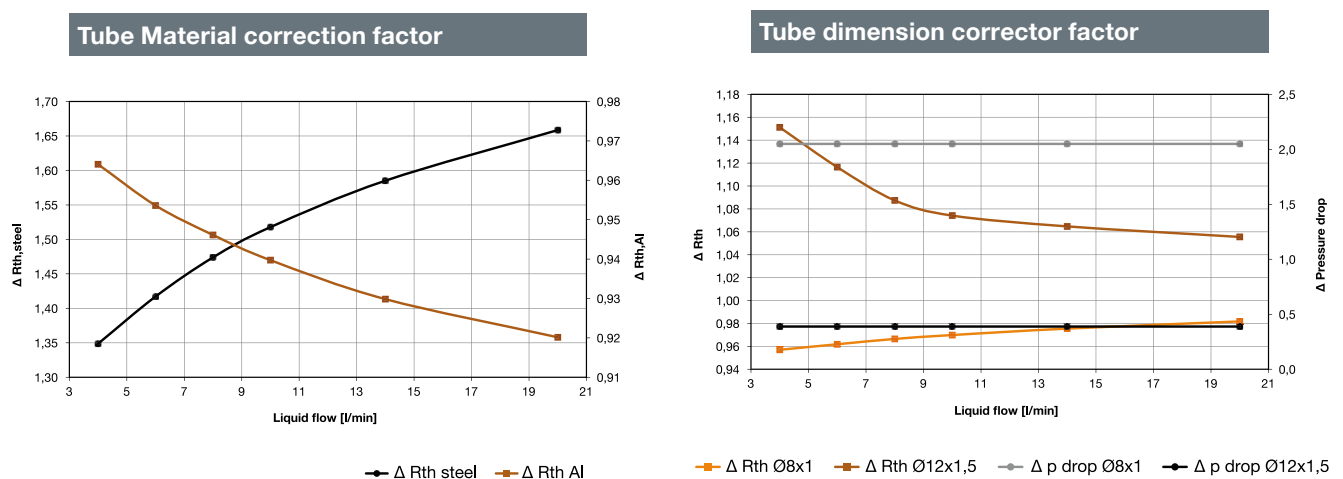
- Welded copper/brass turning fittings
- Copper connector blocks welded to the ends of the tube coil and mechanically assembled to the base plate
- Brazed or mechanically assembled aluminum fittings or blocks

### Surface treatments:

Anodizing, passivation and nickel plating, applicable depending on the construction technology used. They have a negligible effect on the thermal performance of a LCP but are mainly used to improve the surface corrosion resistance.

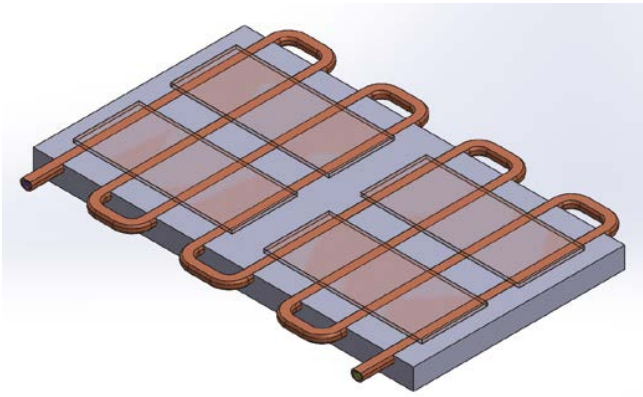
Every single LCP produced is subjected to leakage tests and it is traceable by an univocal progressive numbering. The pressure drop test instead is performed on specific request and in the prototyping stage.

The technical data shown in the catalog, originating from laboratory tests and thermal simulations are reliable. However, because real conditions of use may be different from those in the laboratory, it is advisable to check them through an empirical test in LCP real use conditions.



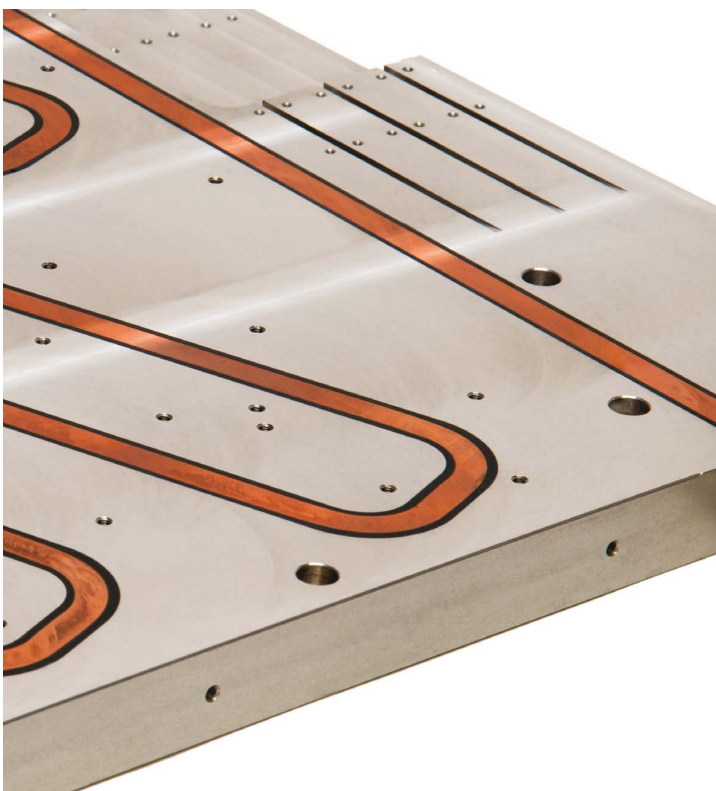
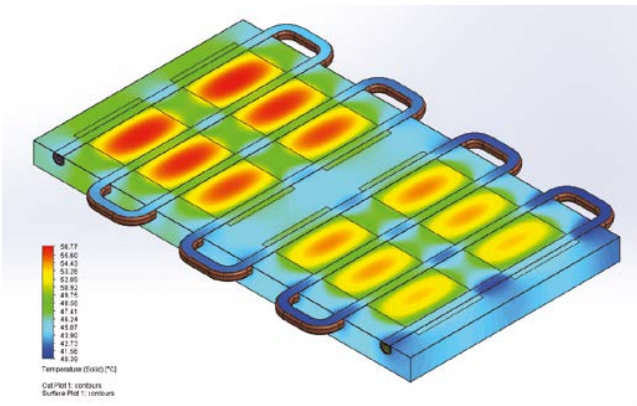
# SERIE LCP-ET

EMBEDDED TUBE



## General specifications - Base plate

Width (W)	max 600 mm
Length (L)	max 1200 mm
Thickness (H)	max 100 mm
Material	EN AW-1050A - EN AW-5083 - EN AW-6060 EN AW-6082 - EN AW-6101B



# SERIE LCP-ET

EMBEDDED TUBE

Newtronic can design embedded tube LCPs to be fully customized for the individual needs of each specific design, regardless of the application for which the plate is designed.

Aluminum alloys produced in our factory with different thermal and mechanical characteristics can be combined with extruded or electrowelded copper, stainless steel, and aluminum tube coils of all diameters and thicknesses, and fitted with connectors of all types both outside and inside the plate perimeter. We form the tube coils with a specific shape that maximizes both the tube adhesion and the size of the contact area between the heat sources and the tube itself. The tubes are mechanically assembled to the base plate using specific tools for each geometry, and high pressure hydraulic presses. The exclusive section shape, pressed in the base plates without glues or resins, maximizes adhesion and minimizes any thermal impedance between the tube coil and the plate, both on the straight and curved parts of the design.

Different geometries in the construction of the base plate and the tube coil allow us to localize and concentrate the best dissipation performance in areas of the plate where the most critical interfaces are positioned, leading to optimised Thermal Conductivity, minimized mechanical and electrochemical resistance, and reduced overall cost: for every design need there is a custom solution, always effective and efficient.

## General specifications - Tube

Material	Dimensions [mm] * (diameter and wall thickness)	Bending Radius [mm] *
Aluminium & Copper	6x1	10 - 15 - 20 - 12.8
	8x1	12,5 - 20 - 22
	9.52x1	18 - 19
	10x1 - 10x1.5	13 - 14 - 15 - 20 - 22.5 - 25 - 30 - 45
	12x1 - 12x1.5	18 - 31
	12.7x1	14
	14x1	25 - 45
	15x1	24 - 30 - 45
	16x1	32 - 40
	18x1	45
Stainless Steel	8x0.5 - 8x1	12
	10x0.5 - 10x1	15
	12x1	18
	15x1	22.5

\* Other options upon request

# SERIE LCP-ET

EMBEDDED TUBE

The presented LCP are just a few of the possible configurations.

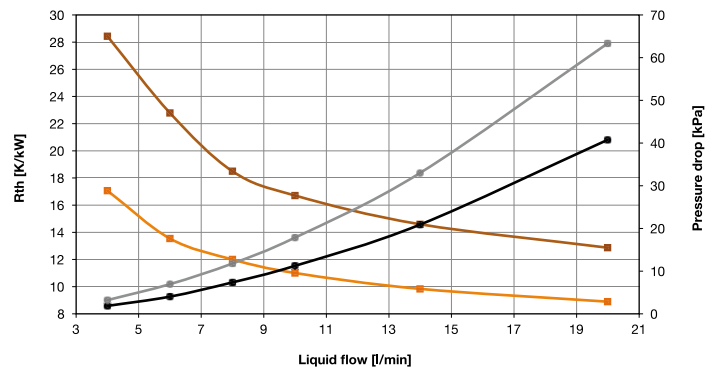
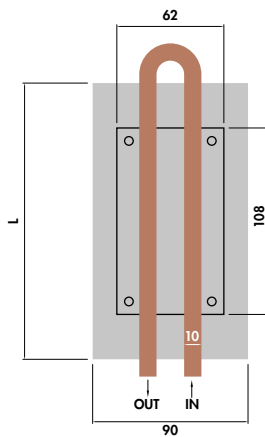
## LCP 90x20 - ET 2 Pass

Base Plate: Al EN AW-6082, 20mm thick

Tube: Cu 10 x 1.5mm

Liquid: H2O, Tin 40°C

Pd: 1 kW @ L=160mm, 1.5 kW @ L=300mm



— Rth L=160mm — Rth L=300mm — ΔP L=160mm — ΔP L=300mm

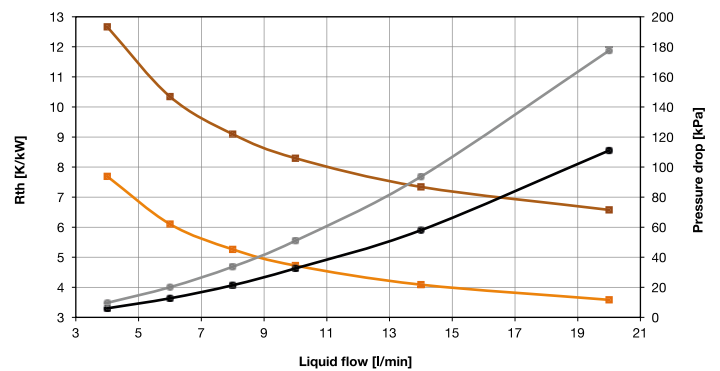
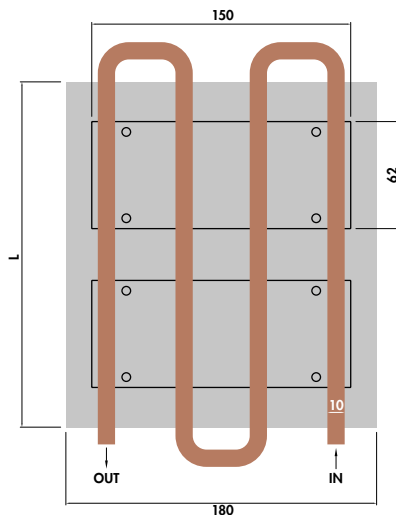
## LCP 180x20 - ET 4 Pass

Base Plate: Al EN AW-6082, 20mm thick

Tube: Cu 10 x 1.5mm

Liquid: H2O, Tin 40°C

Pd: 2 kW @ L=200mm, 4 kW @ L=400mm



— Rth L=200mm — Rth L=400mm — ΔP L=200mm — ΔP L=400mm



# SERIE LCP-ET

EMBEDDED TUBE

The presented LCP are just a few of the possible configurations.

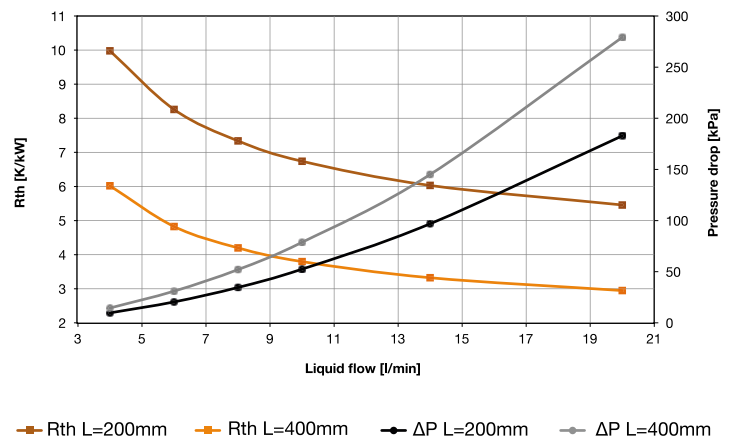
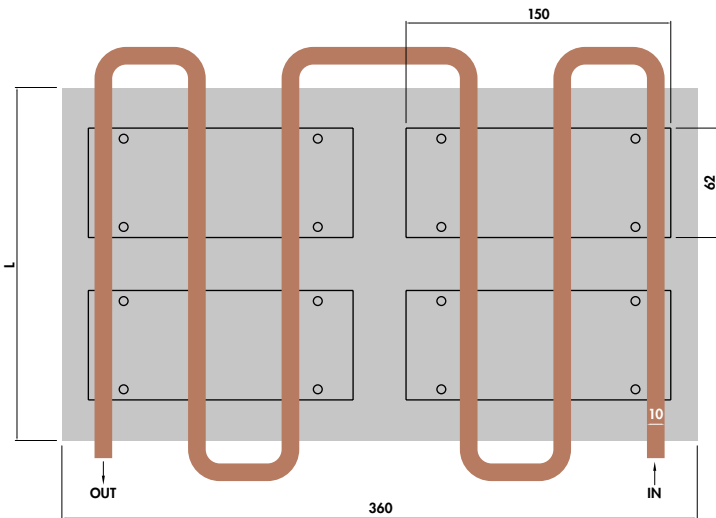
## LCP 360x20 - ET 6 Pass

Base Plate: Al EN AW-6082, 20mm thick

Tube: Cu 10 x 1.5mm

Liquid: H<sub>2</sub>O, Tin 40°C

Pd: 4 kW @ L=200mm, 8 kW @ L=400mm



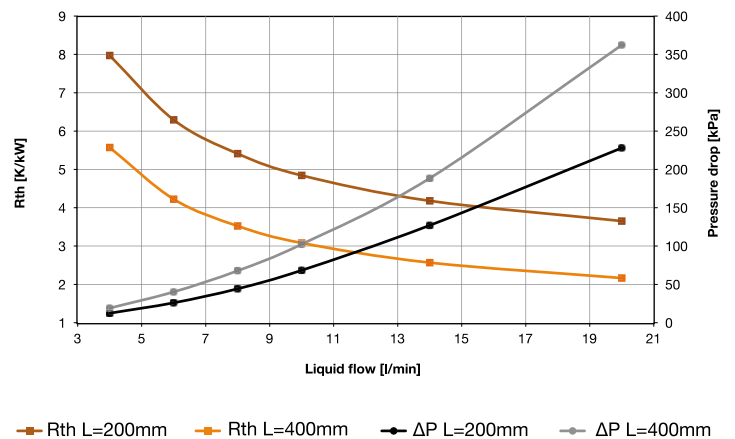
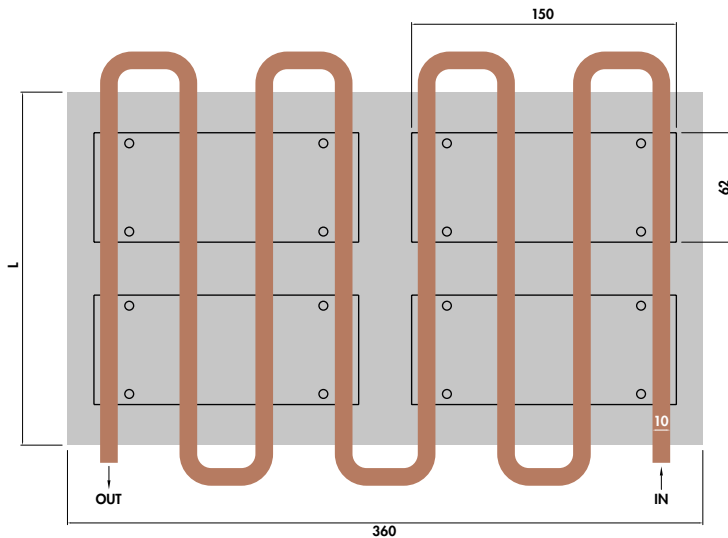
## LCP 360x20 - ET 8 Pass

Base Plate: Al EN AW-6082, 20mm thick

Tube: Cu 10 x 1.5mm

Liquid: H<sub>2</sub>O, Tin 40°C

Pd: 4 kW @ L=200mm, 8 kW @ L=400mm



# SERIE LCP-GD

GUN DRILLED

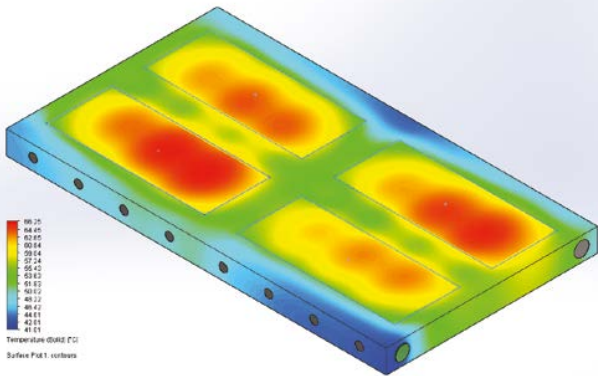
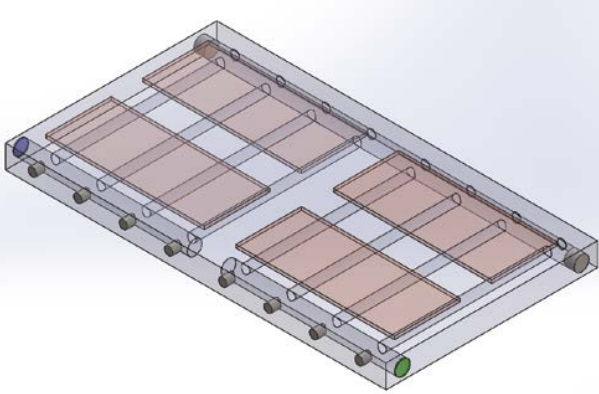
Gun-drilled or through-hole technology is most suited to applications with no excessive cooling requirements, and where ease of manufacture and cost effectiveness are important. There are no constraints on the type of alloy which may be used, and no limit to the depth or diameter of the holes. This technology allows us the design freedom and unlimited customization possibilities to produce LCPs, air-liquid hybrid heat sinks, and fittings of any shape and characteristic.

There is no dimensional constraint on the 3 axes of the design volume and a variable drilling length is achievable depending on the diameter used. We use external and intermediate sealing plugs within the channels to create the desired internal flow routes, with inlet and outlet connectors for both internal and external fitting to the plate.



# SERIE LCP-GD

GUN DRILLED



## General specifications

Width (W) max 700 mm

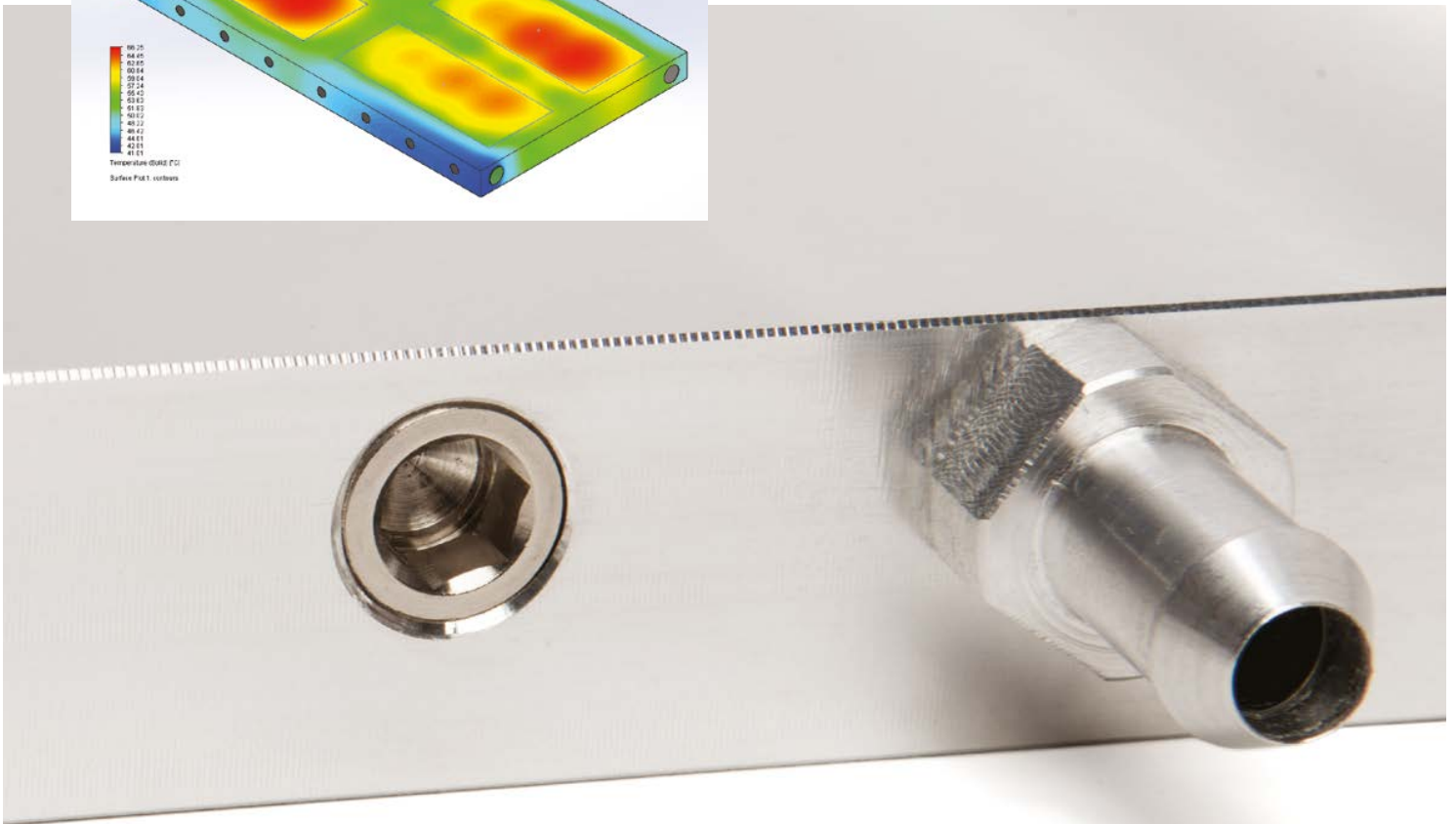
Length (L) max 2500 mm

Thickness (H) max 100 mm

Material EN AW-1050A - EN AW-5083 - EN AW-6060  
EN AW-6082 - EN AW-6101B

Gun Drilled Hole diameter 6 ÷ 40 mm

Gun Drilled Hole depth max 4000 mm



# SERIE LCP-GD

GUN DRILLED

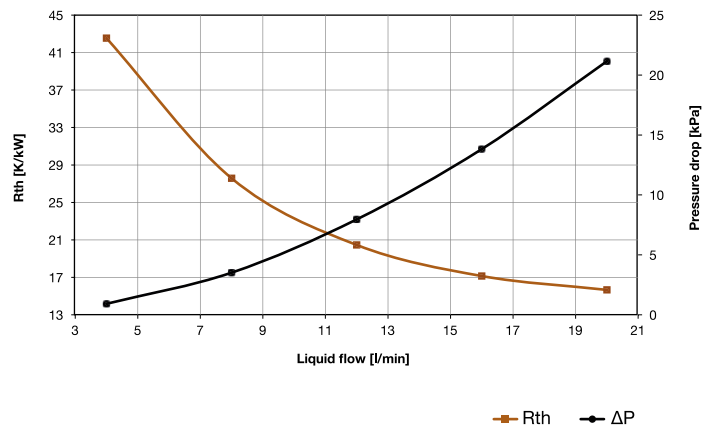
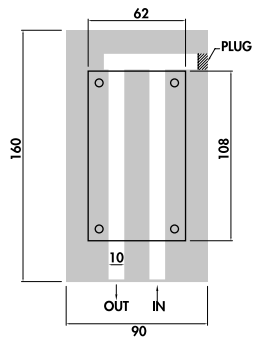
The presented LCP are just a few of the possible configurations.

## LCP 90x20/160 - GD 2 Pass

Base Plate: Al EN AW-6082, 20mm thick

Liquid: H2O, Tin 40°C

Pd: 1 kW

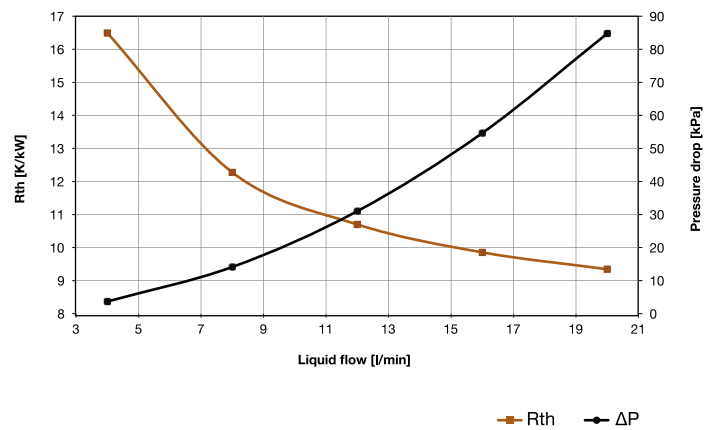
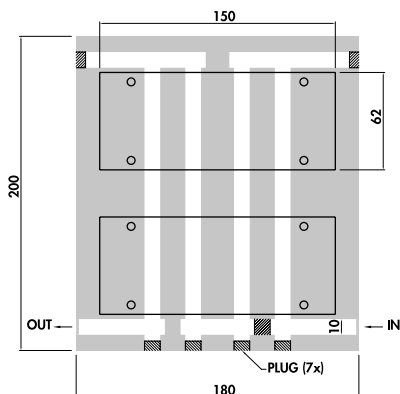


## LCP 180x20/200 - GD 4 Pass

Base Plate: Al EN AW-6082, 20mm thick

Liquid: H2O, Tin 40°C

Pd: 2 kW



# SERIE LCP-ET

GUN DRILLED

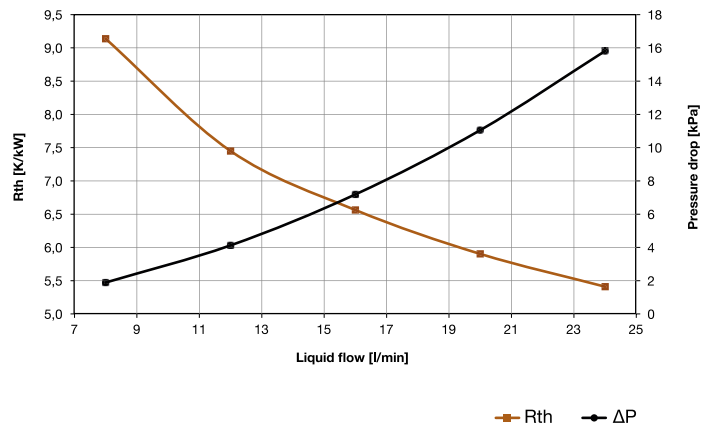
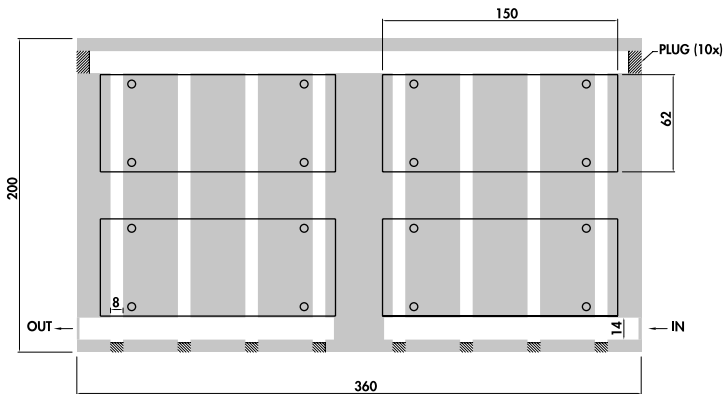
The presented LCP are just a few of the possible configurations.

## LCP 360x22/200 - GD 8 Pass

Base Plate: Al EN AW-6082, 22mm thick

Liquid: H2O, Tin 40°C

Pd: 4 kW

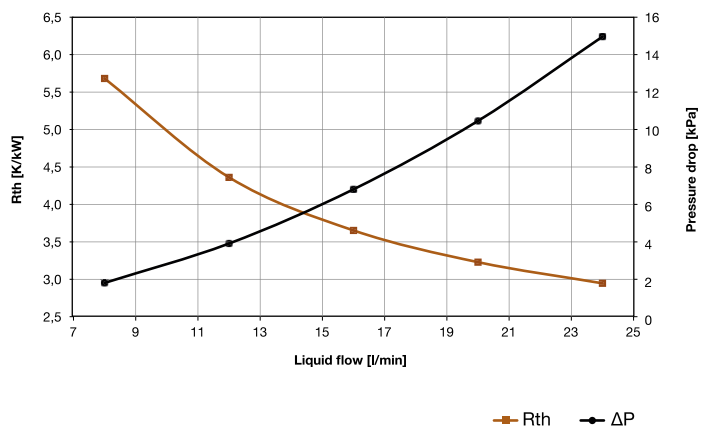
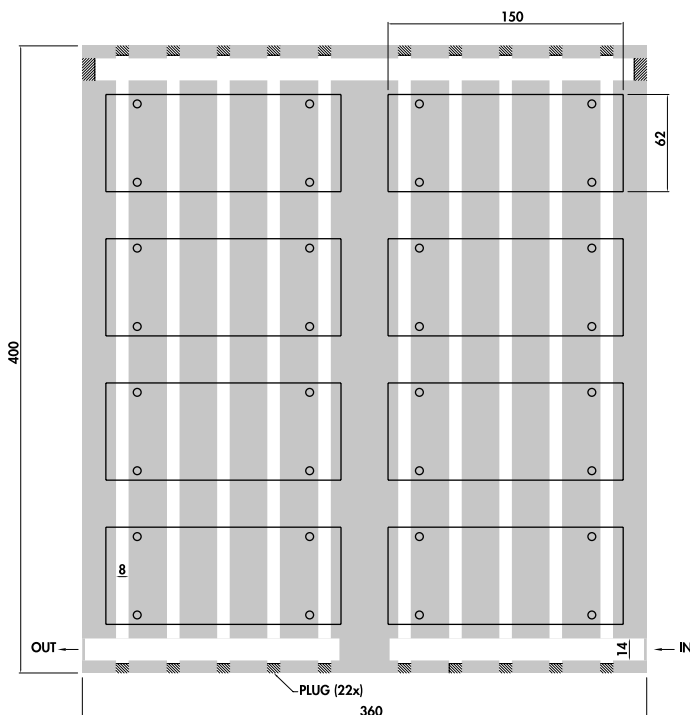


## LCP 360x22/400 - GD 10 Pass

Base Plate: Al EN AW-6082, 22mm thick

Liquid: H2O, Tin 40°C

Pd: 8 kW

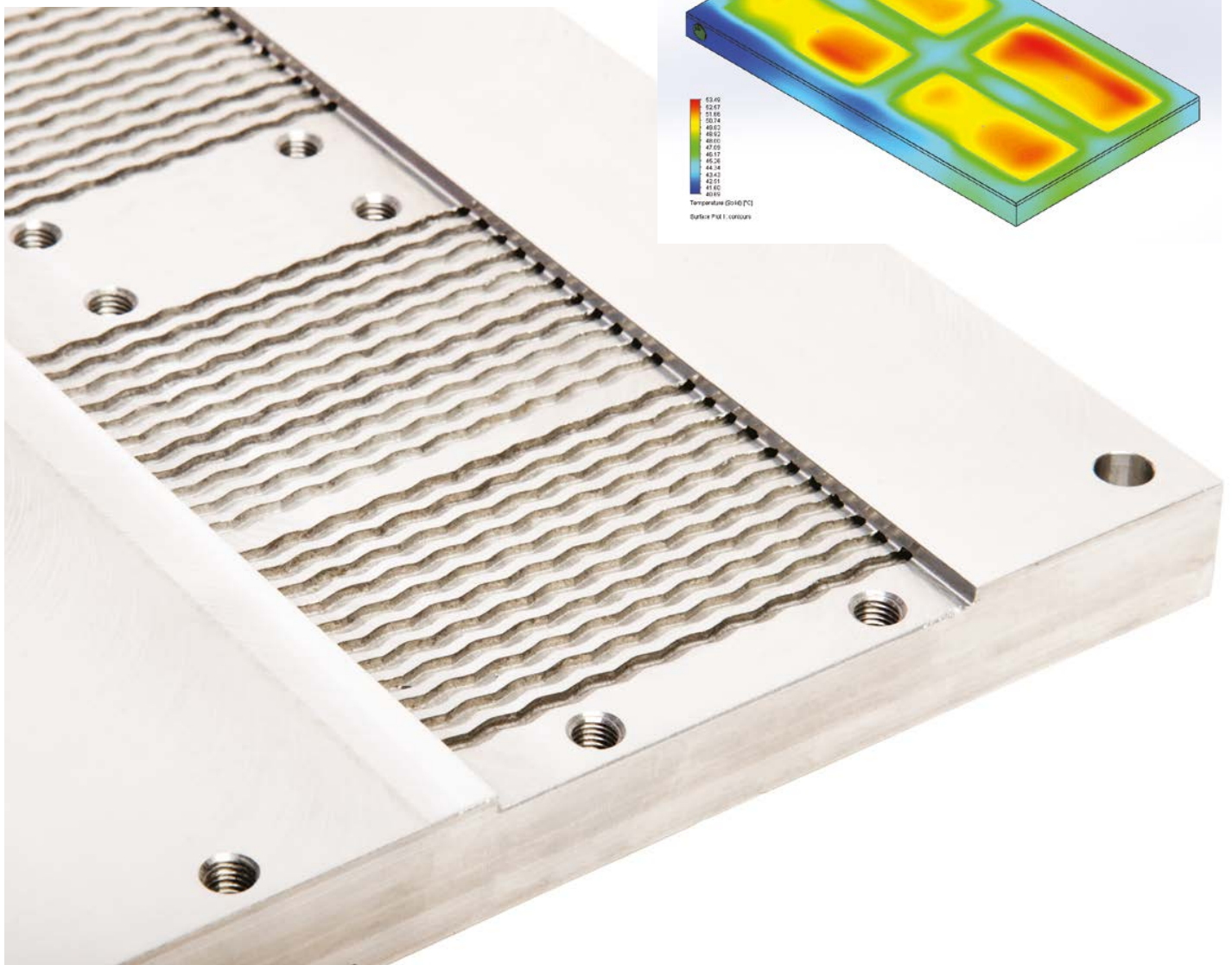
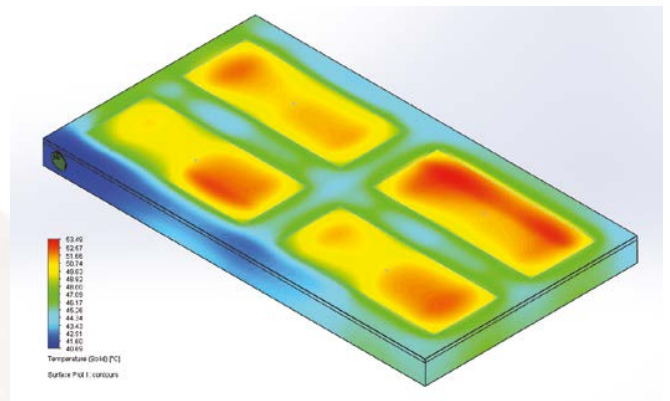
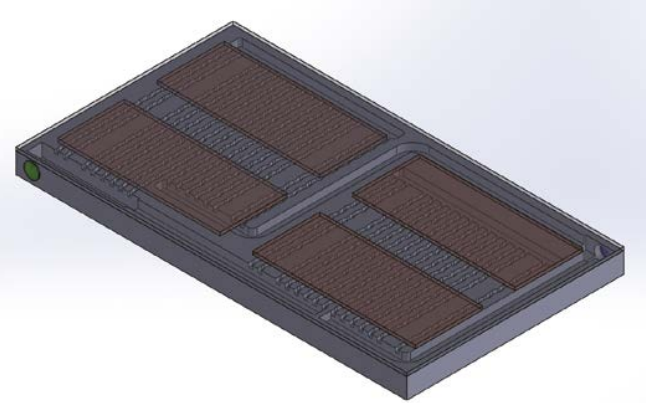


# SERIE LCP-CB

CAB BRAZED

## General specifications

<b>Width (W)</b>	max 600 mm
<b>Length (L)</b>	max 1500 mm
<b>Thickness (H)</b>	max 30 mm
<b>Material</b>	EN AW-1050A EN AW-6060 EN AW-6101B



# SERIE LCP-CB

CAB BRAZED

Where it is appropriate to the client's project, brazing in controlled atmosphere is a sophisticated manufacturing technology specifically applied to thermal management systems that allows us to customize the design and the cooling features of the plate to its maximum limits, using special aluminum alloys.

The projects requiring the highest thermal performance use this technology to ensure complete cooling uniformity under the overall area used by semiconductors and the active components.

Developed by the Engineering Department, internal channel designs (with or without the use of turbulators) are defined through the use of sophisticated 3D design programs and CFD (Computational Fluid Dynamics) simulation. This optimises the design for internal flows and the required pressure drop, allowing the construction of LCPs without any constraint on internal and external shape. CAB Plates may be completed with connectors of any type, diameter and thread pitch both integrated and external to the plate.



# SERIE LCP-CB

CAB BRAZED

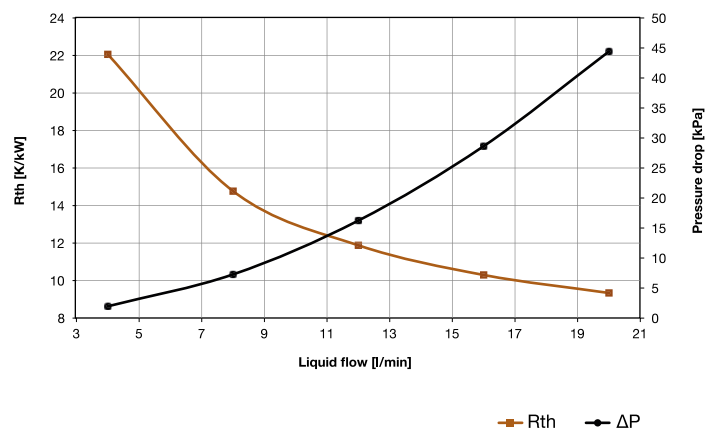
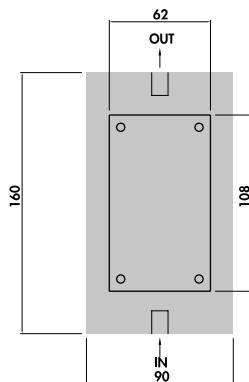
The presented LCP are just a few of the possible configurations.

## LCP 90x20/160 - CB

Base Plate: Al EN AW-1050A, 20mm thick

Liquid: H<sub>2</sub>O, Tin 40°C

Pd: 1 kW

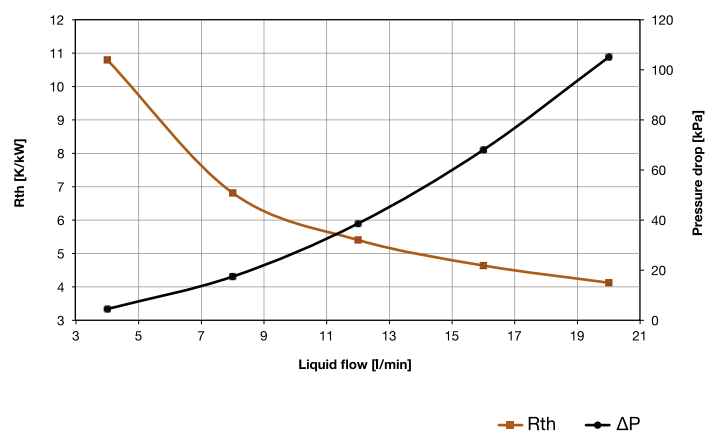
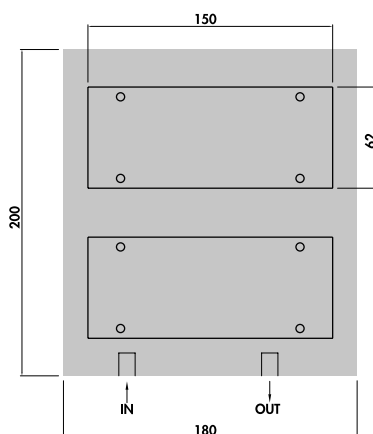


## LCP 180x20/200 - CB

Base Plate: Al EN AW-1050A, 20mm thick

Liquid: H<sub>2</sub>O, Tin 40°C

Pd: 2 kW





# SERIE LCP-CB

CAB BRAZED

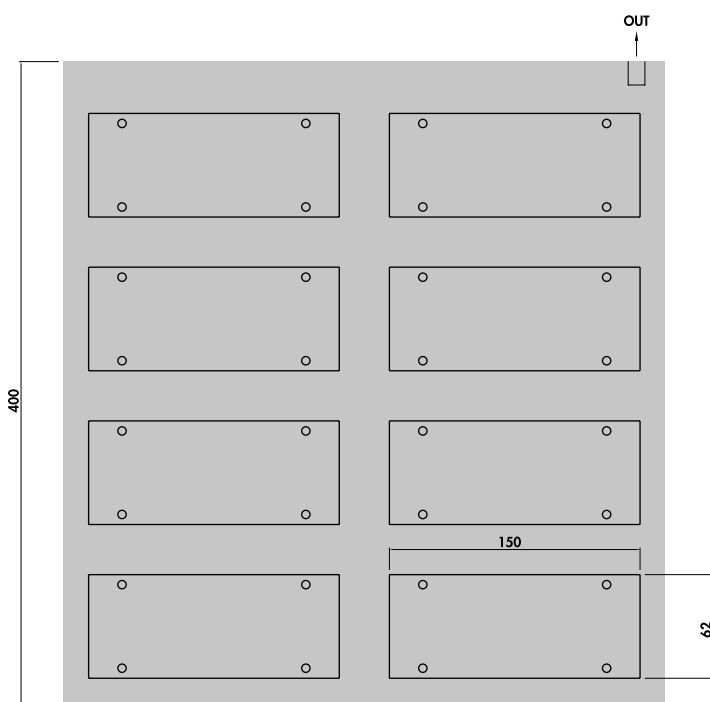
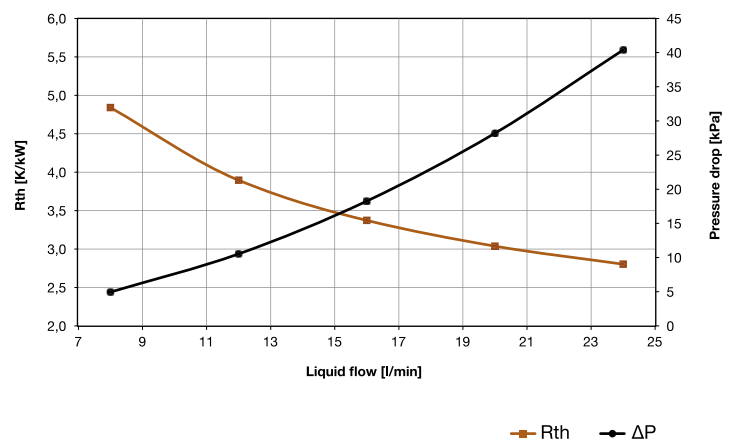
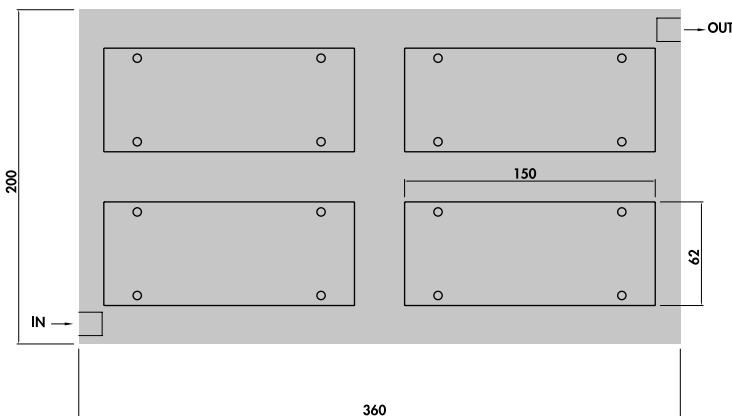
The presented LCP are just a few of the possible configurations.

## LCP 360x22/200 - CB

Base Plate: Al EN AW-1050A, 22mm thick

Liquid: H2O, Tin 40°C

Pd: 4 kW

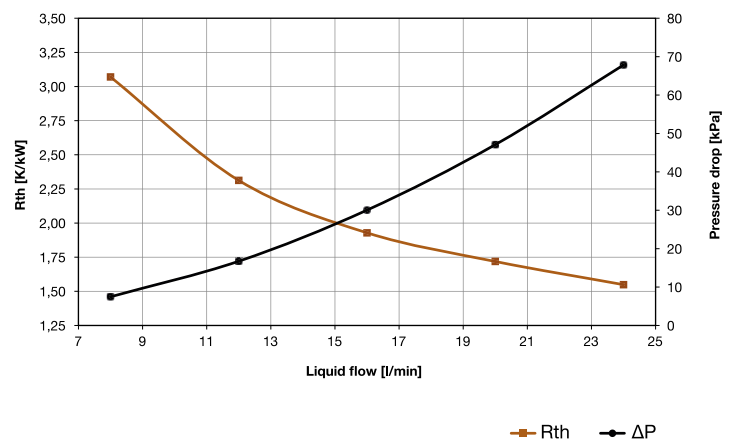


## LCP 360x22/400 - CB

Base Plate: Al EN AW-1050A, 22mm thick

Liquid: H2O, Tin 40°C

Pd: 8 kW

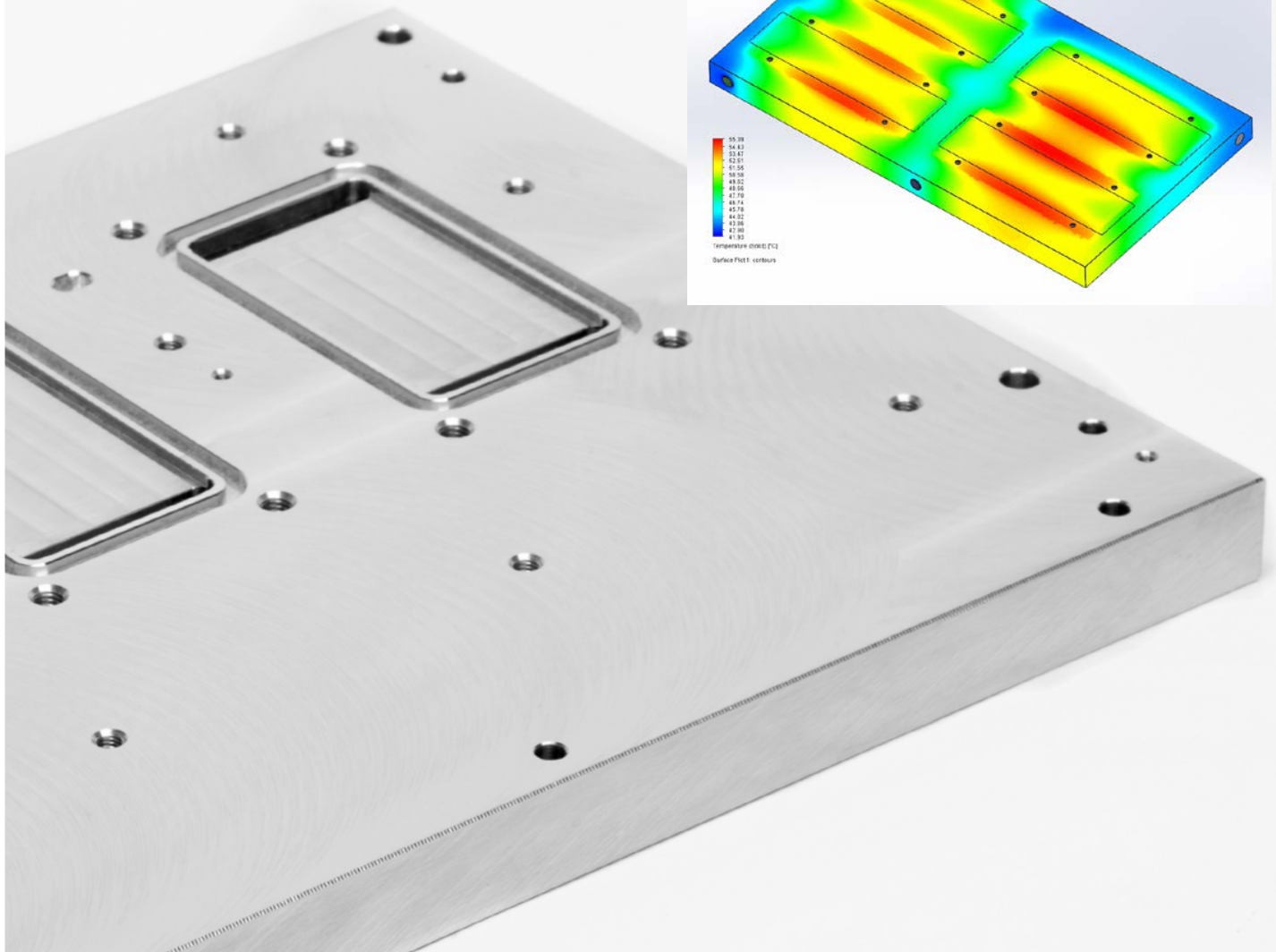
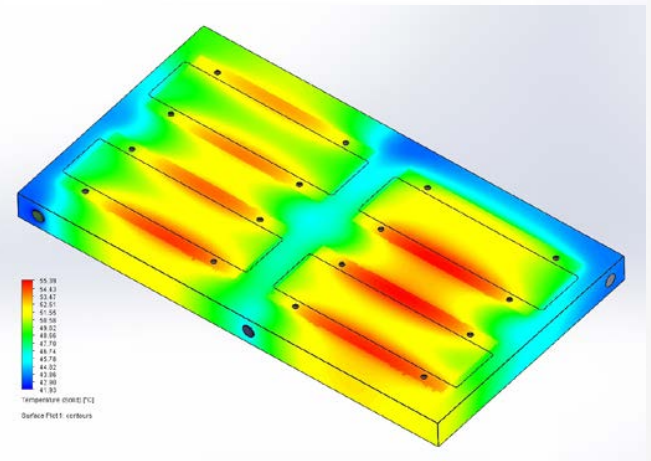
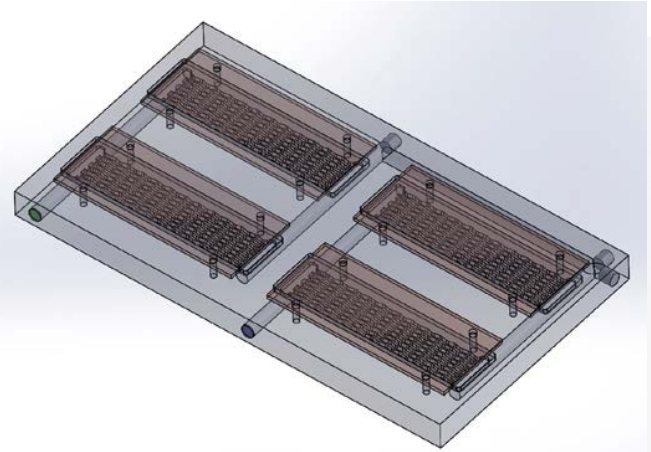


# SERIE LCP-FSW

FRICTION STIR WELDING

## General specifications

Width (W)	max 700 mm
Length (L)	max 2000 mm
Thickness (H)	max 100 mm
Material	EN AW-1050A EN AW-5083 EN AW-6060 EN AW-6082 EN AW-6101B Copper Stainless Steel

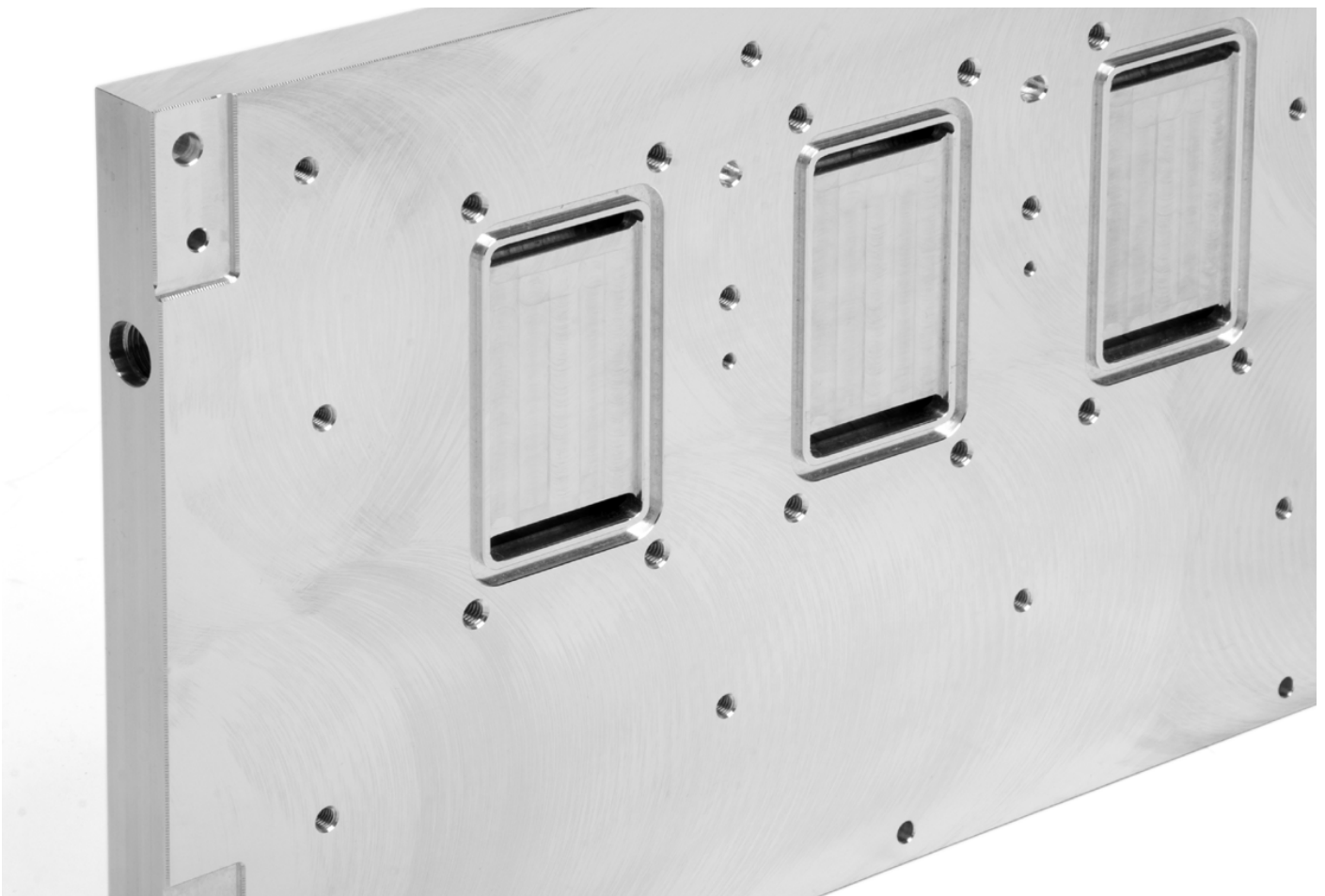


# SERIE LCP-FSW

FRICITION STIR WELDING

Friction Stir Welding is a solid-state joining method that applying to a construction of a liquid cooled plate allows to achieve very strong hermetic seal and high thermal performance, offering one of the most cost effective solution in cooling technologies.

Depending on the system specification, several materials and aluminium alloys can be used for the realization of a FSW LCP. Dimensions and shape of the internal cooling channels are designed by thermal engineers through advanced 3D and computational fluid dynamics simulation software, allowing the optimization of both the pressure drop and the liquid flow to consequently reach a very high efficiency level.



# SERIE LCP-FSW

FRICITION STIR WELDING

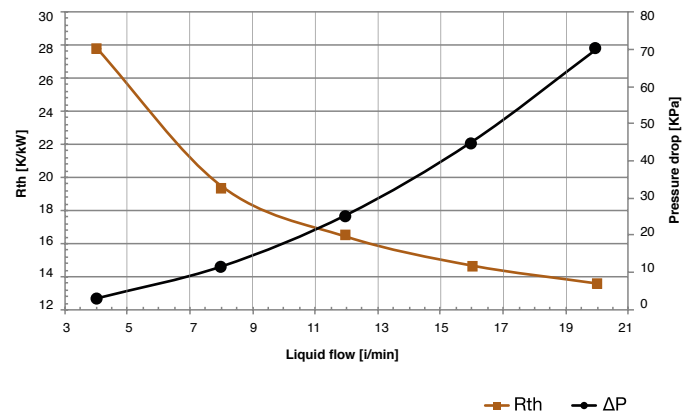
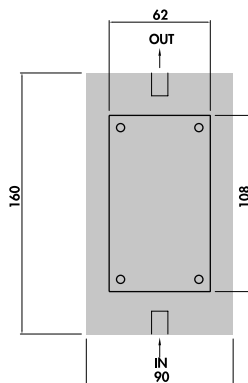
The presented LCP are just a few of the possible configurations.

## LCP 90x20/160 - FSW

Base Plate: Al EN AW-1050A, 20mm thick

Liquid: H2O, Tin 40°C

Pd: 1 kW

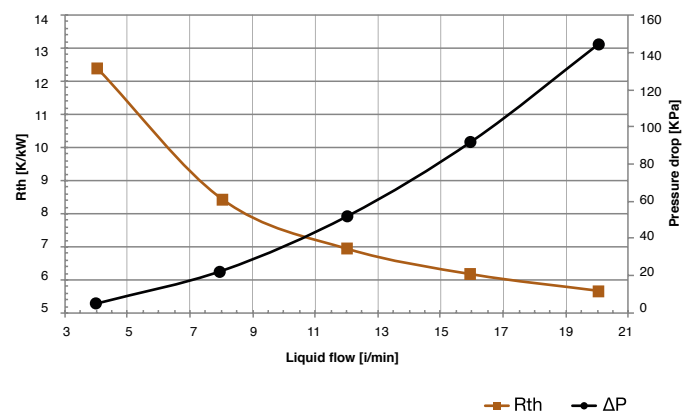
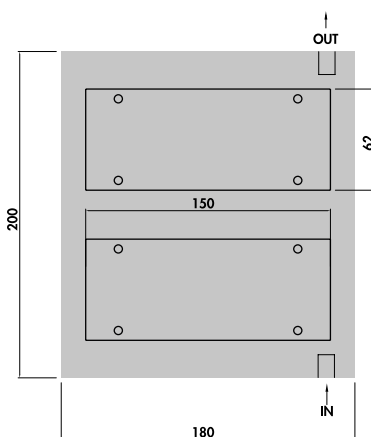


## LCP 180x20/200 - FSW

Base Plate: Al EN AW-1050A, 20mm thick

Liquid: H2O, Tin 40°C

Pd: 2 kW



# SERIE LCP-FSW

FRICITION STIR WELDING

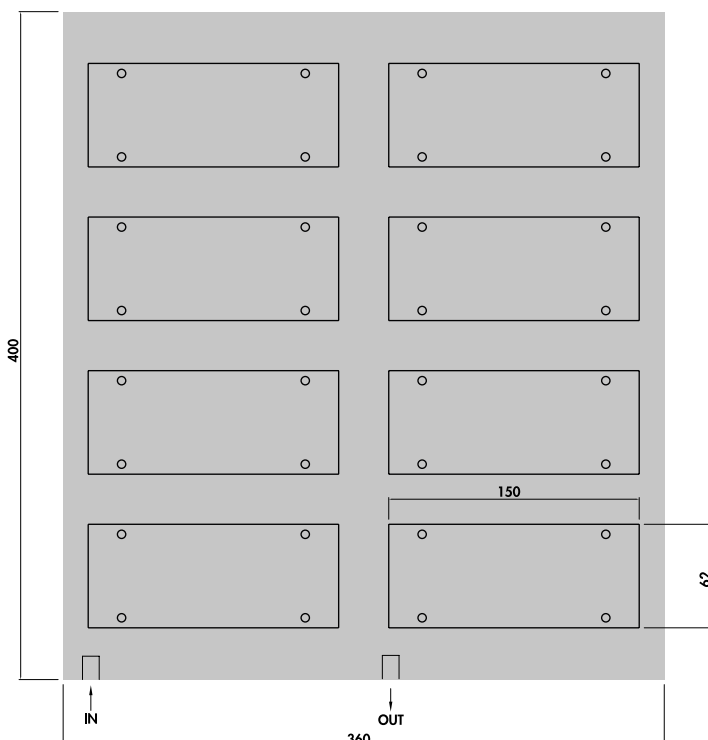
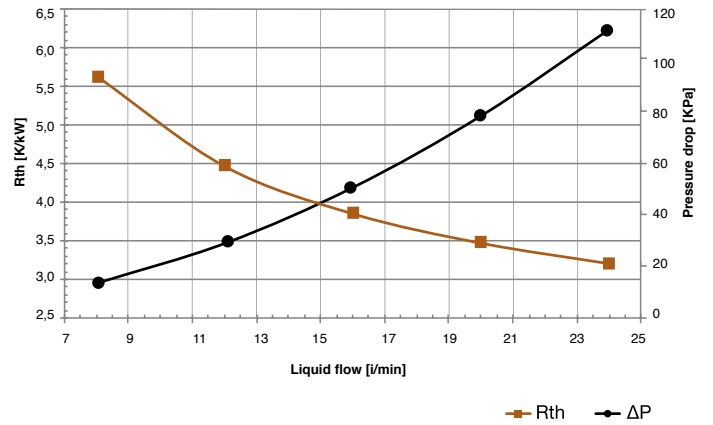
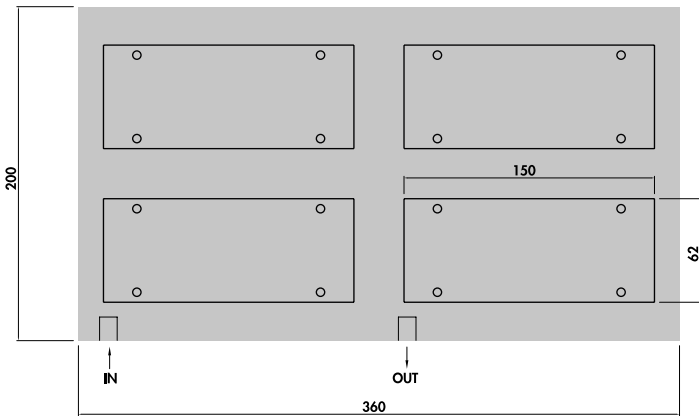
The presented LCP are just a few of the possible configurations.

## LCP 360x22/200 - FSW

Base Plate: Al EN AW-1050A, 22mm thick

Liquid: H2O, Tin 40°C

Pd: 4 kW

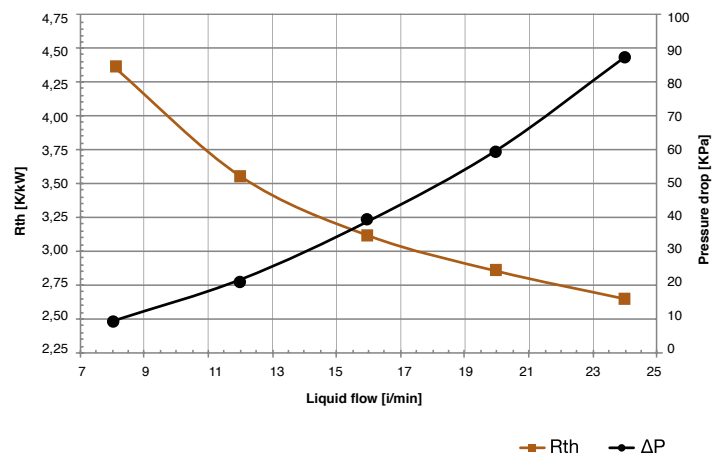


## LCP 360x22/400 - FSW

Base Plate: Al EN AW-1050A, 22mm thick

Liquid: H2O, Tin 40°C

Pd: 8 kW



# FUSION

Innovation and research into new technical solutions have always been Mecc.Al's strength. Manufacturing and industrial technologies have developed and evolved over 40 years of history within the various business units, making it possible to call on an a large and exclusive data base of cross-technological know-how.

Our partners' new R&D projects require more innovative solutions than those readily available on the market, which may no longer be sufficient to support increasingly sophisticated and complex applications.

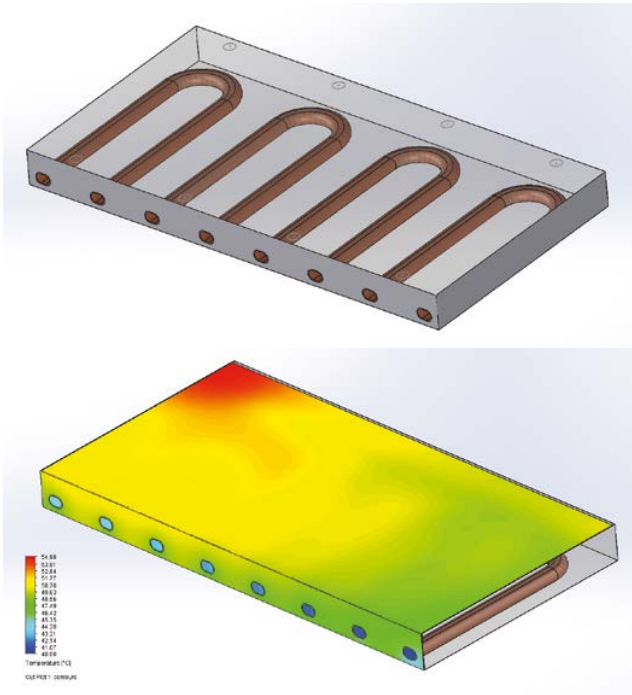
Fusion is the technology that combines the Company's knowledge gained in the fusion of specific aluminum alloys with the experience of the design and production of LCPs with copper, stainless steel, aluminum tube coils and hollow channels. This involves the fabrication of pre-assembled tube coils crossing copper plates, before being combined in molds within the aluminum structure of the system being cooled. A limitless number of possible customizations without traditional constraints.

## General specifications - Cooling channel

Material	Dimensions [mm] * (diameter and wall thickness)	Bending Radius [mm] *
<b>Core</b>	Upon design	Upon design
<b>Copper</b>	6x1	10 - 15 - 20 - 12.8
	8x1	12,5 - 20 - 22
	9.52x1	18 - 19
	10x1 - 10x1.5	13 - 14 - 15 - 20 - 22.5 - 25 - 30 - 45
	12x1 - 12x1.5	18 - 31
	12.7x1	14
	14x1	25 - 45
	15x1	24 - 30 - 45
	16x1	32 - 40
	18x1	45
<b>Stainless Steel</b>	8x0.5 - 8x1	12
	10x0.5 - 10x1	15
	12x1	18
	15x1	22.5

\* Other options upon request

# FUSION



## General specifications - Base plate

<b>Width (W)</b>	max 1000
<b>Length (L)</b>	max 350
<b>Thickness (H)</b>	max 30
<b>Material</b>	EN AC-42100





**KØLEPROFILER**



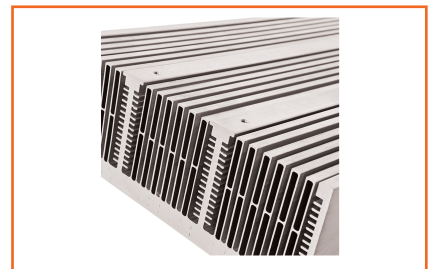
**VORES PRODUKTSORTIMENT INKLUDERER:**



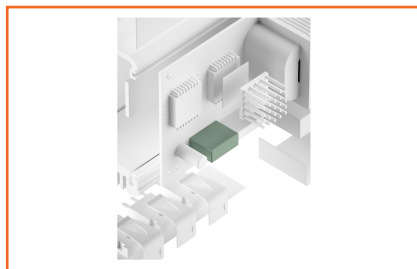
**EKSTRUDEREDE**



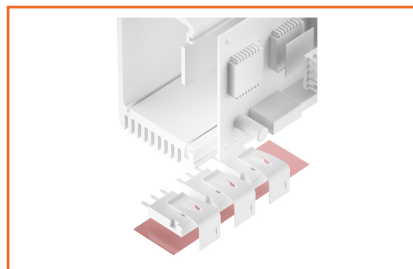
**SAMMENSATTE**



**HIGH PERFORMANCE**



**SILICONE CAPS**



**FOILS & FILMS**



**TERMISK LEDENDE MATERIALE**

**VI FØRER PRODUKTER INDENFOR KATEGORIERNE:**



**AUTOMATIK**



**HVAC & BYGNINGS-  
AUTOMATIK**



**ELVARME**



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