Technical introduction

1. General points

In order to provide optimum performance of semi-conducting devices it is essential not to exceed the maximum junction temperature indicated by the manufacturer.

Generally this maximum junction temperature can only be maintained without exceeding it by running the device concerned at lower power outputs.

At outputs approaching the maximum ratings semi-conductor devices have to be cooled by so called heatsinks, sometimes called dissipators.

The thermal performance of these heatsinks primarily depends on the thermal conductivity of the material from which they are made, size of surface area and mass.

In addition, surface colour, mounting position,temperature, ambient air velocity and mounting place all have varying influence on the final performance of the heatsink from one application to another..

However, a figure for thermal resistance can be experimentally determined in a reliable manner and used in the equations that follow in part 2.

There are no agreed international standard methods for testing electronic cooling systems or for the determination of the thermal resistance.

Therefore the diagrams and values given in our catalogue have been determined under practical operating conditions and therefore allow the most suitable heatsink from the range to be selected.

We expressly point out that all information and data is given to the best of our knowledge and belief. The user is solely responsible for the proper use of our products and he should check their suitability for the intended application.

Fischer Elektronik do not assume any warranty, whether expressed or implied, for the suitability, function or merchantibility of their products in specific or general applications, and they cannot be held liable for accidental or consequential damage due to non-observance of the above.

Furthermore Fischer Elektronik reserve the right to carry out technical modifications to their products at any time.
All orders are subject to the General Sales Conditions of Fischer Elektronik.

2. The determination of thermal resistance

The thermal resistance is the parameter that is the most important in cooler selection, apart from mechanical considerations.

For determination of the thermal resistance the following equation applies:

Equation 1:

$$R_{thK} = \frac{\vartheta_i - \vartheta_u}{P} - (R_{thG} + R_{thM}) = \frac{\Delta\vartheta}{P} - R_{thGM}$$

In case of an application where the maximum junction temperature is not exceeded the temperature has to be verified.
When the case temperature has been measured the use of the following equation will enable the maximum junction temperature to be calculated:

Equation 2:

$$\vartheta_i = \vartheta_G + P \times R_{thG}$$

The meaning of the determinants:

ϑ_i = maximum junction temperature in °C of the device as indicated by manufacturer.
As a »safety factor« this should be reduced by 20-30 °C.

ϑ_u = ambient temperature in °C.
The rise in temperature caused by radiant heat of the heatsink should be increased by a margin of 10-30 °C.

$\Delta\vartheta$ = difference between maximum junction temperature and ambient temperature.

ϑ_G = measured temperature of device case (equation 2).

P = maximum power rating of device in [W]

R_{th} = thermal resistance in [K/W]

R_{thG} = internal thermal resistance of semiconductor device (as indicated by manufacturer)

R_{thM} = thermal resistance of mounting surface. For TO 3 cases the following approximate values apply:

1. dry, without insulatar	0.05 - 0.20 K/W
2. with thermal compound/without insulator	0.005 - 0.10 K/W
3. Aluminium oxide wafer with thermal compound	0.20 - 0.60 K/W
4. Mica wafer (0.05 mm thick) with thermal compound	0.40 - 0.90 K/W

R_{thK} = thermal resistance of heatsink, which can be directly taken from the diagrams

R_{thGM} = sum of R_{thG} and R_{thM}. For parallel connections of several transistors the value R_{thGM} can be determined by the following equation:

Equation 3:
$$\frac{1}{R_{thGM\ ges.}} = \frac{1}{R_{thG1} + R_{thM1}} + \frac{1}{R_{thG2} + R_{thM2}} + \cdots + \frac{1}{R_{thGn} + R_{thMn}}$$

The result can be substituted into equation 1.

K = Kelvin, which is the standard measure of temperature differences, measured in °C, therefore 1°C = 1 K.

K/W = Kelvin per watt, the unit of thermal resistance.

Calculation examples:

1. A TO 3 power transistor with 60 watt rating has a maximum junction temperature of 180 °C and an internal resistance of 0.6 K/W at an ambient of 40 °C with aluminium oxide wafers.

What thermal resistance is required for the heatsink?

given:

P = 60 W

ϑ_i = 180 °C - 20 °C =160 °C (for safety margin)

ϑ_U = 40 °C

R_{thG} = 0.6 K/W

R_{thM} = 0.4 K/W (average value)

find: R_{thK} using equation 1

$$R_{thK} = \frac{\vartheta_i - \vartheta_U}{P} - (R_{thG} + R_{thM}) = \frac{160\ °C - 40\ °C}{60\ W} - (0.6\ K/W + 0.4\ K/W) = \underline{1{,}0\ K/W}$$

2. Same conditions as above but for three devices with equally distributed power ratings.

solution use equation 1 and equation 3
$$\frac{1}{R_{thGM\ ges.}} = \frac{1}{0.6 + 0.4\ K/W} + \frac{1}{0.6 + 0.4\ K/W} + \frac{1}{0.6 + 0.4\ K/W} = \frac{3}{1}\ W/K$$

$$R_{thGM\ ges.} = \frac{1}{3}\ K/W = \underline{0.33\ K/W}$$

substitute into Equation 1 gives:
$$R_{thK} = \frac{160\ °C - 40\ °C}{60\ W} - 0.33\ K/W = \underline{1.67\ K/W}$$

With these values determined, the tabulation on page A 13 - 17 can be used to give a choice of possible heatsink profiles. Then by examination of the drawings and curves the final choice can be made.

3. A transistor with power rating of 50 W and internal thermal resistance of 0.5 K/W has a case temperature of 40 °C. What is the actual value of junction temperature?

given:

P = 50 W R_{thG} = 0.5 K/W ϑ_G = 40 °C

find: ϑ_i using equation 2

$$\vartheta_i = \vartheta_G + (P \bullet R_{thG}) \qquad \vartheta_i = 40\ °C + (50\ W \bullet 0.5\ K/W) = \underline{65\ °C}$$

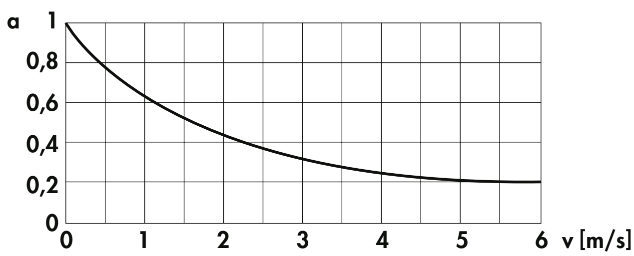
Thermal resistances of any profiles with forced convection

R_{thKf} ≈ $a \bullet R_{thK}$

R_{thKf} = thermal resistance with forced convection

R_{thK} = thermal resistance with natural convection

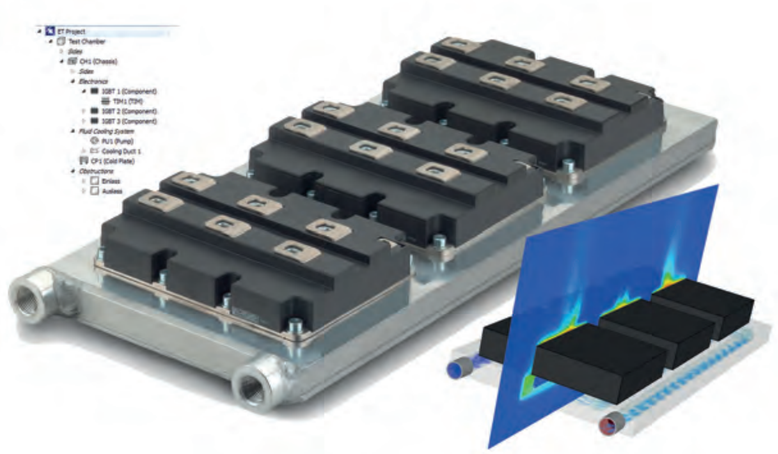
a = factor of proportion



Computer based thermal simulation for optimal cooling concepts

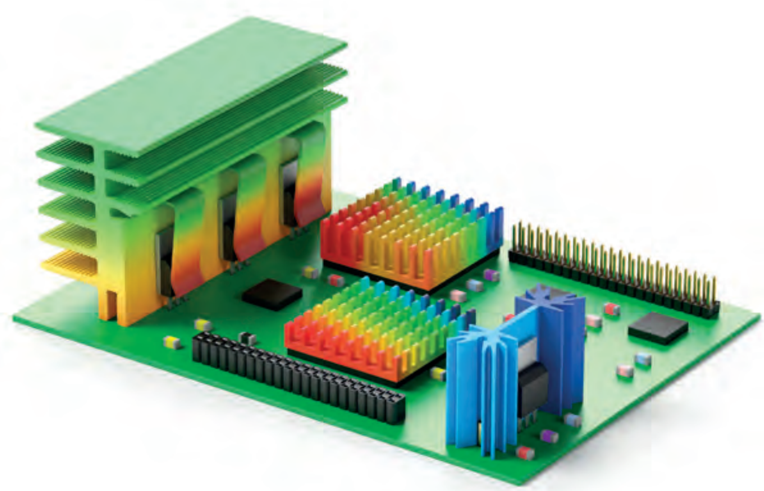
Performance, service life and reliability of electronic semiconductor devices are significantly determined by the thermal load to which the devices are exposed. An exceeding of the maximum operating temperature leads to malfunctions. An exceeding of the permissible junction temperature leads to a destruction of the semiconductor. To make it worse there is an advancing trend in the semiconductor industry for continuous increasing integration- and power densities of electronic devices. For the solution of thermal problems the first question is which kind of heat dissipation has to be considered. For this there are different processes available: by means of free convection (passive) with different heatsink solutions, by means of forced convection (active with help of fans, cooling aggregates) or by means of fluid media (fluid cooling).

However, electronic devices and systems have many different boundary and installation conditions. Therefore the choice of the optimum thermal management is often difficult. There are surely possibilities to find the right heat dissipation concept by using the thermal resistance for calculations or by testing and verifying prototypes directly in the application, but nowadays customer specified mechanical adjustments are requested and demanded more than ever. Small mechanical post-machinings, such as additional integrated threads or drilling can be considered in the calculation with safety reserves in the temperature of the thermal resistance, but extensive modifications demand a repeated inspection of the thermal circumstances.



To facilitate the determination of passive heat dissipation concepts Fischer Elektronik offers a computer based thermal simulation as a kind of service.

Considered factors in the thermal simulation



With help of the computer based thermal simulation the necessary characteristics of the cooling concept can be determined exactly. Based on physical concepts such as mass, energy and impulse the software especially considers the thermal requirements for free or forced convection. Simultaneously the system is aligned to thermal dissipation by means of fluid. Moreover the thermal simulation calculates physical effects such as thermal radiation and turbulences. The emission factor of the different surfaces also plays its role. As a result the simulation software delivers a precise cooling solution for the application and is a big help for the decision-making and interpretation of the electronic design.

Advantages of a computer based simulation

The computer based thermal simulation is already used for the prototype development. Herewith the development cycles of heat dissipation concepts is reduced considerably. Unsuitable concepts can be discarded quickly and without big costs of material. A lot of features and options of the simulation system also reduce the temporary and apparatuses efforts compared to a conventional simulation in the measurement chamber.

We will be happy to advise you in detail about the theme thermal simulation.

Remarks:

1. The values indicated in the diagrams apply only for heatsinks with black anodised surface, mounted vertically and natural convection.

Correction factors: natural surface: +10 to 15 % for horizontal mounting: +15 to 20 %

2. Heatsink profiles are extruded to European standard DIN EN 12020 (former DIN 17615).
   For profiles exceeding a circumscribed circle of 350 mm, the tolerances to DIN EN 755 (former DIN 1748) apply.

Important note:
Manufacturers of certain electronic components, especially modules with a large surface area, IGBT etc., specify installation surfaces for heatsinks etc. with an flatness, which is beyond standard tolerances. Such perfect flatness can only be achieved by milling the installation surface. Furthermore, it should be noted that threaded wire inserts may be required in order to reach higher tightening torques in aluminium (e.g. Heli-Coil or similar.). Please observe the semiconductor manufacturers' information.

3. The mentioned heatsink profiles in our catalogue contain so called extrusion marks between the fins for a profile identification.
   To avoid misuse the operator has to check the size and position for the mechanical treatment or placement of the components.

4. Profile extruded threaded channels are no threads conforming to standards, as they have no thread pitch.
   The thread pitch is imitated by staggered webs (ribs). The customer is responsible for appropriate use.

5. Machining of our extruded and non extruded profiles conforms to requirements of DIN ISO 2768 m - unless otherwise stated.
   For all ICK S types DIN ISO 2768c is valid.

6. The lengths of extruded profiles [|↔|] and the pin layouts [⊕] indicate only the standard range. We offer every profile cut to customer's exact length and machining requirement made to drawing or sample. We bore, countersink, mill, saw, grind and cut threads into your heat sink to meet your specific requirements. With our modern machine tools including CNC machining centres, multispindled drills (up to 26 drillings/threads at the same time) and digital milling and stamping tools plus our own "in house" tool room we are able to manufacture competetively priced prototypes as well as batch and mass produced parts with short lead times.

7. The standard material of our heatsinks is warm age-hardened aluminium alloy according to EN AW 6060 – T66 (former AlMgSi05 – F22 acc. to DIN 1748). Our standard surface treatments are raw degreased aluminium (Al) and black anodised (SA). On request, we anodise clear natural (ME) or decorative in any colour that is technically possible.

8. If you cannot find a suitable profile within our range of approx. 400 profiles, 13 small heatsinks and 50 finger shaped heatsinks, we can design and produce to your requirements. Please contact us at the start of your next project so that we can work together, either directly or through our representatives. Remember that we have the ability to find the solution for "your" cooling problem.

9. Note on tolerances

All dimensions given in this cataloque for products, items and machined parts are acc. to DIN ISO 2768 m if not otherwise stated. Not included are items like extruded profiles, diecasts, handles, vibration dumpers etc. for which different standards apply.

Update - 2023

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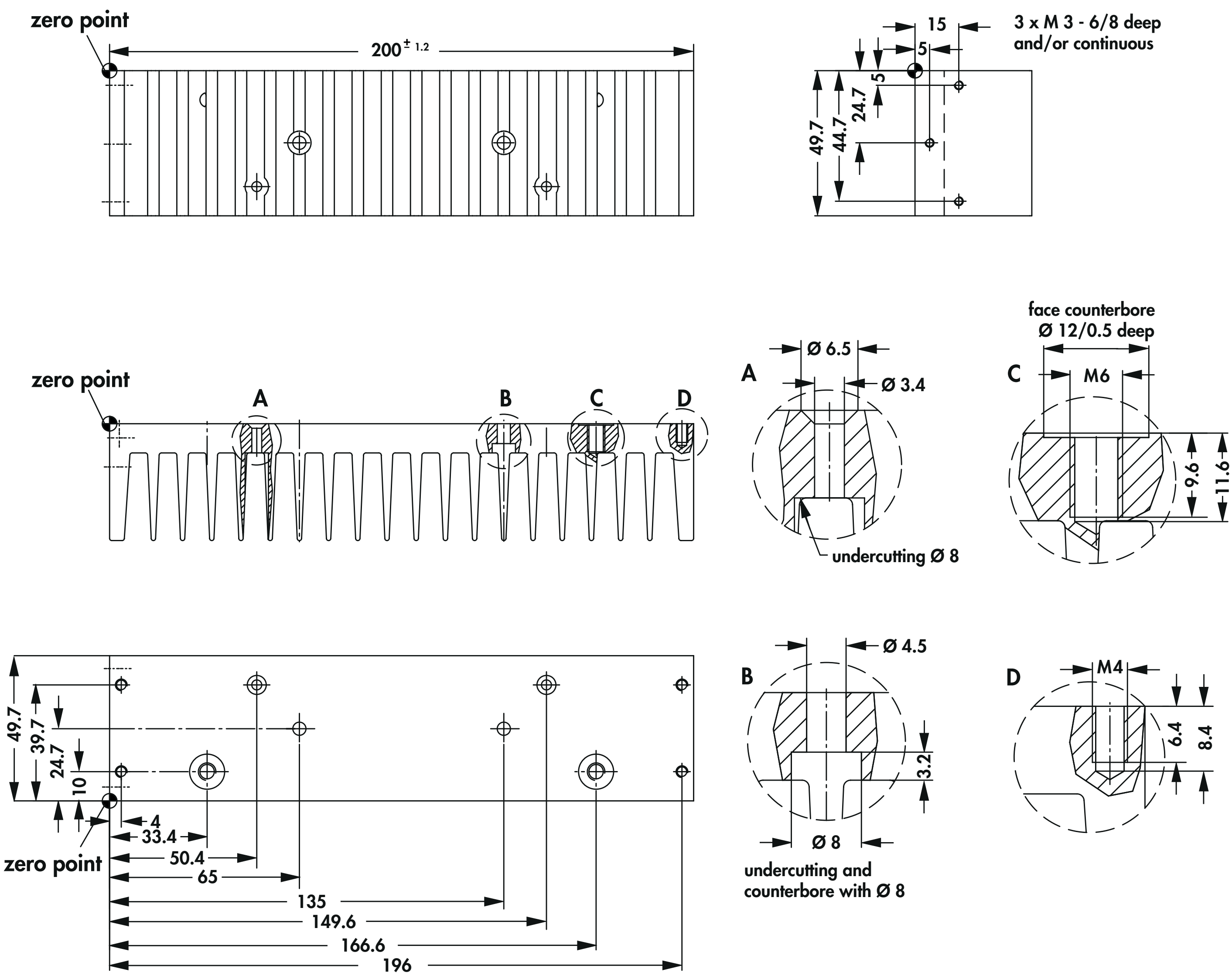
General information

Blind holes are produced after anodising. Through holes are produced before anodising. For completely visual parts additional lacquering or adding additional mounting threads or bolts is recommended.

A part of the extruded heatsink profiles is pressed according to DIN EN 12020 (circumscribing circle <350mm). For sections that exceed a circumscribed circle of 350 mm, DIN EN 755 applies. The machining tolerances are specified according to DIN ISO 2768 m.



Information for dimensioning, shown on SK 47 general:

The deflection can be up to 0.8 mm concave, 0.2 mm convex. If a certain flatness of the bottom surface is required the bottom thickness can be decreased by a maximum of approx. 0.8 mm by means of face-milling. This situation must be taken into consideration with the bore hole depths for blind holes.
Counterbores and bore hole diameters are to be produced according to DIN 74, if not explicitly stated otherwise.
The depth of thread should be calculated as follows.

Example M5:
thread: M5 x 1.6 mm = 8 mm core bore: 8 mm + 2 mm = 10 mm

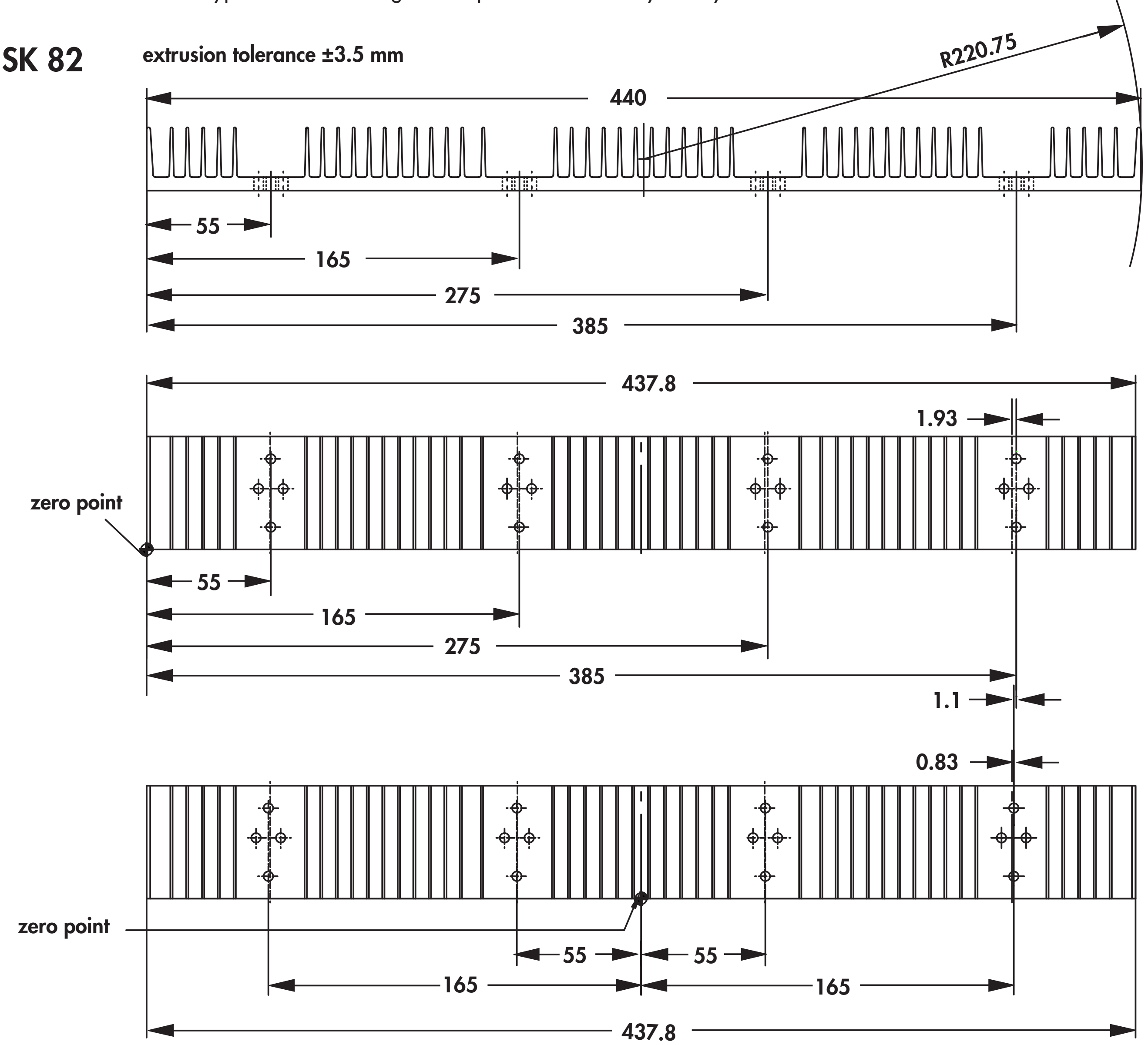
Examples:
cutout A: Through-hole according to DIN 74 A m 3, counterbore bottom side, undercut of the fins.
cutout B: Through hole with break-through of the fins according to DIN 74 H m 4, counterbore on fin side.
cutout C: Thread M6. Depth of thread 1.6 x 6 mm = 9.6 mm, bore depth 9.6 mm + 2 mm = 11.6 mm.
Bore hole on fin base is plunged through. Face counterbore dia. 12 x 0.5 on bottom side.
cutout D: Blind thread M4. Depth of thread 1.6 x 4 mm = 6.4 mm, bore depth 6.4 mm + 2 mm = 8.4 mm.

Extrusion tolerances – production tolerances

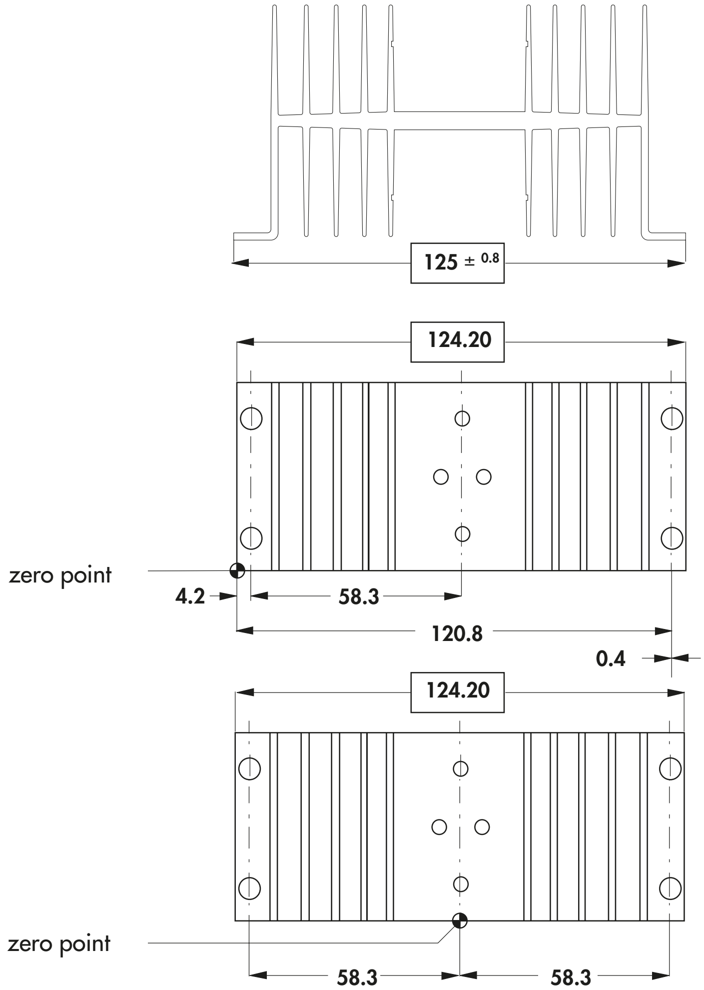
There is often the problem, that the production tolerances cannot be adhered to, due to the extrusion tolerances. The two examples show how the production tolerances can be cut in half by means of suitable dimensioning (here: extension of the zero point from the outer edge to the center of the section).

When taking unfavourable extrusion tolerances into consideration a difference of 1.1 mm arises between the two types of dimensioning with respect to the axis of symmetry.

SK 82



SK 34



extrusion tolerance ± 0.8 mm

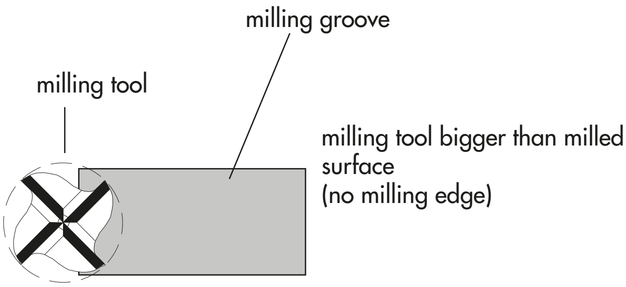
dimensioning set to the outer edges

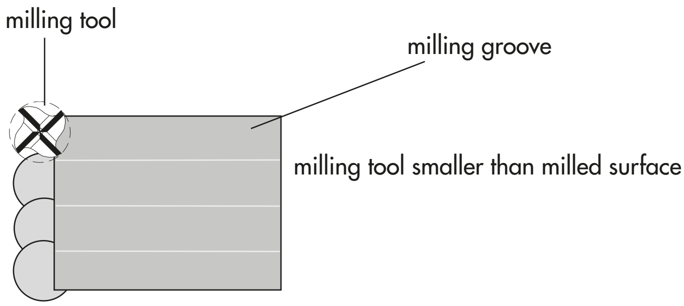
dimensioning set to the center

When taking unfavourable extrusion tolerances into consideration, a difference of 0.4 mm arises between the two types of dimensioning with respect to the axis of symmetry.

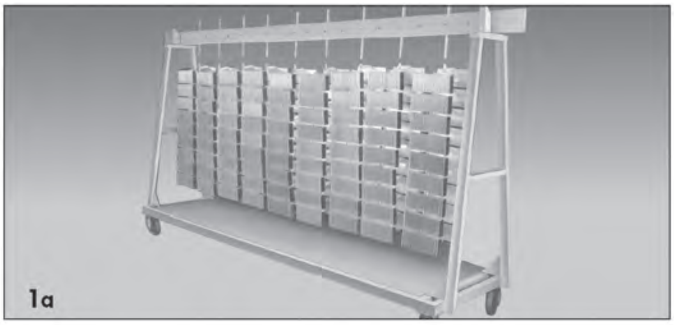
Milling

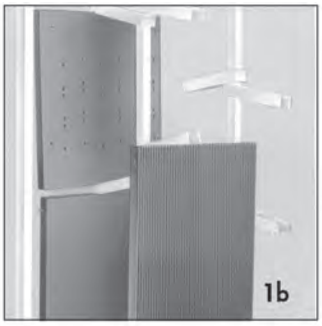
If, when milling heatsinks, cooling aggregates, etc., the milling tool diameter is smaller than the area being milled for production reasons, so called „milling grooves“ with steps or edges are produced (see sketch). Even if the roughness depth value for the surface is observed, it is a good idea to specify the area of the component in which no milling edges are allowed.

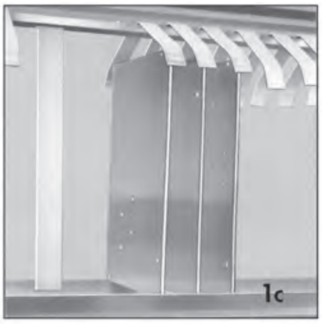


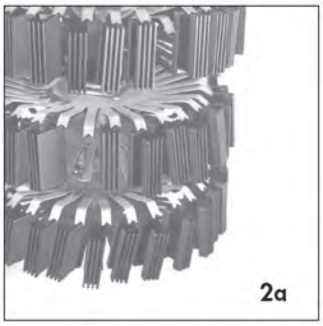


Heatsinks for decorative purposes and as visual parts

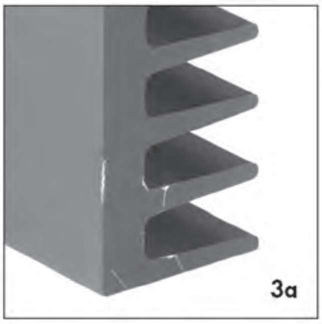

1a

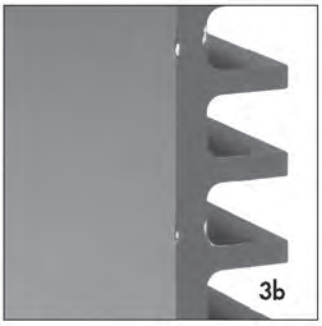

1b


1c


2a


2b


3a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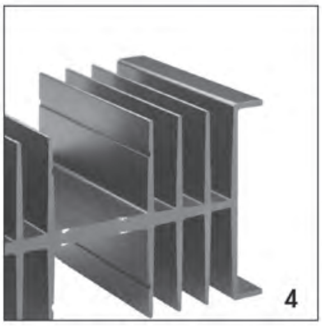
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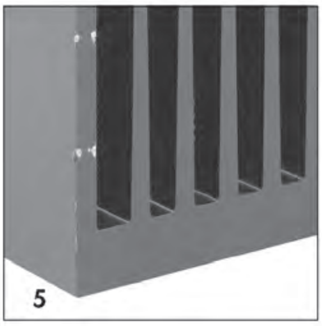
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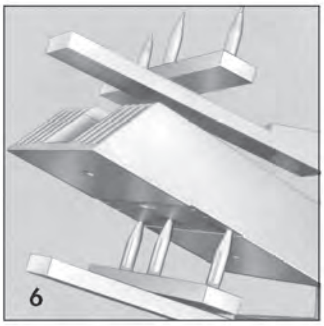
6


7

Anodising (also known as ELOXAL: **EL**ectrically **OX**idised **AL**uminium) is used in many cases for decorative surface protection of aluminium. In this process, the aluminium parts to be treated are connected to the positive pole of a direct-current source (anode) in a suitable electrolyte where aluminium, in so doing, forms the negative pole (cathode). The flowing direct current now causes a migration of oxygencontaining ions, with electrically negative charge, to the anode in order to deposit the oxygen. At this point, the aluminium reacts with this oxygen, forming aluminium oxide. A non-porous, electrically insulating, abrasion free, oxide barrier, or „eloxallayer“, then develops. The development and therefore thickness of this layer can be controlled by the amount of current flow.

For process handling, secure transportation and electrical connection, the parts to be anodised must be placed on „racks“ (figure 1). As excellent electrical contact is necessary and the parts being processed must be mounted on the carrying racks in a totally secure manner a high clamping force is required especially for those large and heavy heatsinks (figure 2). This will mean that „clamp marks“ are visible. These are mere bare points in the case of small and light weight heatsinks with black anodising (figure 3) but for heavy parts the clamping pressures and current can cause deformation of the surface (figure 4). Any such deformations on large heatsinks is unavoidable and varies with each part (figure 5).

If heat sinks are used as visual parts, in other words parts whose surface must be blemish-free in appearance, it is suggested that the customer will define specific areas which should have no clamp marks. If, for technical production reasons, it is not possible to place clamps on the remaining points then consideration should be either given to the construction of separate specialpurpose frames which will allow processing (figure 6). Existing or additional threaded holes may possibly also be used for screwing on fixing angles, upon which the clamps may then be placed (figure 7). Furthermore, there is always the possibility to remove the clamp marks by hand finishing, although some slight indentation may still be visible. Alternatively, instead of using the anodising process there are various paint finishes available.

With visual parts and mouldings, both discussion of all technical details and determination of the desired design in cooperation with the manufacturer - even at the initial enquiry stage - are imperative for the smooth completion of orders to the satisfaction of the customer.

Our experts are at your disposal for all technical advice.

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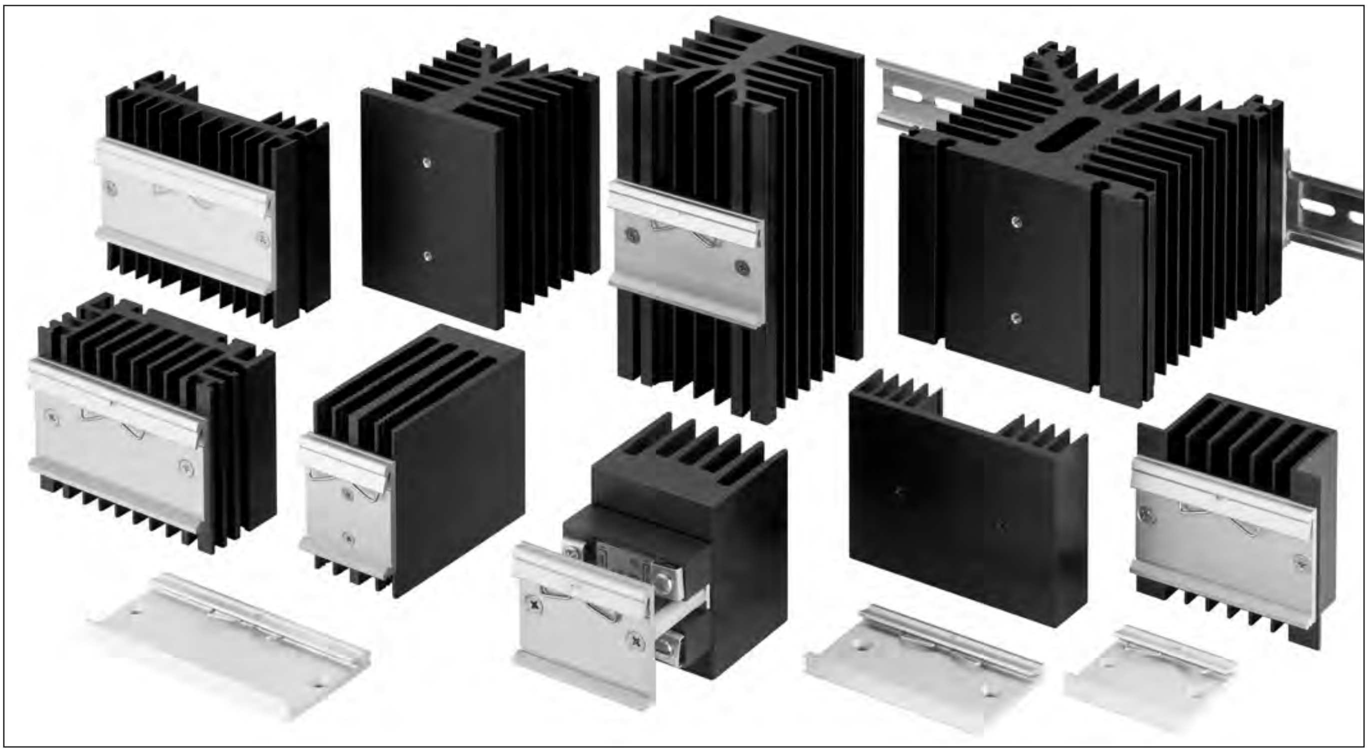
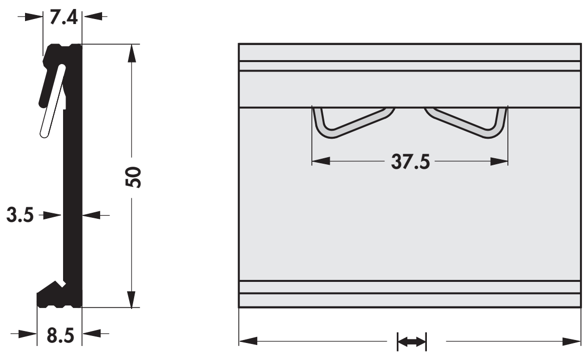
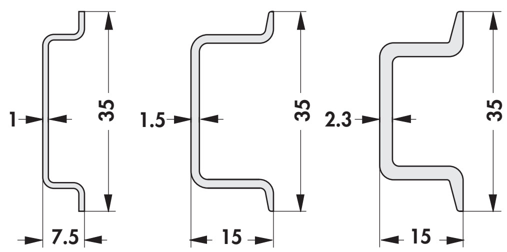
Heatsinks for solid state relays



- universal clip fastening, suitable for all 35 mm mounting rails according to DIN EN 50 022, rail thickness from 1 to 2.3 mm
  KL 35 ... ➔ E 75
- fast and simple asssembly of heatsinks by means of snapping them onto the mounting rail
- secure hold due to a stable extruded profile with integral stainless steel spring
- special lengths (≥40 mm) and drillings on request

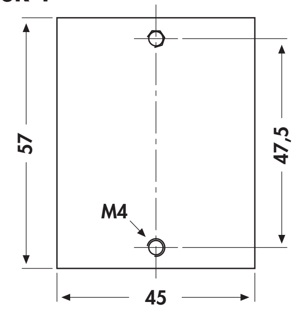
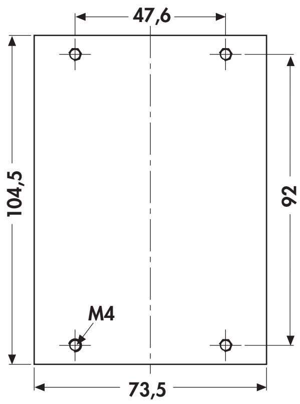
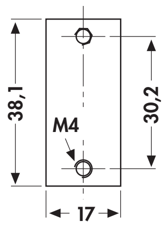
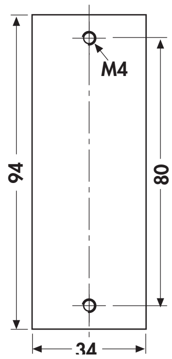




Examples of mounting rail versions suitable for KL 35

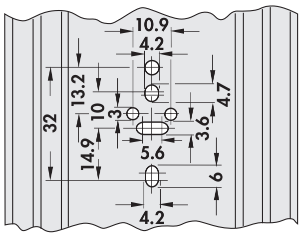
surface:	finish clear anodised

Heatsinks for solid state relays

perforations	with KL 35		without KL 35
– drilling pattern rotated by 90° as well as further drilling patterns upon request	– fixing of the SSR by means of screws with the help of insert nuts in the heatsink	– fixing of the SSR by means of screws with the help of tapped holes in the heatsink	– fixing of the SSR by means of screws with the help of tapped holes in the heatsink
	art. no.	art. no.	art. no.
SSR 1  	SK 172 75 KL SSR 1	SK 89 75 KL SSR 1 SK 89 100 KL SSR 1 SK 111 75 KL SSR 1 SK 434 75 KL SRR 1 SK 453 75 KL SRR 1 SK 467 75 KL SRR 1 SK 507 75 KL SSR 1	SK 04 75 SSR 1 SK 33 75 SSR 1 SK 455 75 SSR 1 SK 467 75 SRR 1 SK 507 75 SRR 1
SSR 2  		SK 89 100 KL SSR 2 SK 89 150 KL SSR 2 SK 176 150 KL SSR 2 SK 507 150 KL SSR 2	SK 04 150 SSR 2 SK 507 150 SSR 2
SSR 3  	SK 187 75 KL SSR 3	SK 111 75 KL SSR 3	
SSR 4  	SK 172 150 KL SSR 4	SK 455 100 KL SSR 4	SK 455 100 SSR 4 SK 467 100 SSR 4

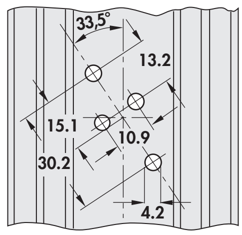
Hole pattern

CB



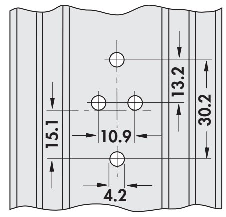
CB = TO 3 + SOT 9 + TO 66 + SOT 32
at |↔| 37.5 mm oblique drilling

TO 3 S



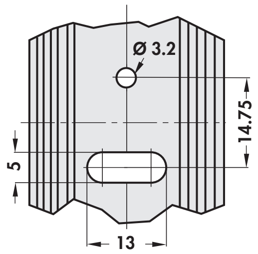
TO 3 oblique drilling for |↔| 37.5 mm

TO 3

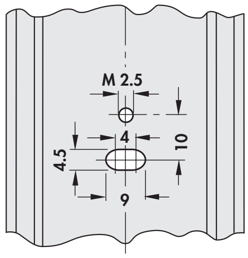


TO 3 exceeding |↔| 50 mm

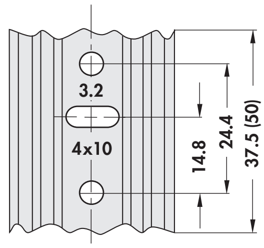
TO 220



SOT 32



K

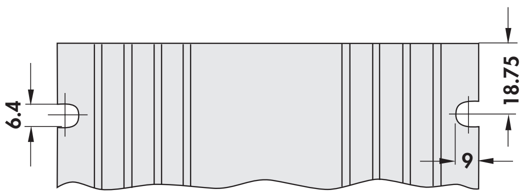


SOT 32 / TO 220 exceeding |↔| 37.5 mm

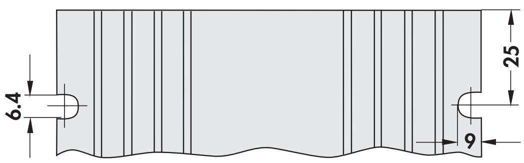
Standard hole pattern are processed as complete pin layouts, centered on the length of the heatsink.
Other positions of the pin layout on the heatsink, multiple drillings or changes of the drillings are processed according to customer's requirements.

For heatsinks exceeding |↔| 75 mm standard hole pattern can be supplied in multiple design.

Fixing slots



|↔| [mm]	number of fixing slots
37.5	2
75	4



|↔| [mm]	number of fixing slots
50	2
100	4

Heatsinks with the following shape and a standard hole pattern have these fixing slots as part of the serial production

Order example

SK 01	50	SA	TO3
profile	length	surface	pin layout

Surface treatment for heatsinks with standard drilling: black anodised **(SA).**

Raw degreased aluminium **(AL)** and clear natural anodise **(ME)** on request.

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Assignment table of transistor heatsinks

	TO 3	TO 66	SOT 9	TO 220	SOT 32
					
extruded heatsink	SK 01 SK 02 SK 03 SK 04 SK 05 SK 07 SK 08 SK 14 SK 16 SK 18 SK 19 SK 20 SK 21 SK 30 SK 31 SK 34 SK 36 SK 39 SK 45 SK 48 SK 51 SK 52 SK 53 SK 60 SK 63 SK 67 SK 69 SK 71 SK 72 SK 73 SK 74 SK 78 SK 79 SK 80 SK 88 SK 97 SK 122 SK 124 SK 147 SK 148 SK 185 SK 195 SK 197 SK 401 SK 402 SK 404	SK 01 SK 02 SK 03 SK 04 SK 05 SK 07 SK 08 SK 14 SK 16 SK 18 SK 19 SK 20 SK 21 SK 30 SK 31 SK 34 SK 36 SK 39 SK 45 SK 48 SK 51 SK 52 SK 53 SK 60 SK 63 SK 69 SK 71 SK 72 SK 73 SK 74 SK 78 SK 79 SK 80 SK 122 SK 147 SK 148 SK 185 SK 195 SK 197 SK 401 SK 402 SK 404	SK 01 SK 02 SK 03 SK 04 SK 05 SK 07 SK 08 SK 14 SK 16 SK 18 SK 19 SK 20 SK 21 SK 30 SK 31 SK 34 SK 36 SK 39 SK 45 SK 48 SK 51 SK 52 SK 53 SK 60 SK 63 SK 69 SK 71 SK 72 SK 73 SK 74 SK 78 SK 79 SK 80 SK 122 SK 147 SK 148 SK 185 SK 195 SK 197 SK 401 SK 402 SK 404	SK 09 SK 59 SK 64 SK 145	SK 01 SK 02 SK 03 SK 04 SK 05 SK 07 SK 08 SK 09 SK 14 SK 16 SK 18 SK 19 SK 20 SK 21 SK 30 SK 31 SK 34 SK 36 SK 39 SK 45 SK 48 SK 51 SK 52 SK 53 SK 60 SK 63 SK 65 SK 69 SK 71 SK 72 SK 73 SK 74 SK 78 SK 79 SK 80 SK 122 SK 147 SK 148 SK 185 SK 195 SK 197 SK 401 SK 402 SK 404

Assignment table transistor heatsinks

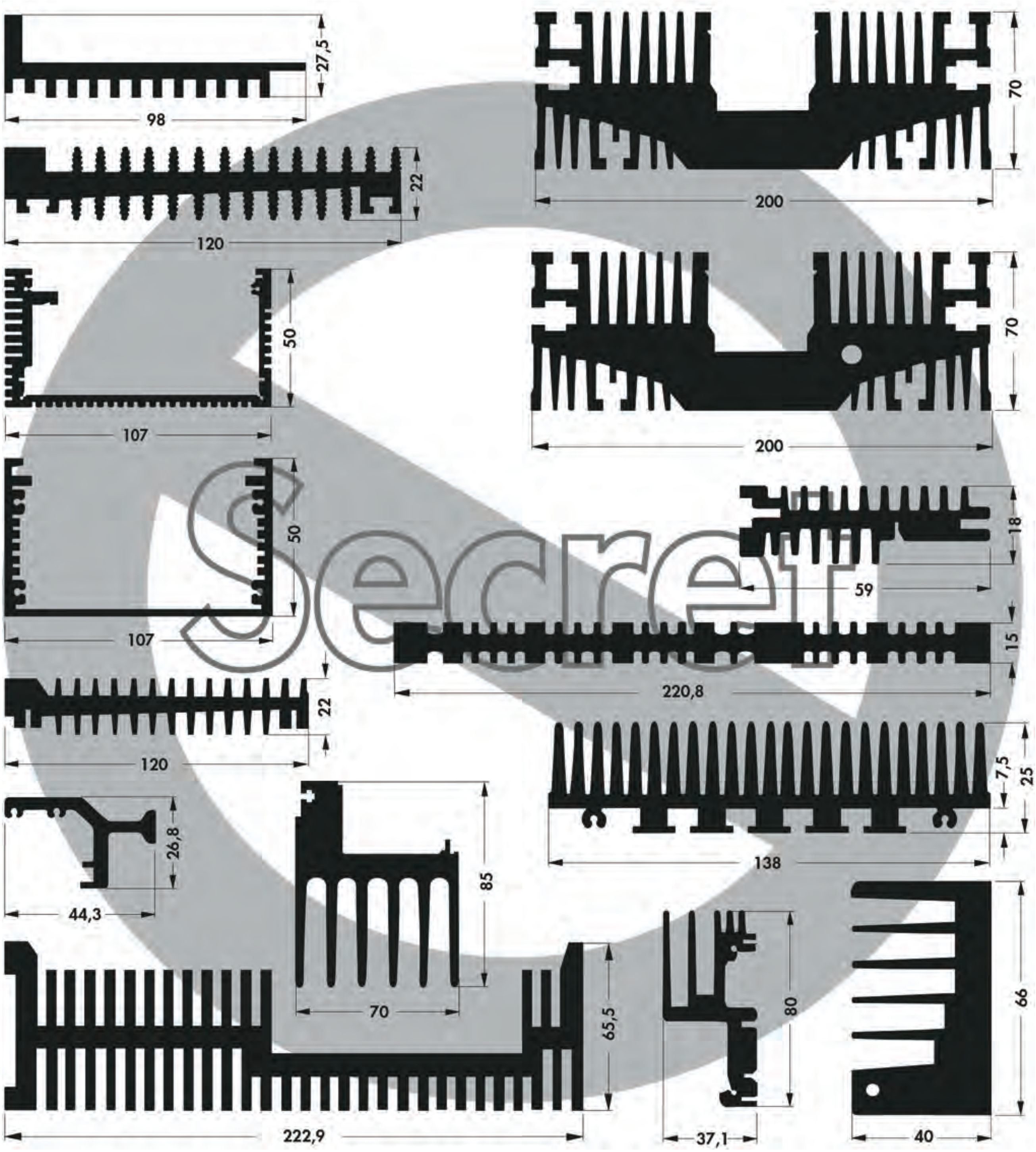
	TO 3	TO 66	SOT 9	TO 5	TO 247	TO 3 P
						
extruded heatsink with solder pin					SK 126 SK 145 SK 400 SK 437 SK 448 SK 459 SK 460 SK 600	SK 104 SK 129 SK 400 SK 409 SK 448 SK 456
extruded heatsink	WP 4030				SK 452 SK 484	SK 452 SK 484
set-up/clip-on heatsinks	AKK 127 AKK 191				FK 243 FK 245 FK 271 FK 272 FK 273 FK 274 FK 275 FK 276 FK 277 FK 278 FK 279 FK 280 FK 281 FK 282	
finger-shaped heatsinks	FK 201 FK 202 FK 205 FK 206 FK 207 FK 208 FK 223 FK 234 FK 236 FK 254 1 FK 318 FK 318 1	FK 201 FK 202 FK 205 FK 206 FK 207 FK 208 FK 223 FK 234 FK 236	FK 201 FK 202 FK 205 FK 206 FK 207 FK 208 FK 223 FK 234 FK 236			
small heatsinks				KF 5 KK 1 KK 562 SKK		

Special profiles

Whenever you cannot find the ideal solution for your problem from the wide range of standard extrusions on offer or a solution constitutes a compromise between the use of the space available and the weight, as long as the quantity is correct a special section is the answer.

Released from the dimensional restrictions of the standard profiles, special extrusions are tailored to your design requirements, and offer considerable benefits in terms of machining time and use of space.

Furthermore your calculation will be influenced positively by the optimised material use and shorter machining times.
You can determine the combination of the desired thermal properties and the design element yourself, by the use of a special profile.
We are not allowed to publish many of our customer-specific Profiles, because they are subject to „non disclosure agreements".
Therefore we only show some examples for customer profiles in the industry.
All figures are illustrations. Changes reserved.



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Imprints of heatsinks and housings – your and our repro time is valuable !

Production processes:

digital UV printing
Digital UV printing delivers high resolution printing with sharp contours throughprecise color application with up to 1200 dpi whereby the colors used cover the complete CMYK spectrum as well as white and silver tones. By means of a full-surface white underlay as a primer intensive colours are generated even on dark surfaces. With this printing method it is possible to print color gradients, pictures or photos. UV LEDs being activated immediately after the printing process harden the ink and ensure optimum durability of the ink on rough and smooth surfaces. Plastic materials, lacquered components and anodized or transparent passivated aluminum surfaces can be printed.

Silk screen printing
In a silk screen process the printing colour is printed on the material to be printed with help of a squeegee through a finely woven tissue. On the so-called silk a light-sensitive coating is applied which hardens by UV irradiation. Certain places which should remain translucent are covered by a film before the UV irradiation. The resulting screen is inserted in the silk printing machine and the requested colour is spread over the silk by a flood squeegee. In the next working step the silk frame is lowered over the workpiece to be printed and the colour is pressed on the material to be printed through the open spaces in the silk, the printing motive. The following hardening is processed at room temperature or by means of UV lamps.

Pad printing
The pad printing is an indirect gravure process for printing on different objects in almost any form and material. With a flood squeegee the requested colour is pulled over a cliché and then removed from the cliché with help of a doctor blade so that only a colour film remains in the recesses. The so-called pad absorbs the colour in the following working steps and presses it on the printing material in a rolling movement. The following hardening of the 2k-colours is processed at room temperature or by means of UV lamps. The pad printing allows the printing on different surface structures as well as on convex / concave curved parts due to the deformability of the pad.

Sub-elox printing
The sub-eloxal printing is a special printing process which is only used on aluminium surfaces. The special nature of this printing process is the colour that is printed in an anodised and open-pore aluminium surface. In a first production step the produced article is degreased and pickled in an anodising plant. Hereby the natural oxide layer of the aluminium is removed and a porous surface is produced. After the anodising process the requested motive is applied on the resulted surface by means of digital printing. Beforehand the aluminium workpiece is warmed up to 50°C whereby a fast drying of the applied colour is achieved. After permanent drying of the surface the final product is compressed in a hot water bath. Due to the hot water sealing the open pores are closed and a hard oxide layer is created under which the previously applied colour is enclosed.

The order for the printing has to contain the font, font size and the exact position of the scripture together with a dimensioning by considering countersinks, etc. A requested company logo always has to be sent as a vector file. If those specifications are neglected the printing order possibly has to be rejected or it leads to a lot of additional work which is associated with additional costs.

The fulfilment of the following criteria enables a smooth order processing:

Adobe Illustrator (.ai/.eps)	without continuous-tone image; used fonts converted into paths or supplied
Adobe Acrobat (.pdf)	all fonts enclosed; continuous-tone images colour-separated
InDesign (.indd)	spot colour or scale colours with right resolution (300 dpi colour, black and white 600 dpi); no RGB

This results in additional time requirement and therefore additional costs:
Precise testing of the data on usability by our repro department. Screen formats (.jpg, .gif, .png) and paper patterns, stickers or anything similar are usually not suitable for creating templates in most cases.

Templates which definitively cannot be used:
Imperfect copies such as paper-fax / Microsoft Office files (.doc, .xls, .ppt) can only be used for inspection or for transmitting texts.

Please always add dimensional drawings (.pdf; .dxf) to the parts to be printed.
Please note as a general rule: retouching work extending beyond the standard time will be invoiced additionally at cost price.