
QUALITY
EFFICIENCY
SERVICE
MeccAL
heatsinks

Con l'incremento della potenza dissipata dai dispositivi elettronici e la loro riduzione nelle dimensioni, la gestione della dissipazione di calore diventa un fattore sempre più importante nella progettazione dei prodotti elettronici. Una temperatura di funzionamento troppo elevata ne diminuisce infatti drasticamente sia l'affidabilità che la vita media.
Mecc.Al è specializzata nella progettazione e produzione di una gamma completa ed in continua evoluzione di dissipatori di ultima generazione per l'industria elettronica. A catalogo sono riportati tutti i profili e gli accessori dell'attuale gamma di prodotto standard che viene costantemente integrata dall'introduzione di nuovi profili e soluzioni tecnologiche.
La struttura tecnico commerciale di **Mecc.Al** è a completa disposizione dei propri clienti e partner commerciali per supportarli in ogni loro più specifica esigenza e possibile customizzazione del prodotto.

With the increase of the power dissipated by electronic devices and their reduction in size, the thermal management of heat dissipation becomes an increasingly critical factor in the design of electronic products. A too high operating temperature drastically decreases both the reliability and lifetime of the components. Mecc.Al is highly specialized in designing and manufacturing a full range in continue evolution of last generation heat sinks for the electronics industry. The catalogue lists all the profiles and accessories of the current range of standard product that is constantly integrated into the introduction of new profiles and technological solutions. The Sales and Technical Departments of Mecc.Al are at its customers and business partners full disposal to support them in all their specific needs and possible customized products.

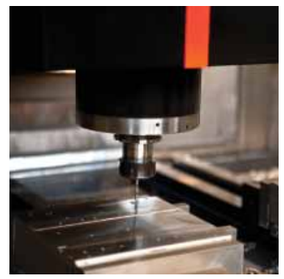
Indice
Index

Azienda
The Company

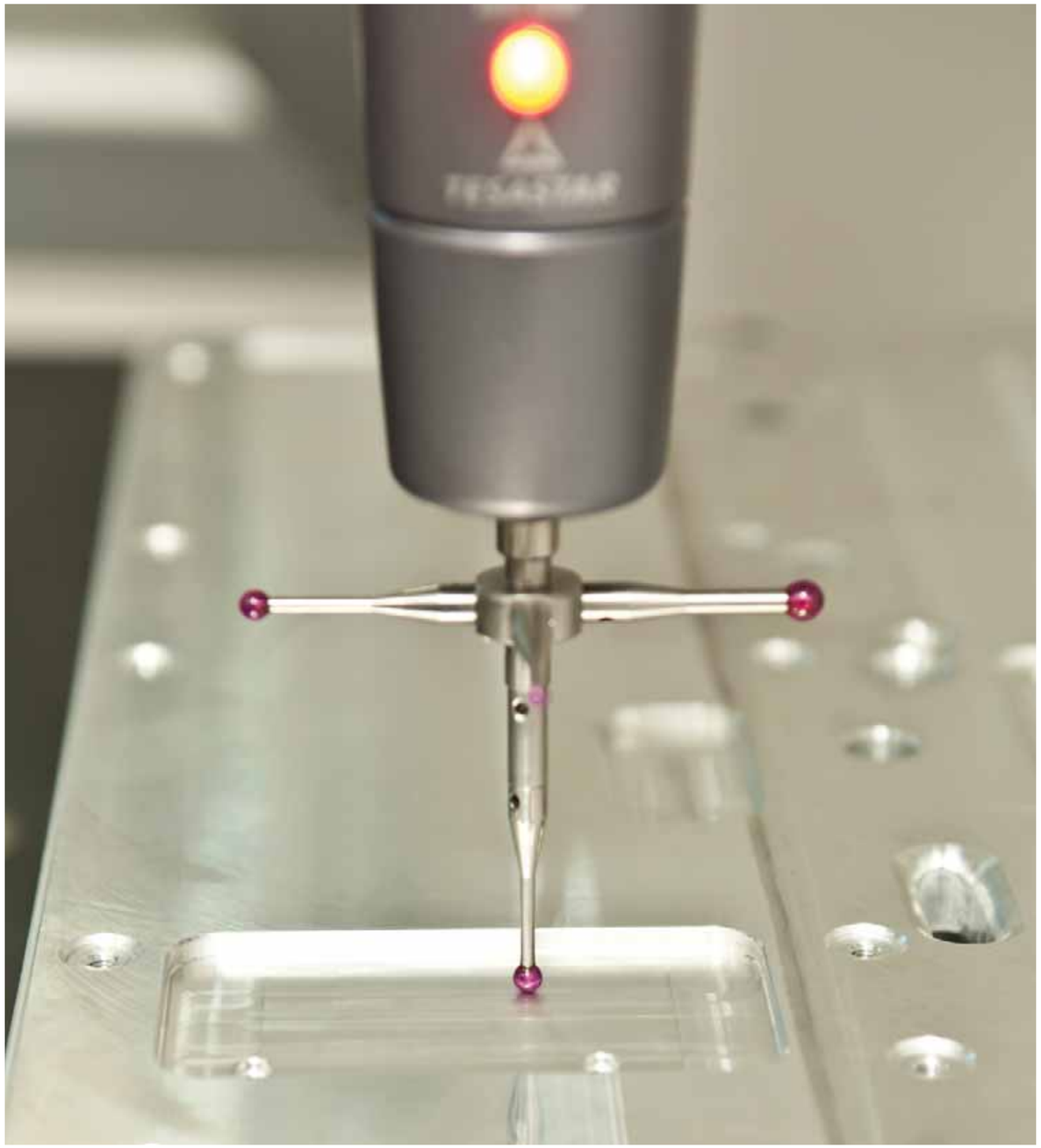
Mecc.Al srl, fondata nel 1996, è una delle sette aziende facenti parte del più grande gruppo industriale privato Italiano del settore dei laminati in allumino con volumi complessivi annui prodotti di oltre 110.000 tonnellate ed esportati in 85 paesi. A capo del gruppo è **Profilglass** S.p.A., a sua volta leader mondiale nella produzione di profili distanziatori e decorativi per vetrocamere. **Mecc.Al** è l'azienda del gruppo specializzata nella progettazione e produzione di dissipatori di calore e supporti meccanici per l'industria elettronica. Avvalendosi delle più moderne tecnologie produttive e di macchine a controllo numerico di ultima generazione, ed attraverso l'esperienza e know-how del proprio ufficio tecnico, **Mecc.Al** offre ai propri clienti una gamma completa di dissipatori in alluminio estrusi, saldati, assemblati ad alte prestazioni, piatti ad acqua, sistemi a clips e ad alette resinate per una ampia varietà di applicazioni, dai gruppi di continuità ai sistemi di telecomunicazione, dall'elettronica industriale di potenza ai sistemi per energia rinnovabile, dal ferroviario all'automotive.

Mecc.Al srl, founded in 1996, is one of the seven companies belonging to the largest Italian private industrial group in the sector of rolled aluminum products with a total annual manufactured volume of over 110,000 tons exported to 85 countries. Heading the group is Profilglass SpA, world leader in the production of spacers and decorative profiles for insulating glass. Mecc.Al is the company of the group specialized in the design and manufacture of heat sinks and mechanical support for the electronics industry. Using the most modern design and production technologies and last generation CNC machines, and through the experience and know-how of its Technical Department, Mecc.Al offers its customers a full range of aluminum heat sinks extruded, welded, assembled high-performance, liquid cooled plates, clip systems and bonded fins for a wide variety of applications, from uninterruptible power supplies to network-communications, from power electronics to renewable energy, railway and automotive sectors.

MeccAL
heatsinks



Qualità, efficienza e servizio
Quality, efficiency and service



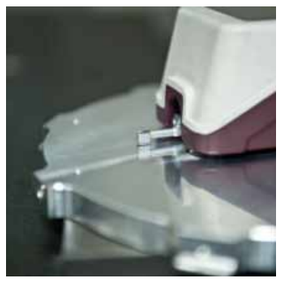
Mecc.Al fornisce da sempre prodotti che soddisfano o eccedono le richieste dei clienti per qualità, tempi di consegna e prestazioni. È una filosofia che i nostri dipendenti hanno assimilato a tutti i livelli, assicurando uno standard qualitativo elevato e costante nel tempo riuscendo così a perseguire l'obiettivo della piena soddisfazione del cliente.

La ricerca della qualità in tutti gli aspetti della produzione è uno dei punti fondamentali di **Mecc.Al**, certificata dall'ente internazionale DNV, secondo la norma UNI EN ISO 9001:2008, grazie anche ad una accurata politica di selezione e controllo rivolta verso i nostri partner e fornitori.

Il reparto di R&S e l'Ufficio Tecnico di **Mecc.Al** sono in grado di fornire ogni tipo di informazione relativa al prodotto e al suo migliore utilizzo, e di sviluppare dissipatori e profili speciali su specifica del cliente, fornendo assistenza e supporto per l'ottimizzazione delle performance termiche del dissipatore con un laboratorio specializzato nella simulazione e caratterizzazione che si avvale di strumenti software all'avanguardia come SolidWorks Flow Simulation.

Un prodotto di alta qualità, affidabile ed esauriente, la capacità manifatturiera, il personale dedito e qualificato ed il rispetto rigoroso dei celeri tempi di consegna sono i punti di forza di **Mecc.Al** che la rendono partner ideale per tutte le esigenze nell'ambito della dissipazione del calore.

Il nostro impegno alla qualità si rivolge allo stesso tempo al rispetto della salute umana ed ambientale, offrendo prodotti conformi alla direttiva RoHS e REACH che limita la presenza di sostanze pericolose nella produzione di apparecchiature elettriche ed elettroniche.



Since always and as a company prerogative Mecc.Al provides products that meet or exceed customer requirements in terms of quality, delivery terms and performance. It is a philosophy that our employees have assimilated at all levels, ensuring a high standard of quality and constant over time allowing them to pursue the goal of the complete customer satisfaction.

Top quality in all aspects of production is one of the key points of Mecc.Al, certified UNI EN ISO 9001:2008 by the International Accredited Unit DNV, thanks also to an extremely careful policy of selection and control of our partners and suppliers.

The R&D and Technical Department of Mecc.Al can provide any information and support on the product and its best use and application, and is able to design and develop new heat sinks and special profiles according to customer specifications optimizing the thermal performance of the heat sinks also supported by SolidWorks Flow Simulation software.

The ability to provide a high quality product, reliable and comprehensive manufacturing capacity, dedicated and qualified staff and strict respect to the short delivery terms are the strengths of Mecc.Al that make us an ideal partner for all requirements on thermal management.

Our commitment to quality is targeted at the same time to human and environmental respect and health, by offering products that meet the RoHS and REACH directives that restrict the presence of hazardous substances in the production of electrical and electronic equipment.

DET NORSKE VERITAS

QUALITY MANAGEMENT SYSTEM CERTIFICATE

Certificato No. / Certificate No. CERT-16646-2005-AQ-BOL-SINCERT

Si attesta che / This certifies that

Il sistema di gestione per la qualità di / the quality management system of

MECC.AL. S.r.l.

Via Giovanni Agnelli, 25 - 61032 Calcinelli di Saltara (PU) - Italy
Via Giovanni Agnelli, 12 - 61032 Calcinelli di Saltara (PU) - Italy

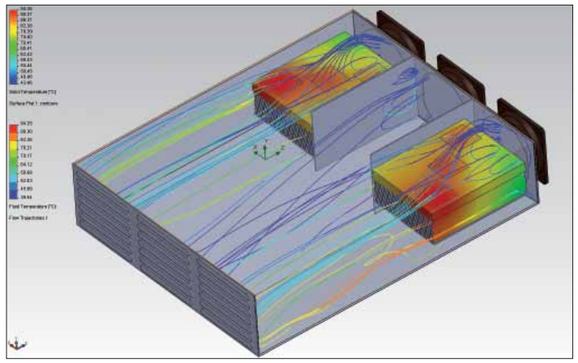
È conforme ai requisiti della norma per i sistemi di gestione per la qualità
Conforms to the quality management systems standard

UNI EN ISO 9001:2008 (ISO 9001:2008)

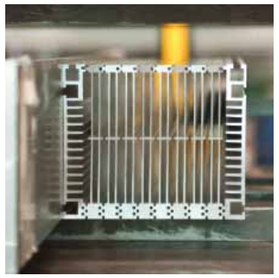
Questa certificazione è valida per il seguente campo applicativo:
This certificate is valid for the following products or services:

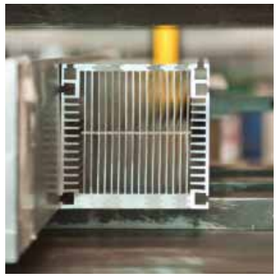
Produzione di dissipatori in alluminio
Manufacture of aluminium heat sinks

Data Prima Emissione / First Issue Date: 2005-11-28
Data di scadenza / Expiry Date: 2014-11-07
Luogo e data / Place and date: Agrate Brianza, (MB) 2011-09-15
per l'Organismo di Certificazione / for the Accredited Unit: DET NORSKE VERITAS ITALIA S.R.L.
Settore EA : 17
Corrado Stefani, Lead Auditor
Zeno Beltrami, Management Representative



La produzione
The production





Dotata della migliore tecnologia, un magazzino fornito da più di 400 diversi profili estrusi e un processo produttivo supportato da diversi centri di lavoro a controllo numerico multi pallet, **Mecc.Al** riesce a far fronte ad ordini per piccoli e grandi quantitativi garantendo sempre la massima qualità e puntualità nelle consegne. Grazie all'utilizzo dei più moderni software di progettazione CADCAM, di SolidWorks e SolidCAM, siamo in grado di fornire soluzioni efficaci anche su progetti complessi, garantendo fin dal primo stadio di sviluppo la totale rispondenza alle specifiche del cliente. Il Sistema Controllo Qualità è supportato dall'utilizzo dei più moderni strumenti di misurazione verticale e tridimensionale.

Sono disponibili in produzione:

- Macchine per il taglio automatico e semiautomatico
- Macchine CNC multi pallet
- Presse
- Macchine saldatrici
- Sistemi di lavaggio ad ultrasuoni.

Oltre a qualsiasi tipo di lavorazione meccanica, grazie al proprio impianto di ossidazione, Mecc.Al offre la possibilità delle seguenti finiture superficiali:

- Anodizzazione (nera o con colore a richiesta)
- Alodine o Surtec
- Burattatura
- Grezzo
- Sabbiatura
- Verniciatura.

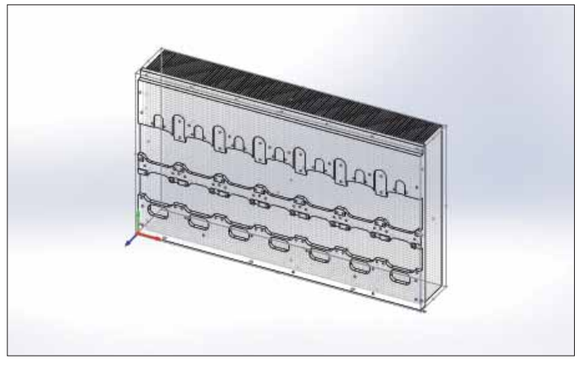
Equipped with the best technology, a warehouse provided by more than 400 different extruded profiles available on stock and a manufacturing process supported by several multi pallet computer numerical controlled machines, Mecc.Al is able to manage orders for small and large quantities always providing the highest quality and timeliness deliveries.
Thanks to the latest CADCAM design software, SolidWorks and SolidCAM, we can also provide effective solutions to complex projects, guaranteeing the full compliance to customer specifications from the very first stage of product design. The Quality Control is also supported by the use of 3-D Measuring machines and Height gauge machine.

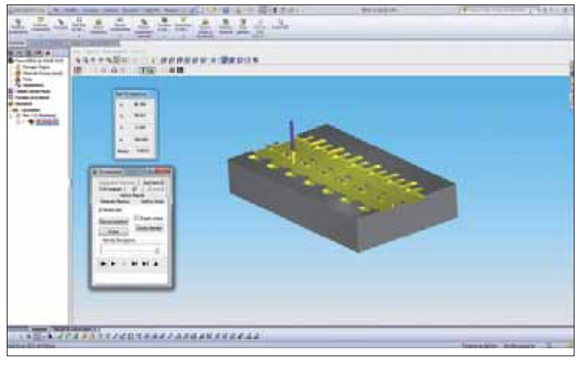
The following technologies are available in our manufacturing plants:

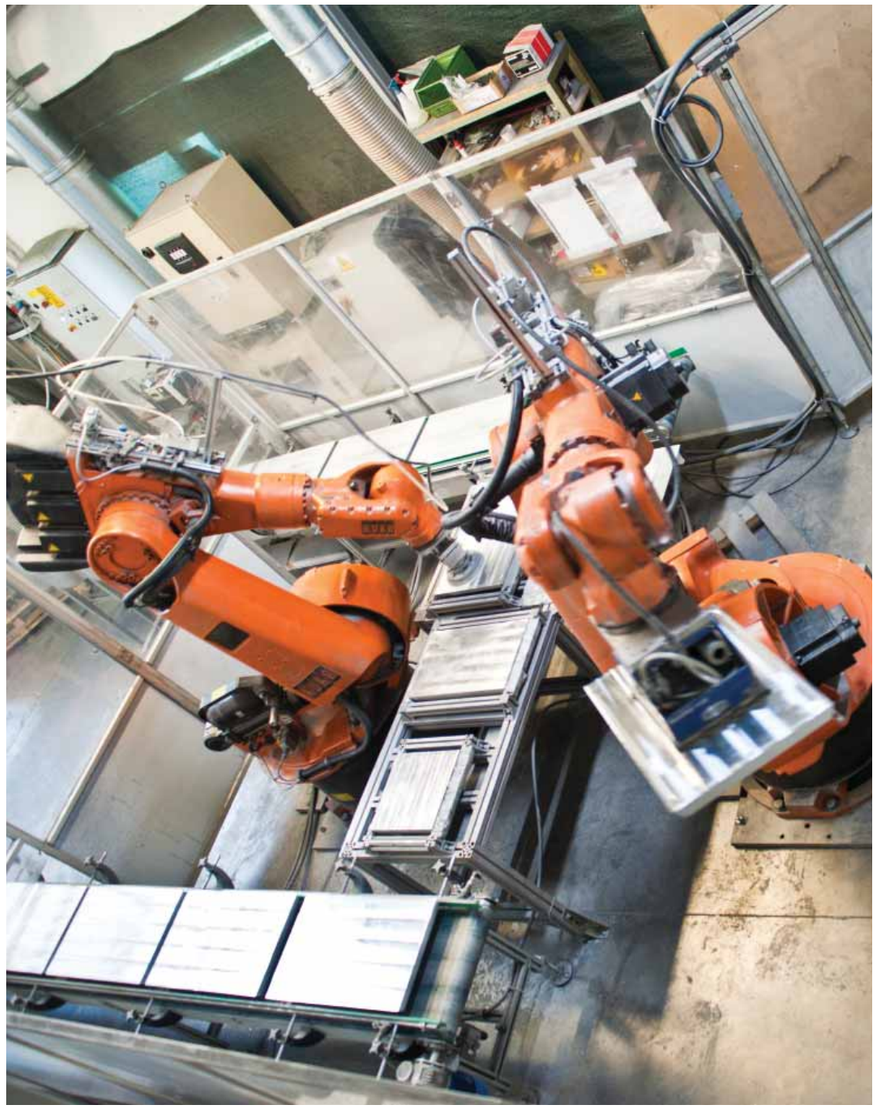
- **Automatic and semi-automating cutting machines**
- **Multi pallets CNC machines**
- **Presses**
- **Welding machines**
- **Ultrasound washing systems.**

Besides to every kind of mechanical machining, through own anodizing plant, Mecc.Al offers the possibility of the following finishing surfaces:

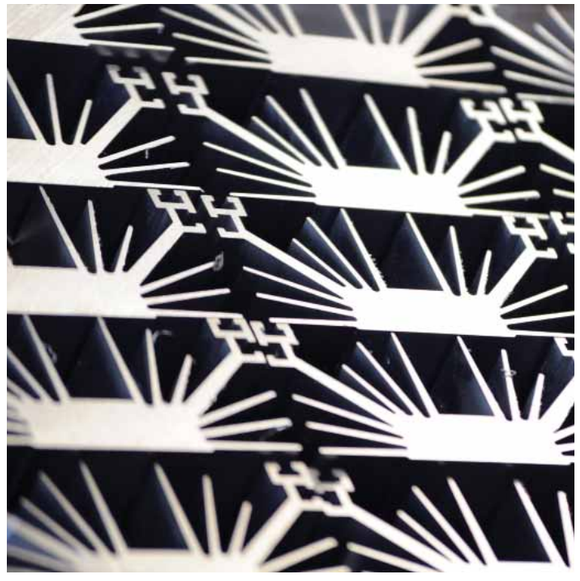
- **Black or coloured anodizing**
- **Alodine or Surtec passivation**
- **Barrel finishing**
- **Raw**
- **Sandblasting**
- **Painting.**

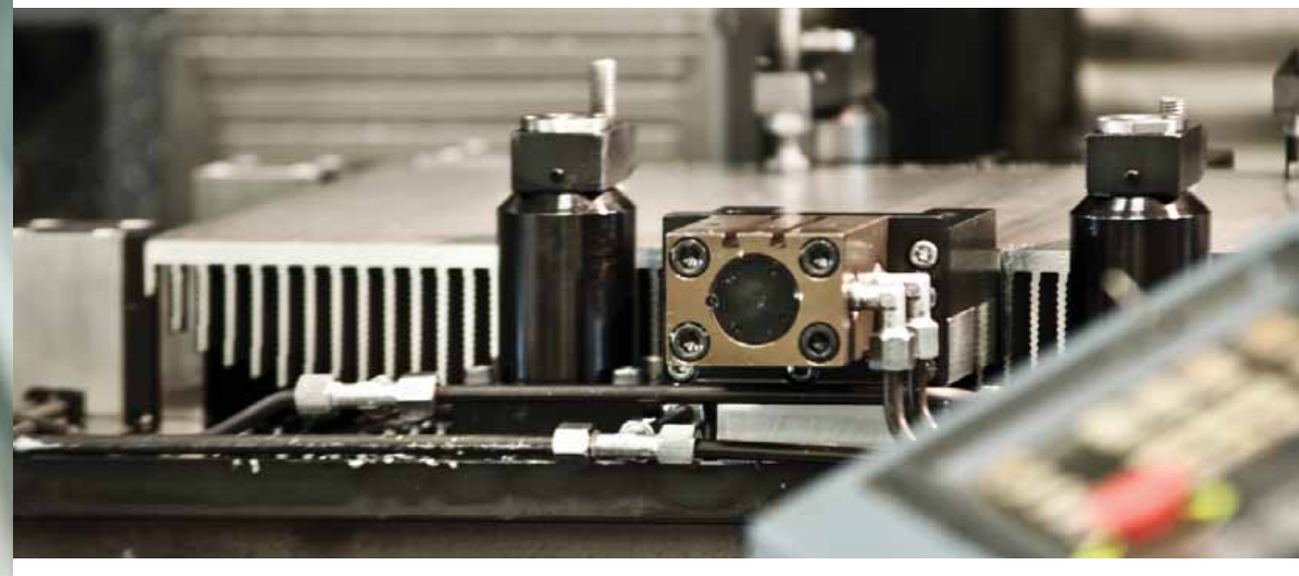


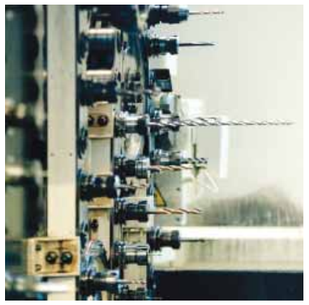




MeccAL heatsinks

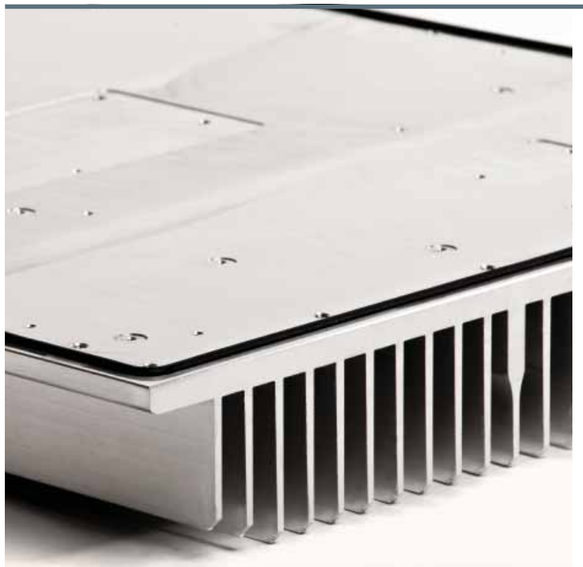






Il prodotto
The product

1



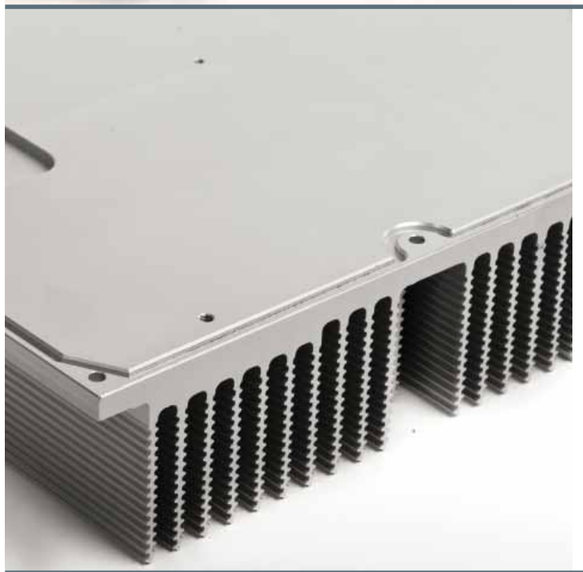
Estruso

Extruded heat sink

Il processo di estrusione dell'alluminio permette di ottenere profili di infinite forme anche complesse. Variando la forma del profilo, cambia la superficie di contatto con l'aria e di conseguenza la capacità di dissipazione. I prodotti estrusi sono generalmente utilizzati in sistemi di media potenza sia in convezione naturale che forzata. I dissipatori estrusi vengono presentati suddivisi per forma (T, H, L, K, E, U, P, pettine e PC pettine e coperchio), larghezza ed altezza, ed organizzati in ordine crescente di dimensioni. Ad esempio, **P400 40** sta ad indicare un dissipatore estruso a forma di Pettine, largo 400 mm e alto 40 mm.

The aluminium extrusion process allows to make innumerable shapes profiles. By modifying the shape of the profile, the surface in contact with air changes and consequently the dissipation capability does.
The extruded heat sinks are generally used in medium electric power systems both in natural and forced convection. The extruded heat sinks are presented divided by shape (T, H, L, K, E, U, P flat back and PC flat back with cover), width and height, and shown in increasing order of size. For example, P400 40 indicates an extruded heat sink having a flat back shape (P), 400 mm wide and 40 mm high.

2



Saldato

Welded heat sink

Per ottenere profili di dimensioni elevate non realizzabili direttamente con l'estrusione, si possono saldare tra loro due o più profili estrusi.
La saldatura è estremamente flessibile alle esigenze dimensionali del cliente e utilizzabile per qualsiasi modifica a profili già esistenti.
Mecc.Al mette a disposizione appositi profili estrusi già smussati per una più efficiente operazione di saldatura, oltre ad una tecnologia all'avanguardia su macchine dedicate che evita l'aggiunta di materiale di saldatura sul dissipatore.

To obtain wider profiles than the ones achievable from extrusion process, it is possible to join together two or more extruded profiles through welding process. This process is extremely flexible to dimensional customer requirements and serviceable for any modification on existing extruded profiles. Mecc.Al provides already bevelled profiles for a higher efficient welding operation, in addition to a technology on dedicated machines which avoids additional welding material into the heat sink.

3

Sistema a molla

Clip system

Il sistema a molla, combinazione di dissipatore e molla di fissaggio, viene particolarmente utilizzato nelle schede elettroniche PCB per il raffreddamento dei package TO-220, TO-247 e similari.
Analogamente al tradizionale sistema di fissaggio a vite, il sistema di assemblaggio a molla offre le stesse prestazioni di scambio di calore tra dissipatore e componente elettronico con notevoli vantaggi in termini tecnici e di produttività.
Oltre a fornire una pressione omogenea e misurata al centro del dispositivo a semiconduttore, i sistemi a molla semplificano notevolmente sia la fase di primo assemblaggio che quella di smontaggio e rimontaggio in seguito a manutenzioni.

The clip system, combination of heat sink and clamping clip, is particularly used in PCB electronic circuit boards for the cooling of TO-220, TO-247 and similar packages.
Like the conventional screw assembled system, the clip system offers the same performance of heat exchange between heat sink and the electronic device with considerable technical and productivity advantages. In addition to providing an evenly and measured pressure at the center of the semiconductor device, the clip systems greatly simplify both the first phase of assembly and the disassembly-reassembly during maintenance.

Il prodotto
The product

4

Alta efficienza

High performance heat sink

Questa linea di prodotti nasce dalla continua e crescente esigenza di fornire dissipatori dalle prestazioni termiche sempre maggiori.
Per raggiungere questo obiettivo, abbiamo lavorato sulla sezione della singola aletta, sul numero di alette e sulla loro disposizione.
Ottenuti assemblando meccanicamente le singole alette, i dissipatori ad alta efficienza offrono inoltre una elevata flessibilità dimensionale e stesse caratteristiche meccaniche dei dissipatori estrusi, rendendoli particolarmente adatti per l'utilizzo in sistemi ad alta potenza in convezione forzata.
Definiti Profili Assemblati (PA) sono suddivisi per larghezza ed altezza del singolo profilo aletta o modulo ed organizzati in ordine crescente di dimensioni.

The high performance heat sinks series born from the continuous and growing need to have heat sinks with higher thermal performances.
To reach that purpose, we worked on every single fin section, on fins number and on their layout on the sink. Got by assembling the single fins mechanically, the high performance heat sinks provide an high dimensional flexibility together with the good mechanical characteristics of the extruded heat sinks. The high performance heat sinks are mostly used in high electric power systems in forced convection. The Assembled Profiles (PA) are divided by width and height of the single fin or module and shown in increasing order of size.

5

Alette resinate

Bonded fins heat sink

Il dissipatore ad alette resinate è ottenuto assemblando la base del dissipatore e le alette attraverso l'utilizzo di resina epossidica ad alta conducibilità termica.
Studiati per applicazioni in convezione forzata, questa famiglia di dissipatori offre prestazioni termiche elevate insieme alla migliore flessibilità dimensionale.
Ottenuti da piatti e laminati prodotti internamente al nostro gruppo industriale, i dissipatori resinati non necessitano di particolari matrici di estrusione ed offrono la possibilità di combinare diversi materiali quali rame e alluminio.

The bonded fins heat sink is obtained by assembling the base of the heat sink and the fins using high thermal conductivity epoxy.
Designed for forced convection applications, this family of heat sinks offers high thermal performance along with the best dimensional flexibility.
Obtained from metal plates and sheets made in our industrial group, bonded fins heat sinks do not require dedicated extrusion tool and offer the possibility of combining different materials such as copper and aluminum.

6

A liquido

Liquid cooled plate

Sfruttando l'elevata conducibilità termica dei liquidi, i sistemi di raffreddamento a liquido, comprensivi di pompa, piastra raffreddata a liquido, scambiatore di calore e vaso di espansione, sono riservati alle applicazioni caratterizzate da potenze dissipate troppo elevate per effettuare un raffreddamento ad aria.
Oltre a profili standard in cui i canali di raffreddamento sono ottenuti direttamente dal processo di estrusione o di lavorazione meccanica, **Mecc.Al** produce piatti a liquido in alluminio completi di sistemi di canalizzazione in rame, alluminio o acciaio e terminazioni completamente personalizzabili su richiesta del cliente.

By taking advantage of liquids high thermal conductivity, the liquid cooling systems, comprehensive of pomp, liquid cooled plate, heat exchanger and expansion tank, are reserved for those applications where the required power dissipation is too high for conventional air cooled heat sinks.
Apart from standard plates where the cooling canals are got directly from extrusion or machining process, Mecc.Al makes aluminum liquid plates having copper, aluminum or stainless steel pipe canalization system and end connections according to customer requirements.

MeccAL heatsinks

Informazioni tecniche
Technical information

Materiale e lavorazioni meccaniche
La leggerezza (2,7 g/cm^3), la conducibilità termica (220 W/m•K) e l'elevata lavorabilità sono le proprietà principali che rendono l'alluminio il metallo adatto alla fabbricazione dei nostri sistemi di dissipazione termica. Salvo diversa indicazione, le caratteristiche dei profili estrusi utilizzati sono le seguenti:
- Composizione chimica: Lega Alluminio EN AW-6060, 6061, 6063 or 6082, secondo la norma europea EN 573-3
- Caratteristiche meccaniche: T5 o T6, secondo norma la norma europea EN 755-2
- Tolleranze dimensionali e di forma secondo la norma europea EN 755-9.

Se non diversamente specificato a disegno e accordato col cliente, i prodotti sono lavorati meccanicamente in rispetto alle tolleranze generali specificate nella norma ISO 2768-m. Tuttavia, salvo indicazione contraria, i pezzi non conformi alle tolleranze generali prescritte non devono essere automaticamente rifiutati quando la funzionalità del pezzo non risulta compromessa.

Prodotti speciali
Mecc.Al produce e commercializza supporti meccanici in alluminio per l'industria elettronica quali:
- Barre commerciali estruse (barre piatte, angolari, barre quadrate e profilati a L e ad U)
- Scatole e contenitori estrusi
- Scatole per alta frequenza ottenute da blocchetti pieni in alluminio.

Material and mechanical machining
The lightness (2,7 g/cm^3), the thermal conductivity (220 W/m•K) and the malleability are the main properties making aluminium the most suitable metal for our heat dissipation systems. If not otherwise stated, the characteristics of used extruded profiles are:
- **Chemistry composition: Aluminium Alloy EN AW-6060, 6061, 6063 or 6082, according to EN 573-3 European regulation**
- **Mechanical characteristic: T5 or T6, according to EN 755-2 European regulation**
- **Tolerances on dimensions and form according to EN755-9 European regulation.**

If not specified on drawing and agreed with customer, the heat sinks are machined according to general tolerances indicated on ISO 2768-m international regulation.
However, if not otherwise stated, not comply pieces to above general tolerances should not automatically be refused when their functionality is not compromised.

Special products
Mecc.Al manufactures and supplies the following mechanical supports for electronic industry:
- **Extruded commercial profiles (flat bars, angles, square bars, L and U profiles)**
- **Extruded boxes and cases**
- **Enclosures for high frequency technology made from a full aluminium profile.**

Come scegliere un dissipatore
L'impiego di un dissipatore di calore in un sistema elettronico, favorendo la trasmissione termica fra dispositivo e ambiente, porta ad una riduzione della resistenza termica dell'intero sistema, permettendo di diminuire la temperatura raggiunta dal dispositivo elettronico a parità di potenza dissipata oppure, sfruttando la massima temperatura di lavoro, di disporre di una potenza dissipabile più elevata.
Le prestazioni di un dissipatore si misurano con la sua resistenza termica R_{TH}[K/W] fornita dal costruttore che tiene conto della trasmissione di calore per convezione ed irraggiamento dal dissipatore all'ambiente circostante più freddo.
La resistenza termica di un dissipatore dipende da diversi fattori quali materiale utilizzato (conducibilità termica), forma e dimensioni, colore e finitura superficiale (efficienza di irraggiamento e resistenza di contatto), condizioni di ventilazione e di montaggio (convezione naturale o forzata). Più piccola è la resistenza termica, e migliori sono le prestazioni di un dissipatore. Conoscendo la temperatura ambientale T_a, la potenza massima dissipata dal dispositivo P_d, la sua resistenza termica giunzione-contenitore R_{THje} e la temperatura massima consentita T_j, la massima re-

How to select a heat sink
A heat sink in an electronic system, by enhancing the heat dissipation from the electronic device (hot surface) to the colder surrounding environment, allows to decrease the thermal resistance of the whole system and therefore the temperature achieved from the device is lower. In the same way, by fixing the maximum device working temperature, a heat sink allows to dissipate a higher power. The performance of a heat sink is related to its thermal resistance R_{TH}[K/W] provided by the manufacturer's datasheet, that takes in account of the convection and radiation heat transferring from the heat sink to the surrounding environment. The thermal resistance depends on different factors: material (thermal conductivity), shape and size, colour and surface finishing (radiation efficiency and contact resistance), convection power and heat sink mounting position (natural or forced convection). Obviously, to a smaller thermal resistance corresponds a better heat sink performance. By knowing the ambient temperature T_a, the power to be dissipate from the electronic device P_d, its junction to case thermal resistance R_{THje} and maximum allowable tempe-

Informazioni tecniche
Technical information

sistenza termica del dissipatore richiesta da progetto è calcolabile come

$$R_{TH} = \frac{T_j - T_a}{P_d} - R_{THje} - R_{THch}$$

Dove R_{THch} è la resistenza termica tra il contenitore del dispositivo elettronico e dissipatore, dipendente dal materiale usato all'interfaccia per omogeneizzare la superficie di contatto (usualmente grasso di silicone). Occorre quindi scegliere da catalogo un dissipatore con una resistenza termica almeno inferiore a quella calcolata.

Condizioni di misura della resistenza termica
Nel presente catalogo i dissipatori sono presentati ordinati per forma e dimensioni espresse in millimetri. Per ogni profilo, sono riportati i seguenti parametri:

- Kg/mt: Peso in chilogrammi del profilo per unità di lunghezza (metro)
- L: Lunghezza in millimetri del dissipatore fissata per il calcolo della resistenza termica indicata
- W: Larghezza in millimetri del dissipatore fissata per il calcolo della resistenza termica indicata (solo per i dissipatori assemblati ad **alta efficienza**)
- $R_{TH,N}$: Resistenza termica in convezione naturale espressa in K/W con sopraelevazione di temperatura di 70°C (temperatura ambiente 25°C)
- $R_{TH,F}$: Resistenza termica in convezione forzata espressa in K/W con velocità dell'aria pari a 3 m/s e sopraelevazione di temperatura di 50°C (temperatura ambiente 25°C). Per flussi d'aria a diverse velocità, fare riferimento al grafico **"Air Speed Correction Factor"** per la determinazione del fattore di moltiplicazione da applicare alla resistenza termica indicata.

I valori di resistenza termica riportati derivano da prove effettuate in laboratorio a temperatura controllata in condizioni verosimili a quelle riscontrate nella realtà. In particolare:

- Sorgente di calore posta al centro del dissipatore con interposizione di grasso di silicone
- Temperatura misurata sulla superficie del dissipatore nelle immediate vicinanze della sorgente di calore attraverso termocoppie a bassa inerzia termica
- In convezione naturale, dissipatore disposto nella condizione di massima efficienza con alettatura verticale.
  Per il montaggio orizzontale, occorre considerare un aumento di $R_{TH,N}$ del 20% circa
- Superficie del dissipatore non trattata.
  Per il particolare anodizzato nero in convezione naturale, il valore della resistenza termica $R_{TH,N}$ va diminuito del 10% circa
- I valori delle resistenze termiche sono relative ai valori di lunghezza indicati. All'aumentare della lunghezza del dissipatore la resistenza termica diminuisce con legge non lineare.

rature T_j, it is possible to calculate the maximum allowable heat sink thermal resistance value as

$$R_{TH} = \frac{T_j - T_a}{P_d} - R_{THje} - R_{THch}$$

Where R_{THch} is the case to heat sink thermal resistance, depending on thermal resistivity of the material used on the case to heat sink interface for getting an homogeneous contact surface (usually, silicone grease). Therefore it is necessary to select on the catalogue a heat sink having a thermal resistance value at least less than the calculated one.

Measurement of thermal resistance
In the catalogue, the heat sinks are shown divided for kind of product and shape, in increasing order by size (in millimetres). For each profile, the following parameters are indicated:

- Kg/mt: Profile weight (kilograms per metre)
- L: Heat sink length in millimetres, fixed in order to calculate the shown thermal resistance
- W: Heat sink width in millimetres, fixed in order to calculate the shown thermal resistance (only for **High Performance heat sink**)
- $R_{TH,N}$: Thermal resistance [K/W] in natural convection calculated with a 70°C sink to ambient temperature difference (25°C ambient temperature)
- $R_{TH,F}$: Thermal resistance [K/W] in forced convection calculated with an air speed of 3 m/s and a 50°C sink to ambient temperature difference (25°C ambient temperature). For different air flow speed, refer to **"Air Speed Correction Factor"** graph to calculate the multiplication factor to apply to the thermal resistance.

The thermal resistance values come from tests made at **Mecc.Al** air conditioned laboratory with following conditions:

- One heat source placed in the middle of the heat sink by using silicone grease between them
- Temperature measured on the heat sink surface under the heat source through miniaturized thermocouples
- In natural convection tests, fins vertically arranged. In horizontal use, the thermal resistance value $R_{TH,N}$ has to be increased by around 20%
- Raw surface heat sink. For black anodized heat sink surface in natural convection, the thermal resistance value $R_{TH,N}$ has to be decreased by around 10%
- The thermal resistances values are related to the shown profile length. The thermal resistance decreases with a non-linear law by increasing the heat sink length.

Per i dissipatori assemblati ad **Alta Efficienza**, le resistenze termiche sono state calcolate usando dissipatori di lunghezza fissata pari a 150 mm. Per diverse lunghezze, fare riferimento al grafico **"Length Correction Factor"** per il calcolo del fattore di moltiplicazione da applicare alla resistenza termica indicata nel profilo, sia in convezione naturale che forzata

- Per i dissipatori ad **Alta Efficienza**, sono riportarti i valori di resistenza termica di assemblati di larghezza (W) di circa 100 mm. Al variare della larghezza del dissipatore, la curva della resistenza termica può essere approssimata in maniera lineare, e dunque raddoppiando la larghezza del dissipatore, la resistenza termica si dimezza.

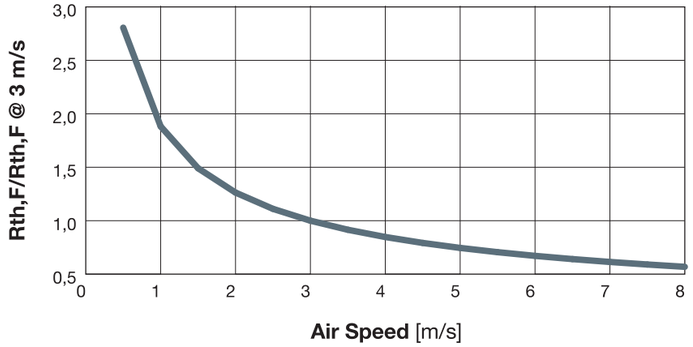
I dati riportati nel presente catalogo derivano da prove di laboratorio e simulazioni effettuate in modo accurato e pertanto sono da considerare affidabili. Tuttavia, poiché le condizioni reali di utilizzo possono essere diverse da quelle di laboratorio, si consiglia di effettuare una verifica pratica nelle condizioni in cui il dissipatore verrà utilizzato.

For assembled High Performance heat sinks, the thermal resistances have been calculated for a 150 mm long piece. For different lengths, it is necessary to multiply the given thermal resistance value by the appropriate factor provided from "Length Correction Factor" graph (for both natural and forced convection cooling)

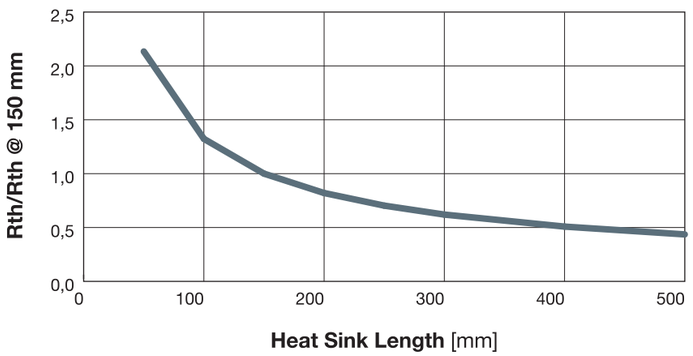
- **For assembled High Performance heat sinks, the thermal resistances have been calculated for an around 100 mm wide piece (W). Varying the heat sink width, the thermal resistance curve can be approximated with a linear law, that is by doubling the heat sink width, the thermal resistance is halved.**

The technical data on this catalogue come from thermal simulations and laboratory tests run in an accurate way, so they can be considered reliable. However, taking into account that the heat sink working conditions of any customized application could be different from the laboratory ones, we suggest to run a thermal test with the same final customer conditions.

Air speed correction factor



Length correction factor (high performance heatsinks only)



MeccAL heatsinks

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Extruded heat sink

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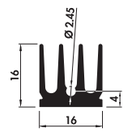
Extruded heat sink



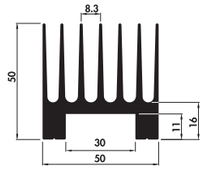
P16 16

Kg/mt: 0,34

L: 30 mm

Rth,N: 11,21 K/W

Rth,F: 3,788 K/W



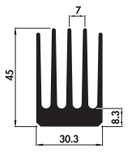
P50 50

Kg/mt: 2,6

L: 50 mm

Rth,N: 2,79 K/W

Rth,F: 0,941 K/W



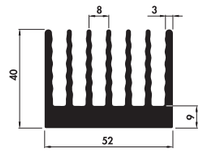
P30,3 45

Kg/mt: 1,80

L: 50 mm

Rth,N: 3,61 K/W

Rth,F: 1,218 K/W



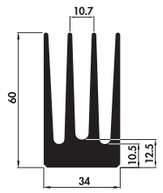
P52 40

Kg/mt: 2,79

L: 50 mm

Rth,N: 2,99 K/W

Rth,F: 1,009 K/W



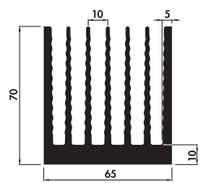
P34 60

Kg/mt: 2,82

L: 50 mm

Rth,N: 3,36 K/W

Rth,F: 1,136 K/W



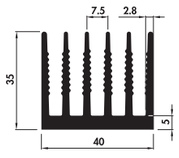
P65 70

Kg/mt: 5,44

L: 100 mm

Rth,N: 1,23 K/W

Rth,F: 0,415 K/W



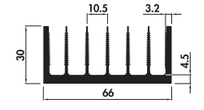
P40 35

Kg/mt: 1,73

L: 50 mm

Rth,N: 3,35 K/W

Rth,F: 1,131 K/W



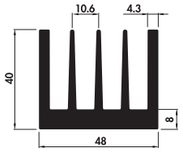
P66 30

Kg/mt: 1,77

L: 100 mm

Rth,N: 1,75 K/W

Rth,F: 0,590 K/W



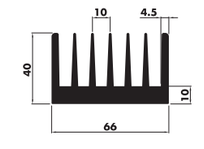
P48 40

Kg/mt: 2,45

L: 50 mm

Rth,N: 3,57 K/W

Rth,F: 1,206 K/W



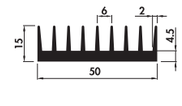
P66 40

Kg/mt: 3,47

L: 100 mm

Rth,N: 1,76 K/W

Rth,F: 0,594 K/W



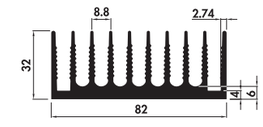
P50 15

Kg/mt: 0,99

L: 50 mm

Rth,N: 4,66 K/W

Rth,F: 1,575 K/W



P82 32

Kg/mt: 2,99

L: 100 mm

Rth,N: 1,54 K/W

Rth,F: 0,519 K/W

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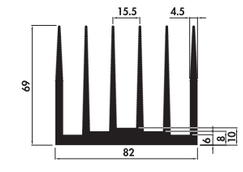
Extruded heat sink



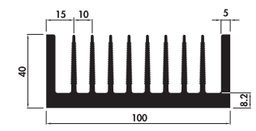
P82 69

Kg/mt: 4,90

L: 100 mm

Rth,N: 1,14 K/W

Rth,F: 0,385 K/W



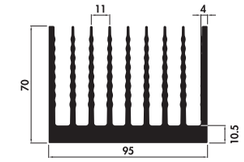
P100 40A

Kg/mt: 4,88

L: 100 mm

Rth,N: 1,24 K/W

Rth,F: 0,419 K/W



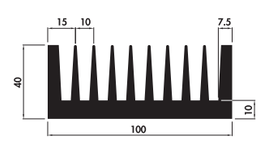
P95 70

Kg/mt: 7,25

L: 100 mm

Rth,N: 1,03 K/W

Rth,F: 0,350 K/W



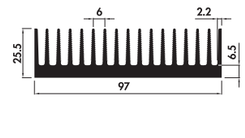
P100 40C

Kg/mt: 5,90

L: 100 mm

Rth,N: 1,44 K/W

Rth,F: 0,486 K/W



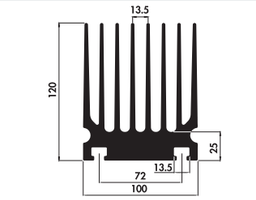
P97 25

Kg/mt: 3,40

L: 100 mm

Rth,N: 1,25 K/W

Rth,F: 0,423 K/W



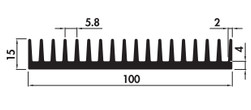
P100 120

Kg/mt: 14,67

L: 100 mm

Rth,N: 0,82 K/W

Rth,F: 0,278 K/W



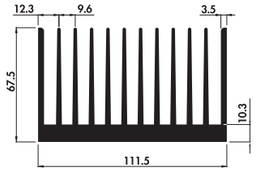
P100 15

Kg/mt: 2,16

L: 100 mm

Rth,N: 1,80 K/W

Rth,F: 0,610 K/W



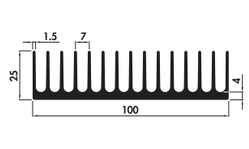
P112 68

Kg/mt: 8,42

L: 150 mm

Rth,N: 0,67 K/W

Rth,F: 0,226 K/W



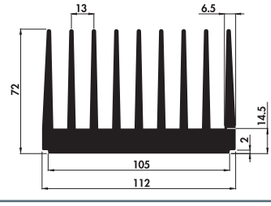
P100 25

Kg/mt: 2,66

L: 100 mm

Rth,N: 1,43 K/W

Rth,F: 0,484 K/W



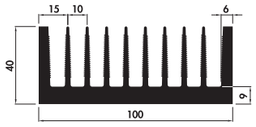
P112 72

Kg/mt: 9,81

L: 150 mm

Rth,N: 0,79 K/W

Rth,F: 0,266 K/W



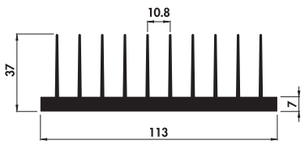
P100 40

Kg/mt: 5,12

L: 100 mm

Rth,N: 1,19 K/W

Rth,F: 0,401 K/W



P113 37

Kg/mt: 3,43

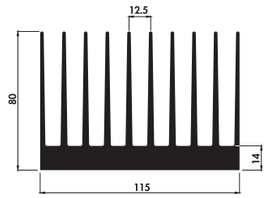
L: 150 mm

Rth,N: 1,05 K/W

Rth,F: 0,355 K/W

Estruso

Extruded heat sink



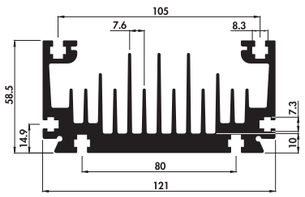
P115 80

Kg/mt: 9,52

L: 150 mm

Rth,N: 0,68 K/W

Rth,F: 0,230 K/W



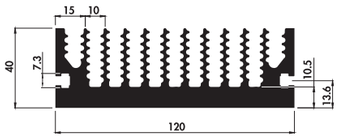
P121 58,5

Kg/mt: 7,13

L: 150 mm

Rth,N: 0,77 K/W

Rth,F: 0,260 K/W



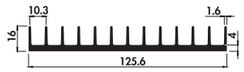
P120 40

Kg/mt: 6,70

L: 150 mm

Rth,N: 0,83 K/W

Rth,F: 0,280 K/W



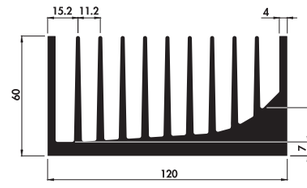
P126 16

Kg/mt: 2,12

L: 150 mm

Rth,N: 1,40 K/W

Rth,F: 0,472 K/W



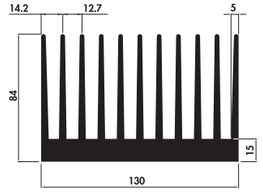
P120 60

Kg/mt: 8,37

L: 150 mm

Rth,N: 0,77 K/W

Rth,F: 0,261 K/W



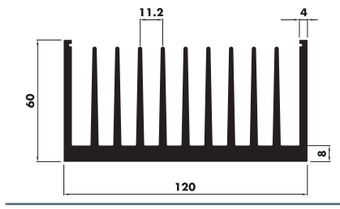
P130 84

Kg/mt: 13,44

L: 150 mm

Rth,N: 0,62 K/W

Rth,F: 0,210 K/W



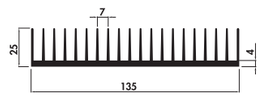
P120 60B

Kg/mt: 7,29

L: 150 mm

Rth,N: 0,76 K/W

Rth,F: 0,258 K/W



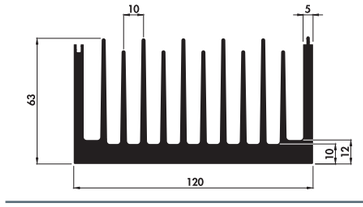
P135 25

Kg/mt: 3,25

L: 150 mm

Rth,N: 0,87 K/W

Rth,F: 0,293 K/W



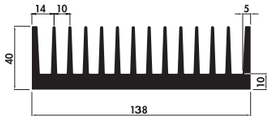
P120 63

Kg/mt: 8,39

L: 150 mm

Rth,N: 0,72 K/W

Rth,F: 0,243 K/W



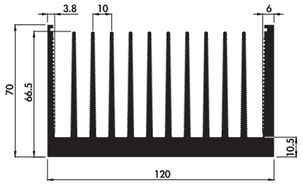
P138 40

Kg/mt: 7,29

L: 150 mm

Rth,N: 0,88 K/W

Rth,F: 0,299 K/W



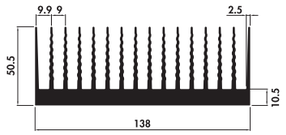
P120 70

Kg/mt: 8,96

L: 150 mm

Rth,N: 0,55 K/W

Rth,F: 0,185 K/W



P138 50

Kg/mt: 7,55

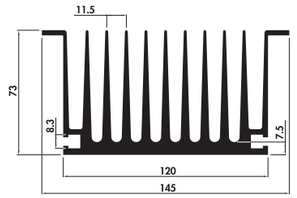
L: 150 mm

Rth,N: 0,67 K/W

Rth,F: 0,228 K/W

Estruso

Extruded heat sink



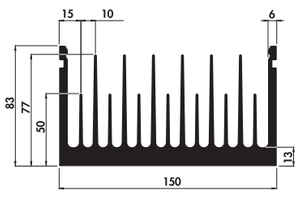
P145 73

Kg/mt: 9,34

L: 150 mm

Rth,N: 0,64 K/W

Rth,F: 0,216 K/W



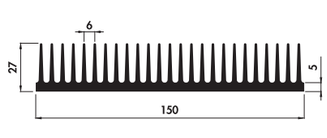
P150 83

Kg/mt: 12,33

L: 150 mm

Rth,N: 0,61 K/W

Rth,F: 0,205 K/W



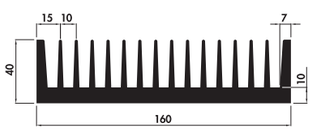
P150 27

Kg/mt: 5,17

L: 150 mm

Rth,N: 0,76 K/W

Rth,F: 0,256 K/W



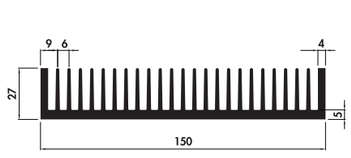
P160 40

Kg/mt: 8,64

L: 200 mm

Rth,N: 0,64 K/W

Rth,F: 0,218 K/W



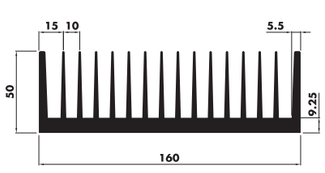
P150 27A

Kg/mt: 5,27

L: 150 mm

Rth,N: 0,74 K/W

Rth,F: 0,251 K/W



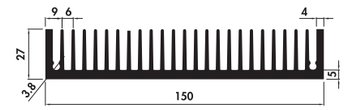
P160 50

Kg/mt: 8,86

L: 200 mm

Rth,N: 0,55 K/W

Rth,F: 0,184 K/W



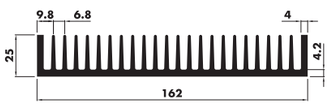
P150 27AF

Kg/mt: 5,29

L: 150 mm

Rth,N: 0,74 K/W

Rth,F: 0,251 K/W



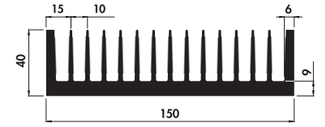
P162 25

Kg/mt: 5,23

L: 200 mm

Rth,N: 0,64 K/W

Rth,F: 0,216 K/W



P150 40

Kg/mt: 7,42

L: 150 mm

Rth,N: 0,68 K/W

Rth,F: 0,299 K/W

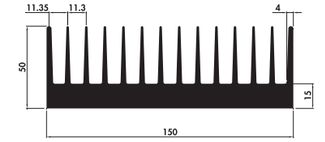
P164 27

Kg/mt: 4,16

L: 200 mm

Rth,N: 0,79 K/W

Rth,F: 0,267 K/W



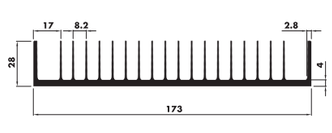
P150 50

Kg/mt: 9,58

L: 150 mm

Rth,N: 0,78 K/W

Rth,F: 0,265 K/W



P173 28

Kg/mt: 4,22

L: 200 mm

Rth,N: 0,44 K/W

Rth,F: 0,148 K/W

Estruso

Extruded heat sink

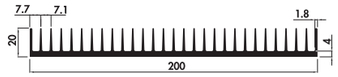
P188 30

Kg/mt: 7,36

L: 200 mm

Rth,N: 0,64 K/W

Rth,F: 0,216 K/W



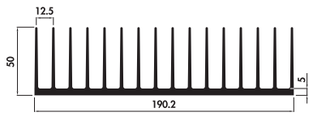
P200 20

Kg/mt: 4,07

L: 200 mm

Rth,N: 0,64 K/W

Rth,F: 0,216 K/W



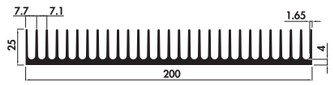
P190 50

Kg/mt: 6,87

L: 200 mm

Rth,N: 0,51 K/W

Rth,F: 0,171 K/W



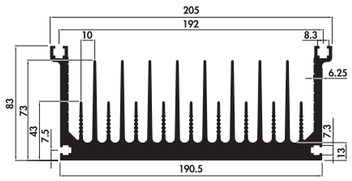
P200 25

Kg/mt: 5,38

L: 200 mm

Rth,N: 0,56 K/W

Rth,F: 0,190 K/W



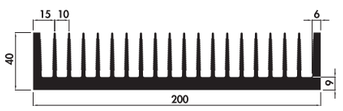
P190 83

Kg/mt: 14,83

L: 200 mm

Rth,N: 0,43 K/W

Rth,F: 0,146 K/W



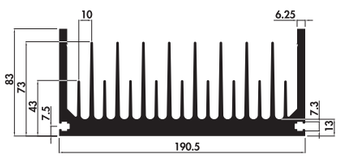
P200 40

Kg/mt: 9,72

L: 200 mm

Rth,N: 0,46 K/W

Rth,F: 0,154 K/W



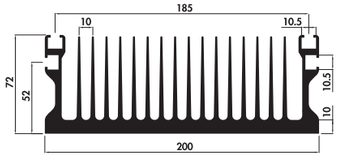
P190 83A

Kg/mt: 14,75

L: 200 mm

Rth,N: 0,45 K/W

Rth,F: 0,146 K/W



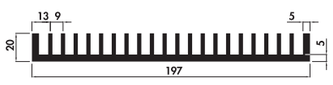
P200 72

Kg/mt: 14,53

L: 200 mm

Rth,N: 0,38 K/W

Rth,F: 0,130 K/W



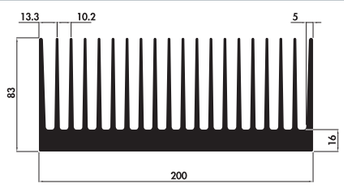
P197 20

Kg/mt: 5,50

L: 200 mm

Rth,N: 0,72 K/W

Rth,F: 0,244 K/W



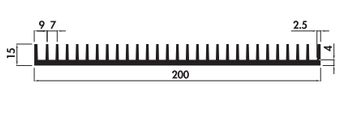
P200 83

Kg/mt: 19,90

L: 200 mm

Rth,N: 0,35 K/W

Rth,F: 0,119 K/W



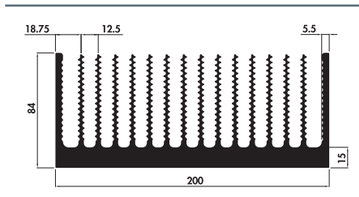
P200 15

Kg/mt: 3,90

L: 200 mm

Rth,N: 0,74 K/W

Rth,F: 0,250 K/W



P200 84

Kg/mt: 17,74

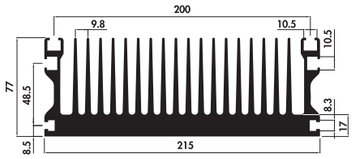
L: 200 mm

Rth,N: 0,34 K/W

Rth,F: 0,113 K/W

Estruso

Extruded heat sink



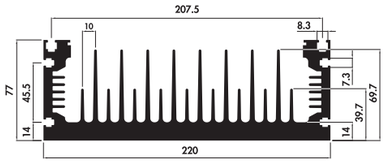
P215 77

Kg/mt: 22,15

L: 250 mm

Rth,N: 0,31 K/W

Rth,F: 0,104 K/W



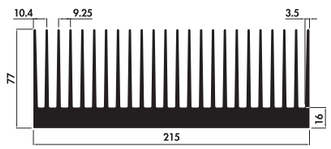
P220 77

Kg/mt: 17,54

L: 250 mm

Rth,N: 0,36 K/W

Rth,F: 0,121 K/W



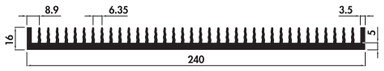
P215 77A

Kg/mt: 19,80

L: 250 mm

Rth,N: 0,28 K/W

Rth,F: 0,096 K/W



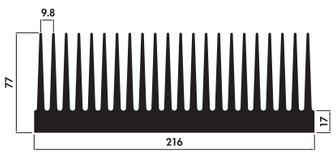
P240 16

Kg/mt: 5,57

L: 250 mm

Rth,N: 0,54 K/W

Rth,F: 0,184 K/W



P216 77

Kg/mt: 24,00

L: 250 mm

Rth,N: 0,31 K/W

Rth,F: 0,103 K/W

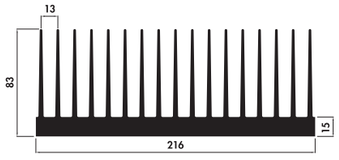
P245 25

Kg/mt: 6,39

L: 250 mm

Rth,N: 0,43 K/W

Rth,F: 0,144 K/W



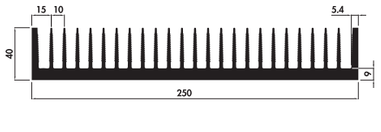
P216 83

Kg/mt: 18,07

L: 250 mm

Rth,N: 0,32 K/W

Rth,F: 0,110 K/W



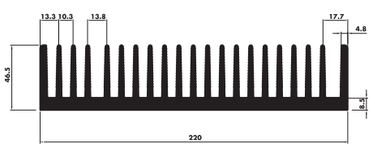
P250 40

Kg/mt: 11,94

L: 250 mm

Rth,N: 0,33 K/W

Rth,F: 0,113 K/W



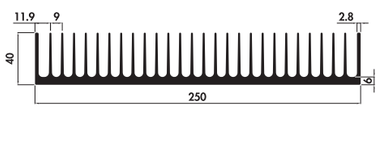
P220 46

Kg/mt: 11,27

L: 250 mm

Rth,N: 0,39 K/W

Rth,F: 0,130 K/W



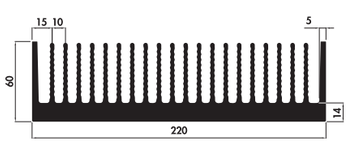
P250 40A

Kg/mt: 9,66

L: 250 mm

Rth,N: 0,36 K/W

Rth,F: 0,123 K/W



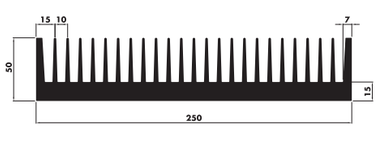
P220 60

Kg/mt: 17,27

L: 250 mm

Rth,N: 0,35 K/W

Rth,F: 0,118 K/W



P250 50

Kg/mt: 17,70

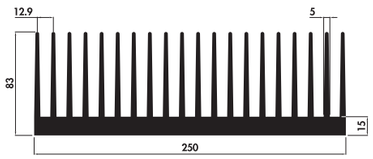
L: 250 mm

Rth,N: 0,38 K/W

Rth,F: 0,127 K/W

Estruso

Extruded heat sink



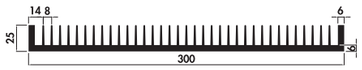
P250 83

Kg/mt: 24,68

L: 250 mm

Rth,N: 0,29 K/W

Rth,F: 0,098 K/W



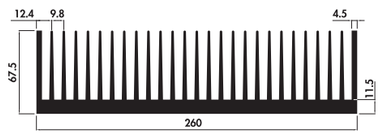
P300 25

Kg/mt: 9,01

L: 300 mm

Rth,N: 0,36 K/W

Rth,F: 0,121 K/W



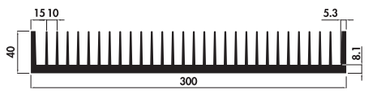
P260 67,5

Kg/mt: 20,68

L: 300 mm

Rth,N: 0,24 K/W

Rth,F: 0,081 K/W



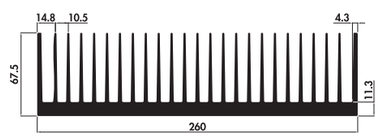
P300 40

Kg/mt: 13,02

L: 300 mm

Rth,N: 0,30 K/W

Rth,F: 0,103 K/W



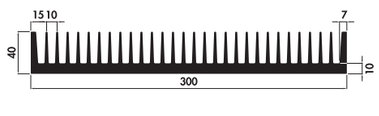
P260 67,5A

Kg/mt: 18,18

L: 300 mm

Rth,N: 0,25 K/W

Rth,F: 0,085 K/W



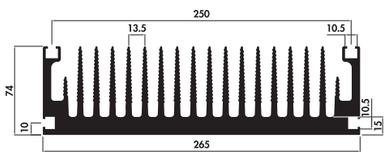
P300 40A

Kg/mt: 15,80

L: 300 mm

Rth,N: 0,32 K/W

Rth,F: 0,108 K/W



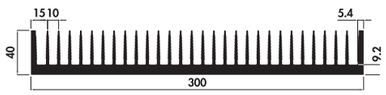
P265 74

Kg/mt: 24,92

L: 300 mm

Rth,N: 0,27 K/W

Rth,F: 0,091 K/W



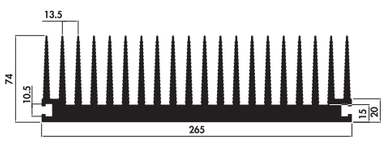
P300 40B

Kg/mt: 14,35

L: 300 mm

Rth,N: 0,26 K/W

Rth,F: 0,088 K/W



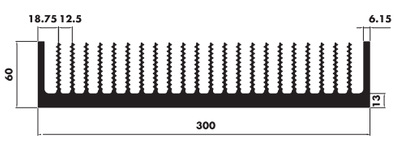
P265 74A

Kg/mt: 24,13

L: 300 mm

Rth,N: 0,27 K/W

Rth,F: 0,090 K/W



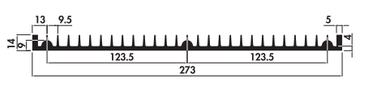
P300 60

Kg/mt: 20,53

L: 300 mm

Rth,N: 0,25 K/W

Rth,F: 0,083 K/W



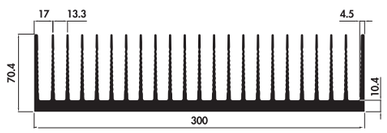
P273 14

Kg/mt: 4,77

L: 300 mm

Rth,N: 0,55 K/W

Rth,F: 0,185 K/W



P300 70

Kg/mt: 18,77

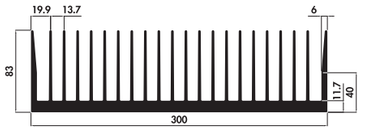
L: 300 mm

Rth,N: 0,25 K/W

Rth,F: 0,084 K/W

Estruso

Extruded heat sink



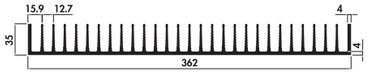
P300 83A

Kg/mt: 23,07

L: 300 mm

Rth,N: 0,23 K/W

Rth,F: 0,078 K/W



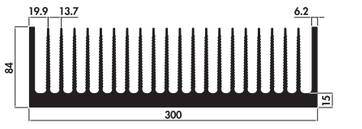
P362 35

Kg/mt: 11,13

L: 400 mm

Rth,N: 0,25 K/W

Rth,F: 0,085 K/W



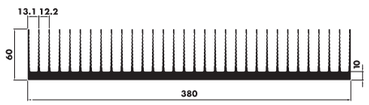
P300 84

Kg/mt: 28,44

L: 300 mm

Rth,N: 0,23 K/W

Rth,F: 0,078 K/W



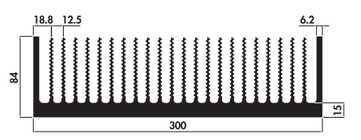
P380 60E

Kg/mt: 18,35

L: 400 mm

Rth,N: 0,18 K/W

Rth,F: 0,061 K/W



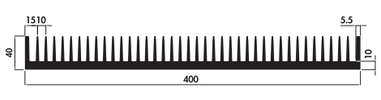
P300 84A

Kg/mt: 26,64

L: 300 mm

Rth,N: 0,19 K/W

Rth,F: 0,065 K/W



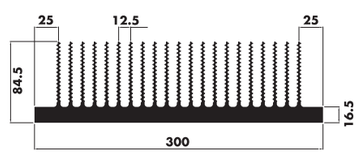
P400 40

Kg/mt: 21,44

L: 400 mm

Rth,N: 0,20 K/W

Rth,F: 0,069 K/W



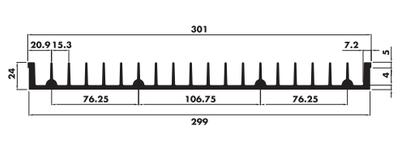
P300 84C

Kg/mt: 24,99

L: 300 mm

Rth,N: 0,20 K/W

Rth,F: 0,069 K/W



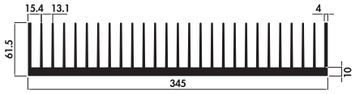
P301 24

Kg/mt: 6,58

L: 300 mm

Rth,N: 0,47 K/W

Rth,F: 0,157 K/W



P345 61

Kg/mt: 20,07

L: 400 mm

Rth,N: 0,20 K/W

Rth,F: 0,067 K/W

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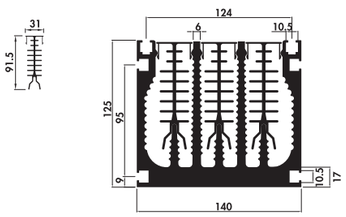
Extruded heat sink

C31 91



PC140 125

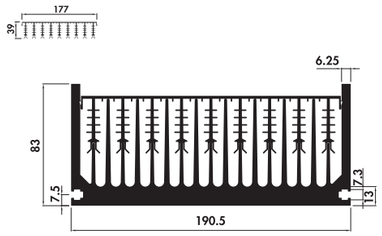
Kg/mt: 22,90

L: 150 mm

Rth,N: 0,38 K/W

Rth,F: 0,128 K/W

C178 39



PC190 83A

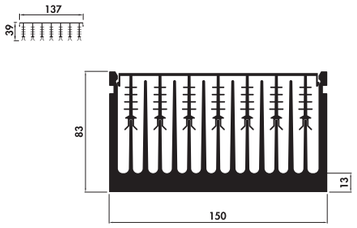
Kg/mt: 18,79

L: 200 mm

Rth,N: 0,29 K/W

Rth,F: 0,099 K/W

C137 39



PC150 83

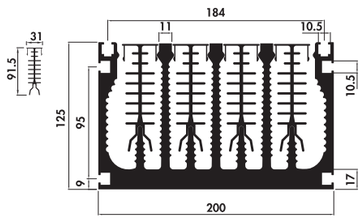
Kg/mt: 15,42

L: 150 mm

Rth,N: 0,41 K/W

Rth,F: 0,139 K/W

C31 91



PC200 125

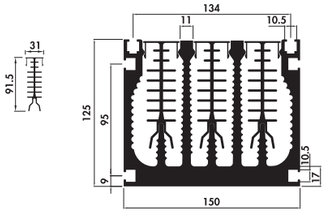
Kg/mt: 30,80

L: 200 mm

Rth,N: 0,26 K/W

Rth,F: 0,088 K/W

C31 91



PC150 125

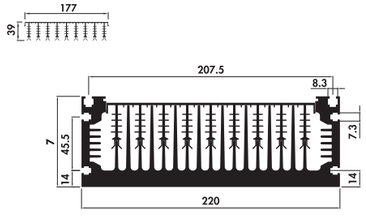
Kg/mt: 23,77

L: 150 mm

Rth,N: 0,38 K/W

Rth,F: 0,128 K/W

C178 39



PC220 77

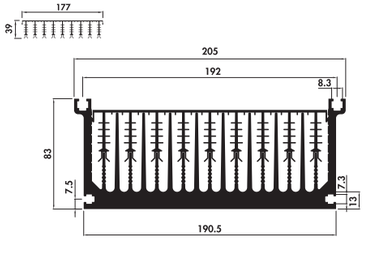
Kg/mt: 21,57

L: 250 mm

Rth,N: 0,24 K/W

Rth,F: 0,082 K/W

C178 39



PC190 83

Kg/mt: 18,87

L: 200 mm

Rth,N: 0,29 K/W

Rth,F: 0,097 K/W

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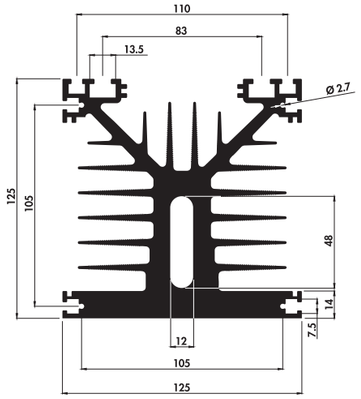
Extruded heat sink



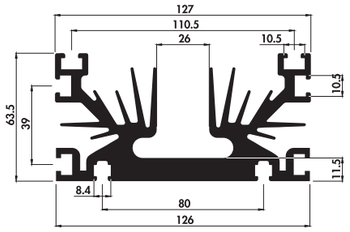
T125 125

Kg/mt: 15,53

L: 150 mm

Rth,N: 0,51 K/W

Rth,F: 0,174 K/W



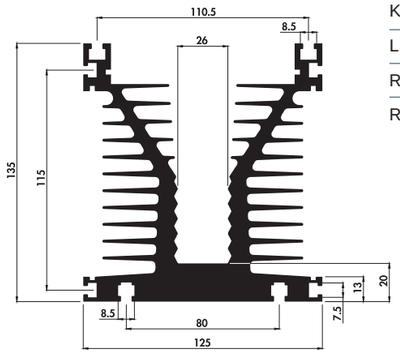
T126 63

Kg/mt: 8,21

L: 150 mm

Rth,N: 0,79 K/W

Rth,F: 0,267 K/W



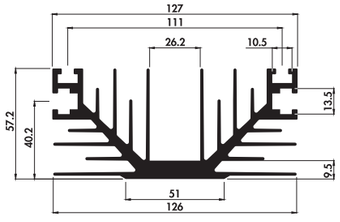
T125 135A

Kg/mt: 14,45

L: 150 mm

Rth,N: 0,54 K/W

Rth,F: 0,183 K/W



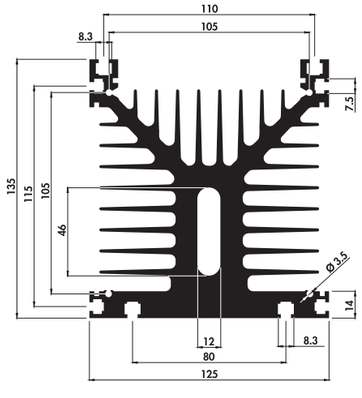
T127 57

Kg/mt: 5,62

L: 150 mm

Rth,N: 0,73 K/W

Rth,F: 0,248 K/W



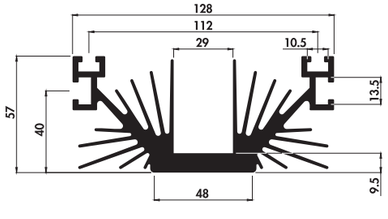
T125 135D

Kg/mt: 17,61

L: 150 mm

Rth,N: 0,50 K/W

Rth,F: 0,168 K/W



T128 57

Kg/mt: 5,95

L: 150 mm

Rth,N: 0,76 K/W

Rth,F: 0,257 K/W

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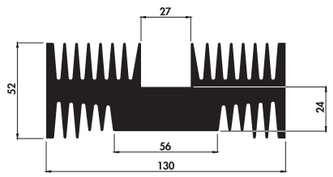
T130 52

Kg/mt: 11,18

L: 150 mm

Rth,N: 0,81 K/W

Rth,F: 0,274 K/W



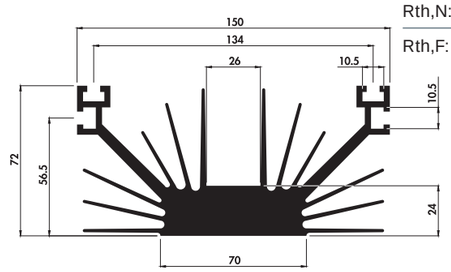
T150 72

Kg/mt: 8,93

L: 150 mm

Rth,N: 0,69 K/W

Rth,F: 0,233 K/W



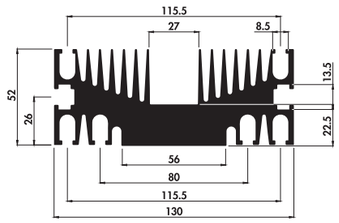
T130 52A

Kg/mt: 10,03

L: 150 mm

Rth,N: 0,77 K/W

Rth,F: 0,261 K/W



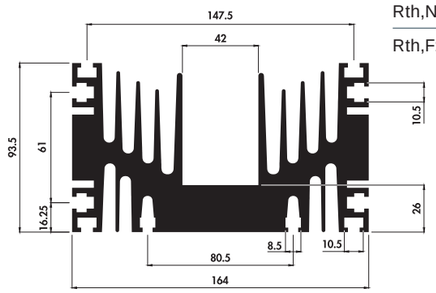
T164 93

Kg/mt: 19,00

L: 200 mm

Rth,N: 0,47 K/W

Rth,F: 0,159 K/W



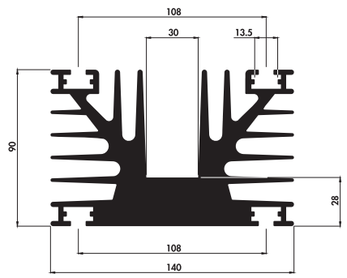
T140 90

Kg/mt: 15,23

L: 150 mm

Rth,N: 0,66 K/W

Rth,F: 0,223 K/W



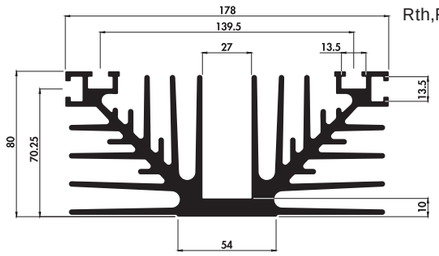
T180 80

Kg/mt: 12,78

L: 200 mm

Rth,N: 0,45 K/W

Rth,F: 0,154 K/W



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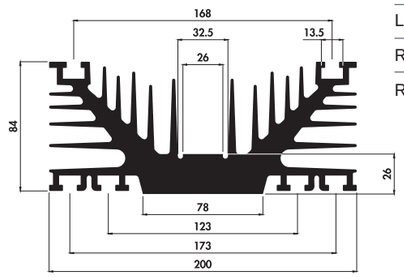
T200 86

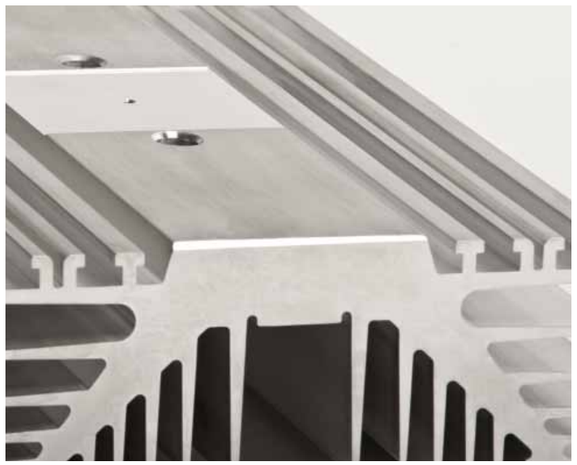
Kg/mt: 19,17

L: 200 mm

Rth,N: 0,45 K/W

Rth,F: 0,152 K/W





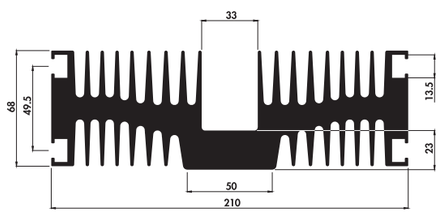
T210 70

Kg/mt: 19,99

L: 200 mm

Rth,N: 0,43 K/W

Rth,F: 0,146 K/W



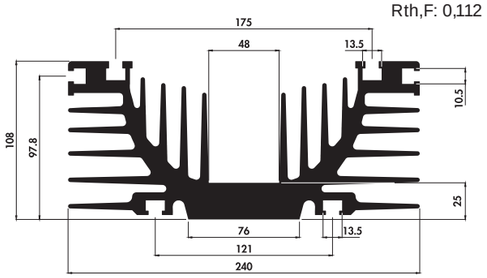
T240 108

Kg/mt: 26,10

L: 250 mm

Rth,N: 0,33 K/W

Rth,F: 0,112 K/W



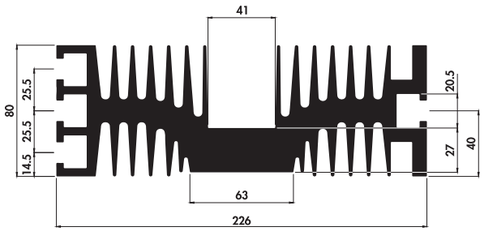
T226 80

Kg/mt: 23,74

L: 250 mm

Rth,N: 0,36 K/W

Rth,F: 0,122 K/W



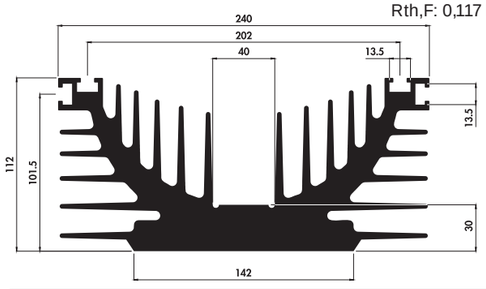
T240 112

Kg/mt: 29,72

L: 250 mm

Rth,N: 0,35 K/W

Rth,F: 0,117 K/W



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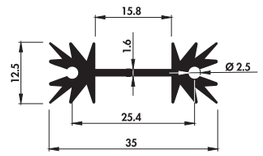
Extruded heat sink



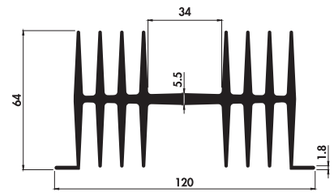
H34,5 12

Kg/mt: 0,434

L: 50 mm

Rth,N: 6,20 K/W

Rth,F: 2,095 K/W



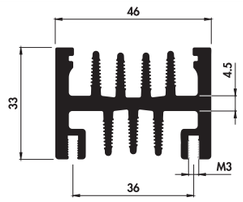
H120 64

Kg/mt: 4,97

L: 100 mm

Rth,N: 1,12 K/W

Rth,F: 0,377 K/W



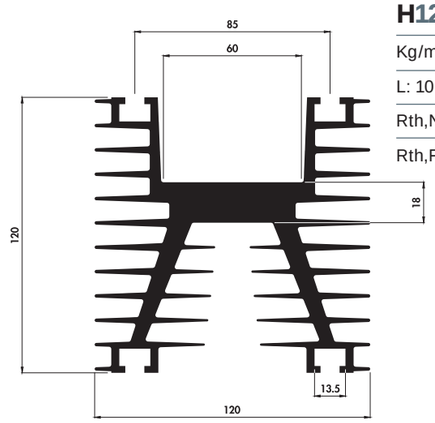
H46 33

Kg/mt: 1,94

L: 50 mm

Rth,N: 3,14 K/W

Rth,F: 1,063 K/W



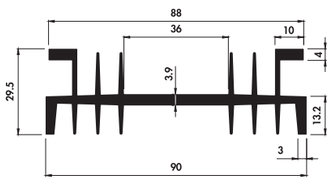
H120 120

Kg/mt: 11,19

L: 100 mm

Rth,N: 0,74 K/W

Rth,F: 0,251 K/W



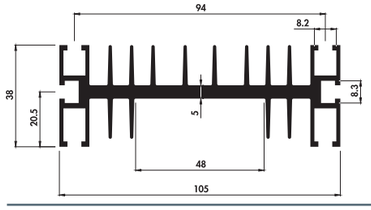
H90 29,5

Kg/mt: 1,86

L: 100 mm

Rth,N: 1,85 K/W

Rth,F: 0,625 K/W



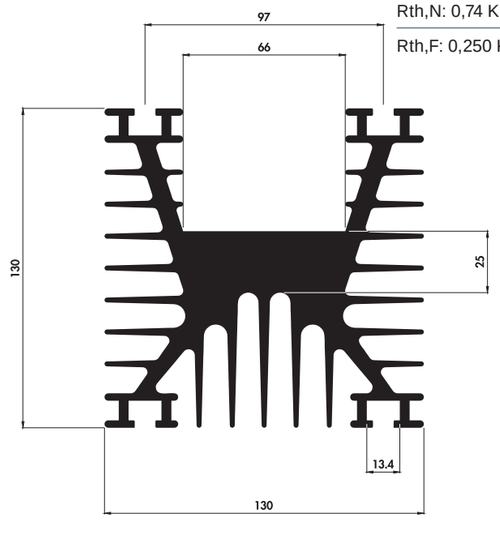
H105 38

Kg/mt: 2,83

L: 100 mm

Rth,N: 1,35 K/W

Rth,F: 0,457 K/W



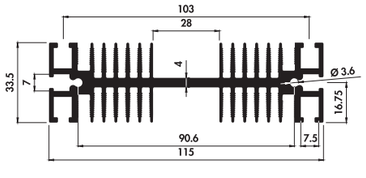
H130 130

Kg/mt: 16,26

L: 100 mm

Rth,N: 0,74 K/W

Rth,F: 0,250 K/W



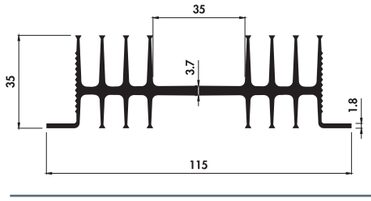
H115 33

Kg/mt: 3,83

L: 100 mm

Rth,N: 0,98 K/W

Rth,F: 0,332 K/W



H115 35

Kg/mt: 2,15

L: 100 mm

Rth,N: 1,50 K/W

Rth,F: 0,507 K/W

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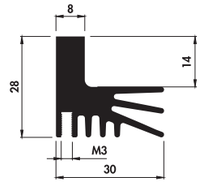
Extruded heat sink



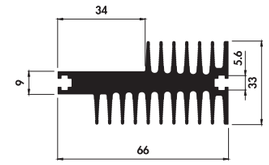
L30 28

Kg/mt: 0,983

L: 50 mm

Rth,N: 5,64 K/W

Rth,F: 1,906 K/W



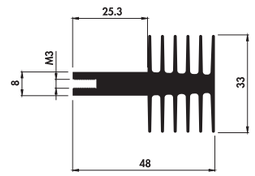
L66 33

Kg/mt: 2,43

L: 100 mm

Rth,N: 1,63 K/W

Rth,F: 0,551 K/W



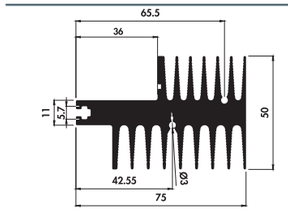
L48 33

Kg/mt: 1,45

L: 50 mm

Rth,N: 3,54 K/W

Rth,F: 1,195 K/W



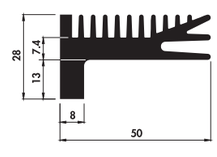
L75 50

Kg/mt: 4,05

L: 100 mm

Rth,N: 1,43 K/W

Rth,F: 0,482 K/W



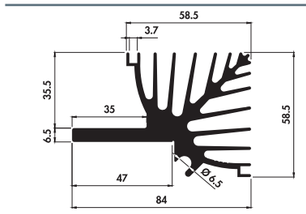
L50 28

Kg/mt: 1,65

L: 50 mm

Rth,N: 4,33 K/W

Rth,F: 1,464 K/W



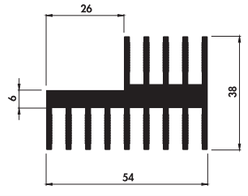
L84 58

Kg/mt: 3,80

L: 100 mm

Rth,N: 1,42 K/W

Rth,F: 0,480 K/W



L54 38

Kg/mt: 2,20

L: 50 mm

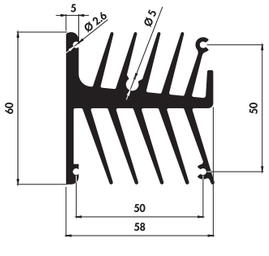
Rth,N: 2,70 K/W

Rth,F: 0,911 K/W

serie K

Estruso

Extruded heat sink



K60 58

Kg/mt: 3,35

L: 50 mm

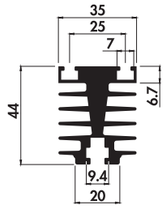
Rth,N: 2,29 K/W

Rth,F: 0,773 K/W

serie E

Estruso

Extruded heat sink



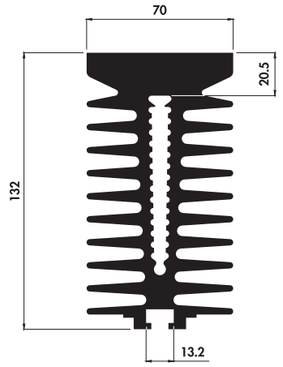
E35 44

Kg/mt: 2,00

L: 50 mm

Rth,N: 3,38 K/W

Rth,F: 1,143 K/W



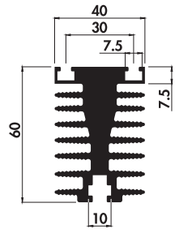
E70 132

Kg/mt: 13,32

L: 100 mm

Rth,N: 0,90 K/W

Rth,F: 0,305 K/W



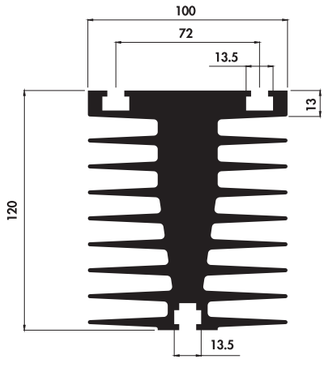
E40 60

Kg/mt: 3,41

L: 50 mm

Rth,N: 2,59 K/W

Rth,F: 0,874 K/W



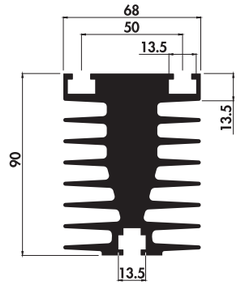
E100 120

Kg/mt: 15,64

L: 100 mm

Rth,N: 0,86 K/W

Rth,F: 0,291 K/W



E68 90

Kg/mt: 8,66

L: 100 mm

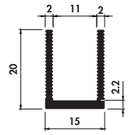
Rth,N: 1,22 K/W

Rth,F: 0,411 K/W

serie U

Estruso

Extruded heat sink



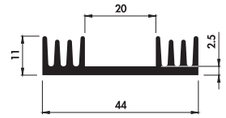
U15 20

Kg/mt: 0,256

L: 50 mm

Rth,N: 8,37 K/W

Rth,F: 2,828 K/W



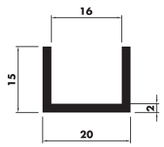
U44 11

Kg/mt: 0,563

L: 50 mm

Rth,N: 5,79 K/W

Rth,F: 1,956 K/W



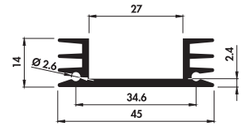
U20 15

Kg/mt: 0,249

L: 50 mm

Rth,N: 9,90 K/W

Rth,F: 3,347 K/W



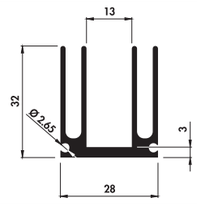
U45 14

Kg/mt: 0,550

L: 50 mm

Rth,N: 5,69 K/W

Rth,F: 1,921 K/W



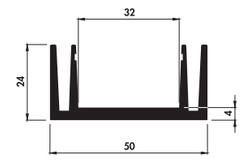
U28 32

Kg/mt: 0,734

L: 50 mm

Rth,N: 4,63 K/W

Rth,F: 1,564 K/W



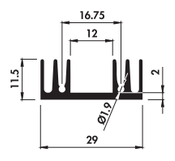
U50 24

Kg/mt: 1,03

L: 50 mm

Rth,N: 4,88 K/W

Rth,F: 1,650 K/W



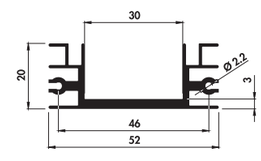
U29 12

Kg/mt: 0,354

L: 50 mm

Rth,N: 6,73 K/W

Rth,F: 2,273 K/W



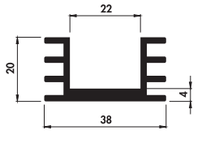
U52 20

Kg/mt: 0,733

L: 50 mm

Rth,N: 4,40 K/W

Rth,F: 1,485 K/W



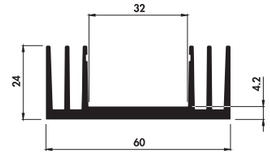
U38 20

Kg/mt: 0,710

L: 50 mm

Rth,N: 5,65 K/W

Rth,F: 1,909 K/W



U60 24

Kg/mt: 1,22

L: 50 mm

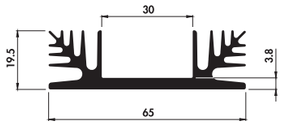
Rth,N: 3,92 K/W

Rth,F: 1,324 K/W

serie U

Estruso

Extruded heat sink



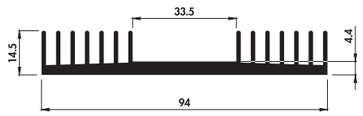
U65 20

Kg/mt: 1,25

L: 50 mm

Rth,N: 3,82 K/W

Rth,F: 1,291 K/W



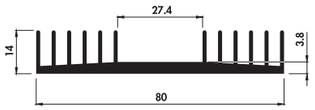
U94 14A

Kg/mt: 1,64

L: 100 mm

Rth,N: 1,97 K/W

Rth,F: 0,664 K/W



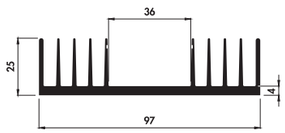
U80 14

Kg/mt: 1,18

L: 50 mm

Rth,N: 3,58 K/W

Rth,F: 1,210 K/W



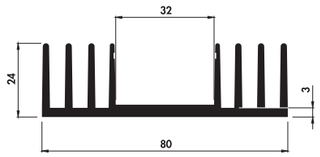
U97 25

Kg/mt: 1,95

L: 100 mm

Rth,N: 1,72 K/W

Rth,F: 0,580 K/W



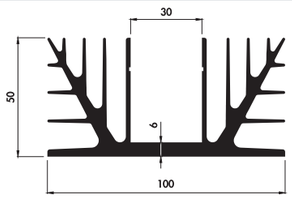
U80 24

Kg/mt: 1,72

L: 50 mm

Rth,N: 3,22 K/W

Rth,F: 1,086 K/W



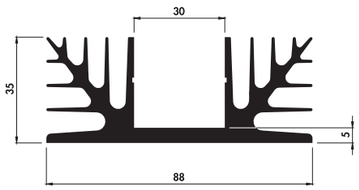
U100 50

Kg/mt: 4,90

L: 100 mm

Rth,N: 1,30 K/W

Rth,F: 0,440 K/W



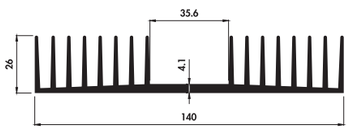
U88 35

Kg/mt: 2,80

L: 50 mm

Rth,N: 2,65 K/W

Rth,F: 0,894 K/W



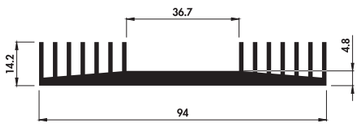
U140 26

Kg/mt: 3,26

L: 100 mm

Rth,N: 1,23 K/W

Rth,F: 0,414 K/W



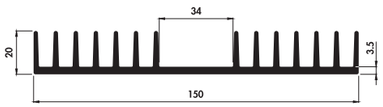
U94 14

Kg/mt: 1,62

L: 100 mm

Rth,N: 2,00 K/W

Rth,F: 0,675 K/W



U150 20

Kg/mt: 2,93

L: 100 mm

Rth,N: 1,50 K/W

Rth,F: 0,507 K/W

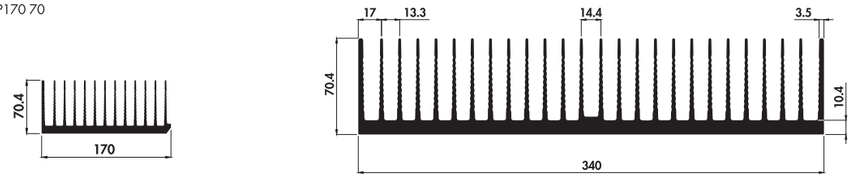
MeccAL heatsinks

Saldato
Welded heat sink

Saldato

Welded heat sink

P170 70



P340 70

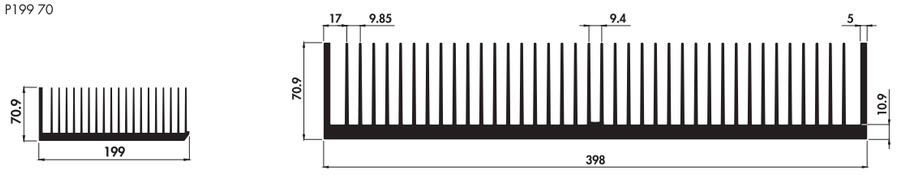
Kg/mt: 21,29

L: 400 mm

Rth,N: 0,19 K/W

Rth,F: 0,063 K/W

P199 70



P398 70

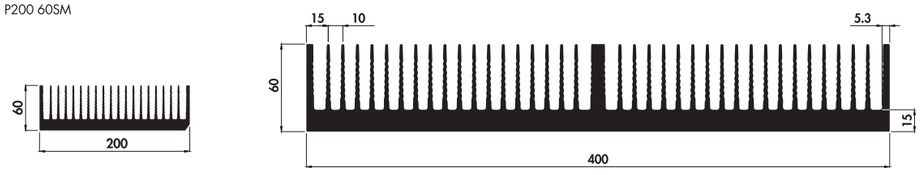
Kg/mt: 28,70

L: 400 mm

Rth,N: 0,14 K/W

Rth,F: 0,049 K/W

P200 60SM



P400 60

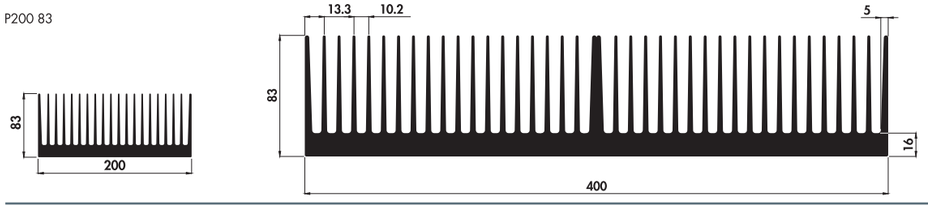
Kg/mt: 30,60

L: 400 mm

Rth,N: 0,17 K/W

Rth,F: 0,058 K/W

P200 83



P400 83

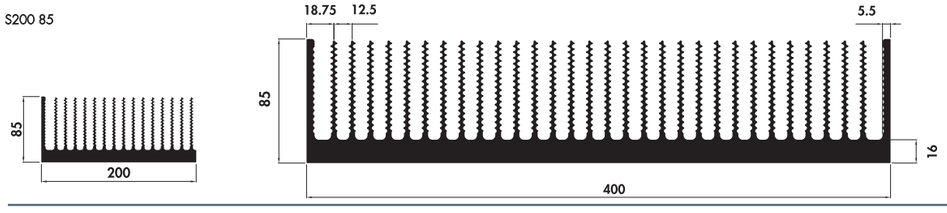
Kg/mt: 39,75

L: 400 mm

Rth,N: 0,14 K/W

Rth,F: 0,047 K/W

S200 85



P400 85

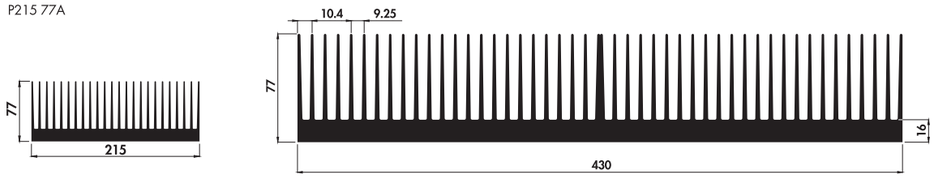
Kg/mt: 35,76

L: 400 mm

Rth,N: 0,13 K/W

Rth,F: 0,043 K/W

P215 77A



P430 77A

Kg/mt: 39,60

L: 450 mm

Rth,N: 0,12 K/W

Rth,F: 0,040 K/W

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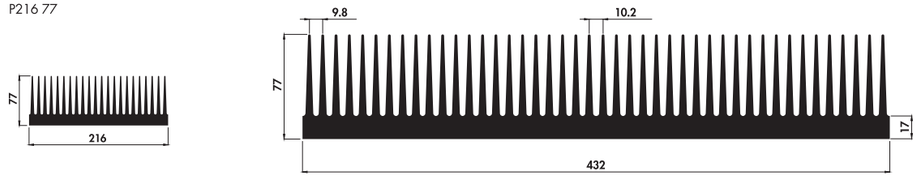
P216 77



P432 77

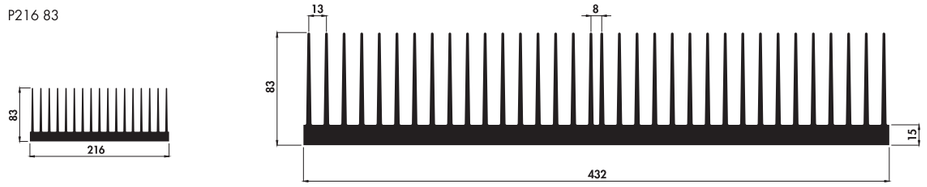
Kg/mt: 48,00

L: 450 mm

Rth,N: 0,13 K/W

Rth,F: 0,043 K/W

P216 83



P432 83

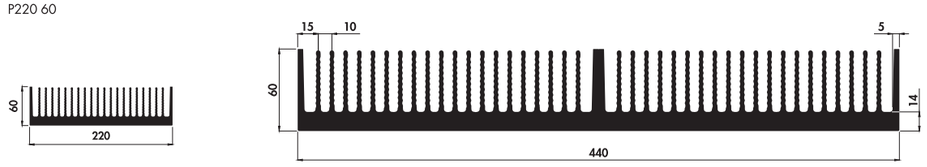
Kg/mt: 36,13

L: 450 mm

Rth,N: 0,13 K/W

Rth,F: 0,046 K/W

P220 60



P440 60

Kg/mt: 34,54

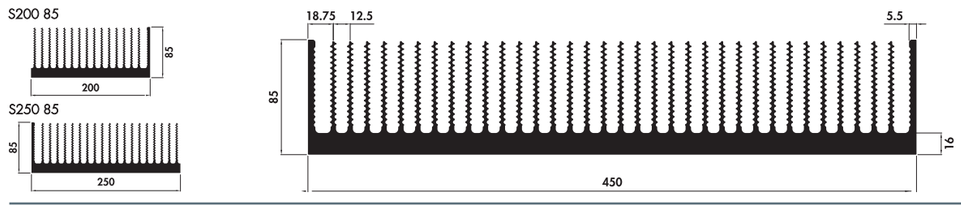
L: 450 mm

Rth,N: 0,15 K/W

Rth,F: 0,050 K/W

S200 85

S250 85



P450 85

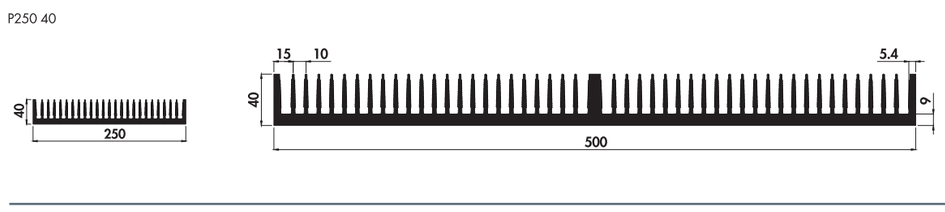
Kg/mt: 40,13

L: 450 mm

Rth,N: 0,11 K/W

Rth,F: 0,037 K/W

P250 40



P500 40

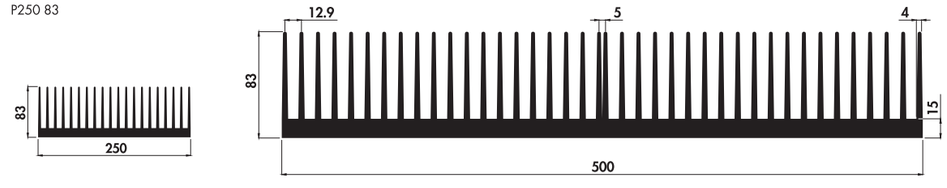
Kg/mt: 23,87

L: 500 mm

Rth,N: 0,13 K/W

Rth,F: 0,044 K/W

P250 83



P500 83

Kg/mt: 49,36

L: 500 mm

Rth,N: 0,11 K/W

Rth,F: 0,038 K/W

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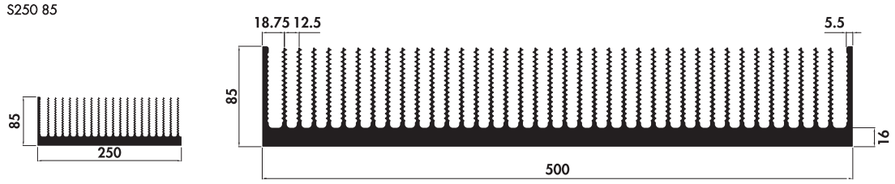
Welded heat sink

S250 85



P500 85

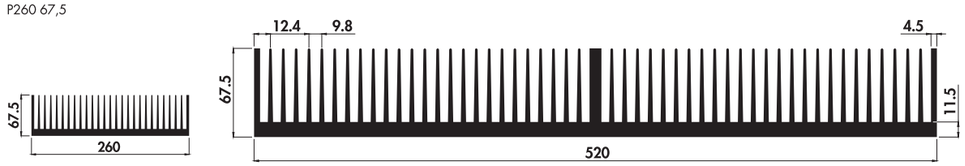
Kg/mt: 44,51

L: 500 mm

Rth,N: 0,09 K/W

Rth,F: 0,032 K/W

P260 67,5



P520 67,5

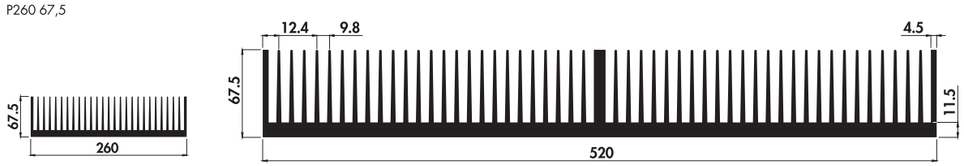
Kg/mt: 41,36

L: 500 mm

Rth,N: 0,11 K/W

Rth,F: 0,036 K/W

P260 67,5



P520 67,5A

Kg/mt: 36,37

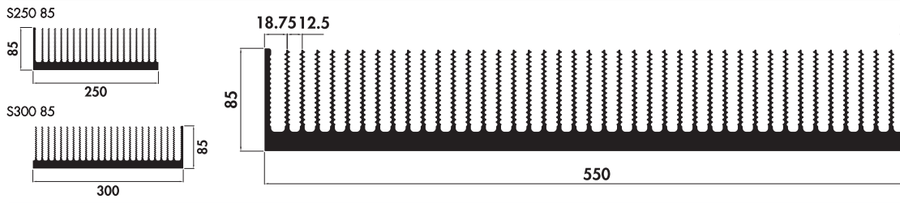
L: 500 mm

Rth,N: 0,11 K/W

Rth,F: 0,038 K/W

S250 85

S300 85



P550 85

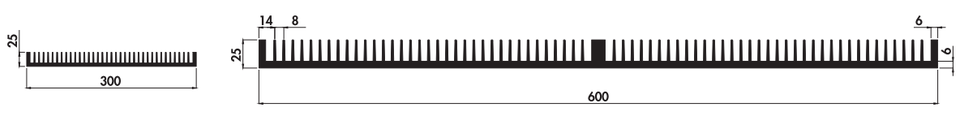
Kg/mt: 48,88

L: 550 mm

Rth,N: 0,08 K/W

Rth,F: 0,028 K/W

P300 25



P600 25

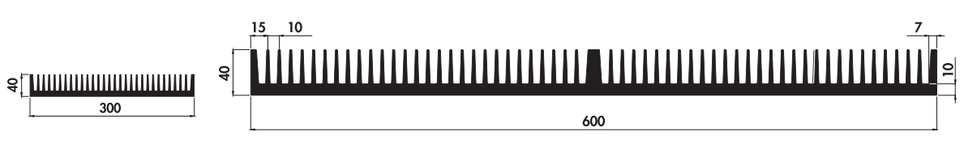
Kg/mt: 18,02

L: 600 mm

Rth,N: 0,14 K/W

Rth,F: 0,047 K/W

P300 40A



P600 40A

Kg/mt: 31,60

L: 600 mm

Rth,N: 0,12 K/W

Rth,F: 0,042 K/W

Saldato

Welded heat sink

P300 70

P600 70

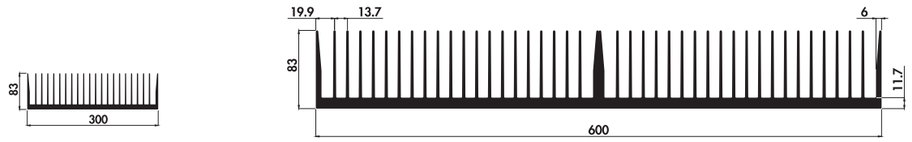
Kg/mt: 37,53

L: 600 mm

Rth,N: 0,10 K/W

Rth,F: 0,033 K/W

P300 83A



P600 83A

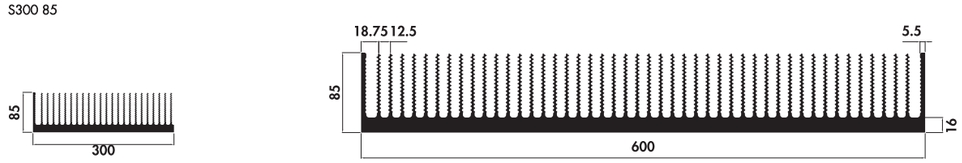
Kg/mt: 46,15

L: 600 mm

Rth,N: 0,09 K/W

Rth,F: 0,031 K/W

S300 85



P600 85

Kg/mt: 53,25

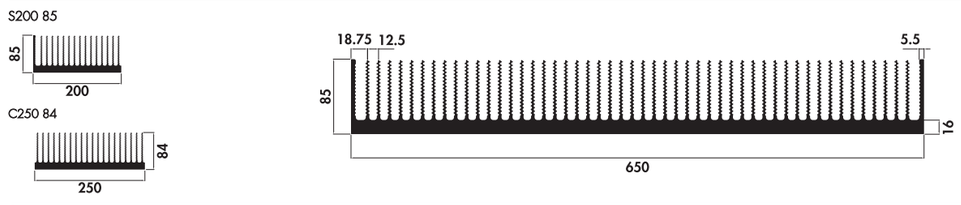
L: 600 mm

Rth,N: 0,07 K/W

Rth,F: 0,025 K/W

S200 85

C250 84



P650 85

Kg/mt: 57,63

L: 650 mm

Rth,N: 0,07 K/W

Rth,F: 0,022 K/W

P345 61

P690 61

Kg/mt: 40,15

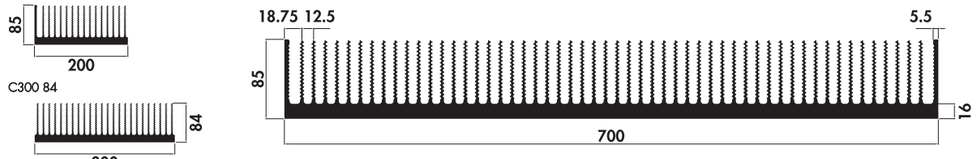
L: 700 mm

Rth,N: 0,08 K/W

Rth,F: 0,029 K/W

S200 85

C300 84



P700 85

Kg/mt: 62,00

L: 700 mm

Rth,N: 0,06 K/W

Rth,F: 0,020 K/W

serie **P**

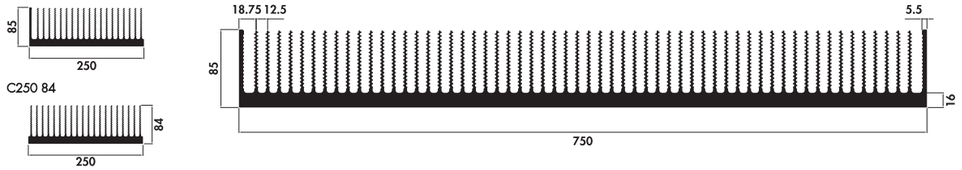
MeccAL heatsinks

Saldato

Welded heat sink

S250 85

C250 84



P750 85

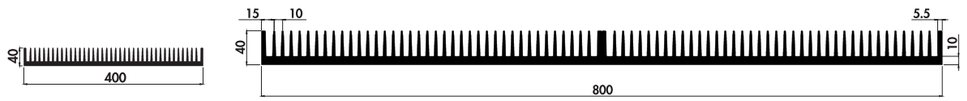
Kg/mt: 66,37

L: 750 mm

Rth,N: 0,05 K/W

Rth,F: 0,018 K/W

P400 40



P800 40

Kg/mt: 42,87

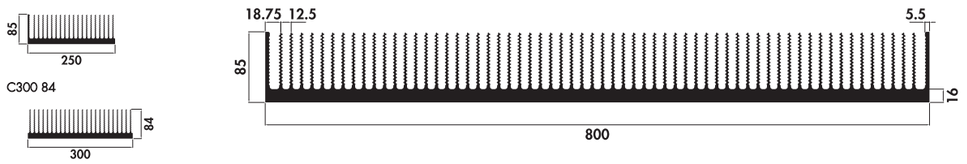
L: 800 mm

Rth,N: 0,08 K/W

Rth,F: 0,027 K/W

S250 85

C300 84



P800 85

Kg/mt: 70,75

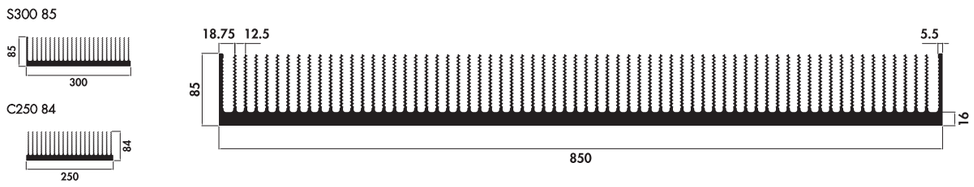
L: 800 mm

Rth,N: 0,05 K/W

Rth,F: 0,017 K/W

S300 85

C250 84



P850 85

Kg/mt: 75,12

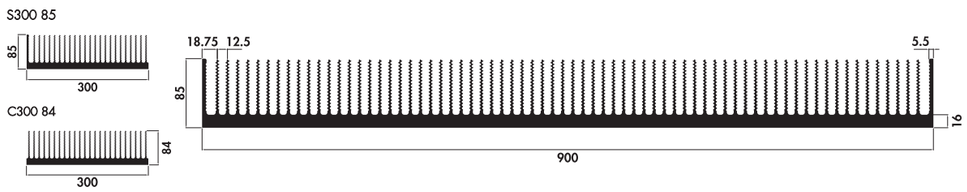
L:850 mm

Rth,N: 0,05 K/W

Rth,F: 0,015 K/W

S300 85

C300 84



P900 85

Kg/mt: 79,49

L: 900 mm

Rth,N: 0,04 K/W

Rth,F: 0,014 K/W

Sistema a molla
Clip system

serie L

Sistema a molla

Clip system

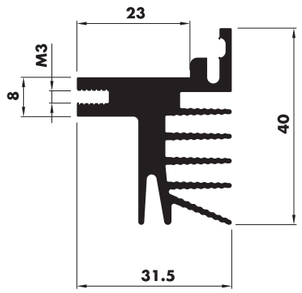
L40 31

Kg/mt: 1,06

L: 50 mm

Rth,N: 4,31 K/W

Rth,F: 1,455 K/W



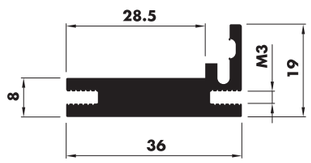
L36 19

Kg/mt: 0,76

L: 50 mm

Rth,N: 7,24 K/W

Rth,F: 2,448 K/W



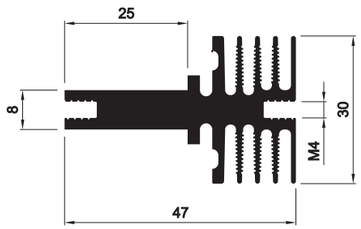
L47 30

Kg/mt: 1,31

L: 50 mm

Rth,N: 3,53 K/W

Rth,F: 1,193 K/W



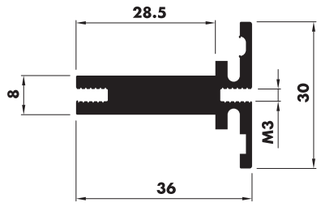
L36 30

Kg/mt: 0,84

L: 50 mm

Rth,N: 6,34 K/W

Rth,F: 2,144 K/W



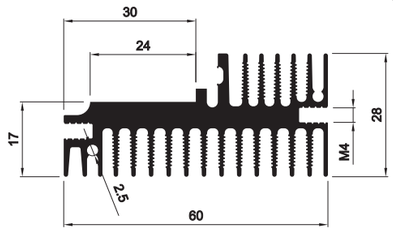
L60 28

Kg/mt: 1,72

L: 50 mm

Rth,N: 2,34 K/W

Rth,F: 0,790 K/W



serie L

Sistema a molla

Clip system

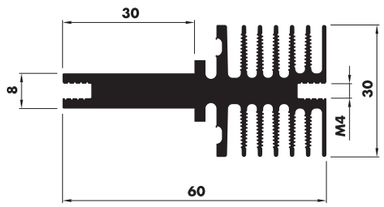
L60 30

Kg/mt: 1,71

L: 50 mm

Rth,N: 2,86 K/W

Rth,F: 0,966 K/W



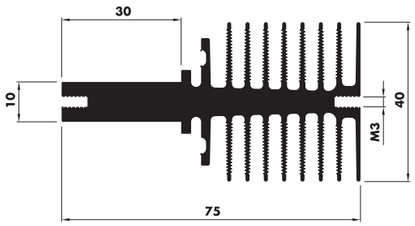
L75 40

Kg/mt: 2,61

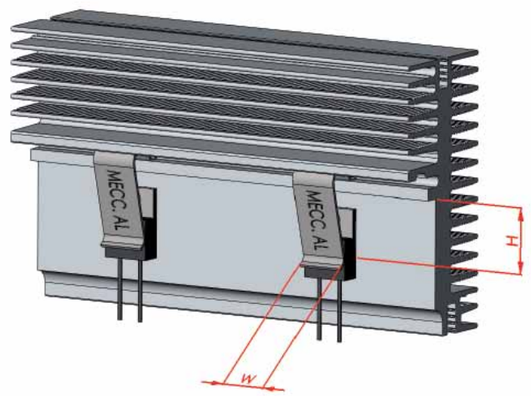
L: 50 mm

Rth,N: 1,99 K/W

Rth,F: 0,673 K/W



Clip Part Number	H	W	Force	Package	Surface Treatment
M1	13,5 mm	10 mm	20 N	TO220	Zinc/Nikel
M2	13,5 mm	13 mm	60 N	TO220	Zinc/Nikel
M3	13,5 mm	15 mm	45 N	TO218	Zinc/Nikel
				TO220	
				TO247	
M4	13,5 mm	20 mm	40 N	TO247	Zinc/Nikel
M10	17,5 mm	12 mm	40 N	TO220	Zinc/Nikel
M12	17,5 mm	6 mm	20 N	TO92	Zinc/Nikel



MeccAL heatsinks

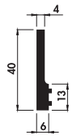
Alta efficienza

High performance heat sink

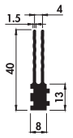
Alta efficienza

High performance heat sink

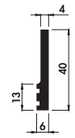
M6 40
Kg/mt: 0.515

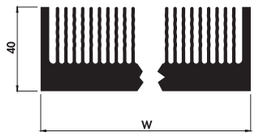


A8 40
Kg/mt: 0.507



F6 40
Kg/mt: 0.479





PA8 40

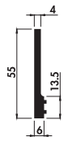
W: 100 mm

L: 150 mm

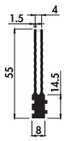
Rth,N: 0,61 K/W

Rth,F: 0,205 K/W

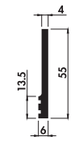
M6 55
Kg/mt: 0.704

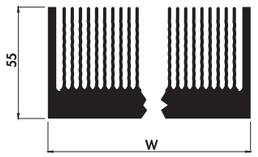


A8 55
Kg/mt: 0.650



F6 55
Kg/mt: 0.643





PA8 55

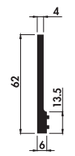
W: 100 mm

L: 150 mm

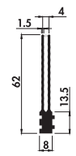
Rth,N: 0,48 K/W

Rth,F: 0,163 K/W

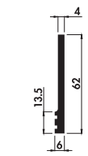
M6 62
Kg/mt: 0.773

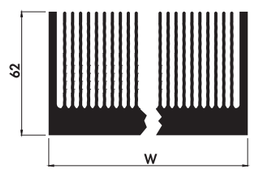


A8 62
Kg/mt: 0.692



F6 62
Kg/mt: 0.713





PA8 62

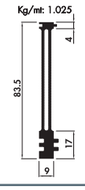
W: 100 mm

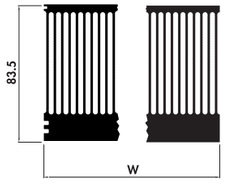
L: 150 mm

Rth,N: 0,43 K/W

Rth,F: 0,146 K/W

A9 83
Kg/mt: 1.025





PA9 83

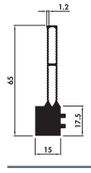
W: 99 mm

L: 150 mm

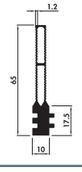
Rth,N: 0,42 K/W

Rth,F: 0,143 K/W

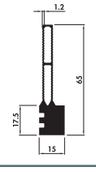
M15 65
Kg/mt: 1.077

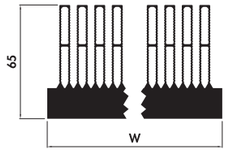


A10 65
Kg/mt: 1.250



F15 65
Kg/mt: 1.006





PA10 65

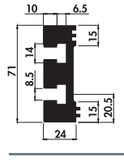
W: 100 mm

L: 150 mm

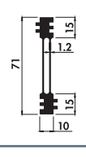
Rth,N: 0,48 K/W

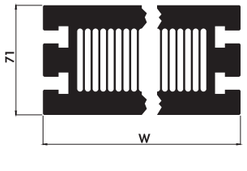
Rth,F: 0,162 K/W

MF24 71
Kg/mt: 3.44



I10 71
Kg/mt: 1.09





PA10 71

W: 108 mm

L: 150 mm

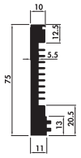
Rth,N: 0,53 K/W

Rth,F: 0,180 K/W

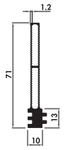
Alta efficienza

High performance heat sink

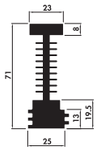
M11 75
Kg/mt: 1.798



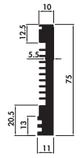
A10 71
Kg/mt: 1.381

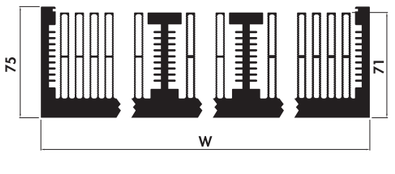


M25 71
Kg/mt: 2.666



F11 75
Kg/mt: 1.715





PA10 75

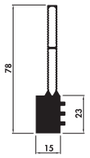
W: 102 mm

L: 150 mm

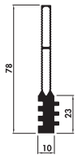
Rth,N: 0,41 K/W

Rth,F: 0,137 K/W

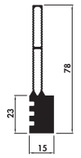
M15 78
Kg/mt: 1.364

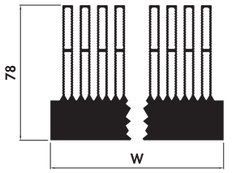


A10 78
Kg/mt: 0.991



F15 78
Kg/mt: 1.240





PA10 78

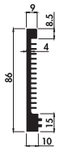
W: 100 mm

L: 150 mm

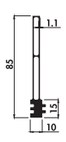
Rth,N: 0,43 K/W

Rth,F: 0,145 K/W

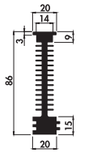
M10 86
Kg/mt: 1.592



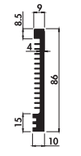
A10 85
Kg/mt: 0.856

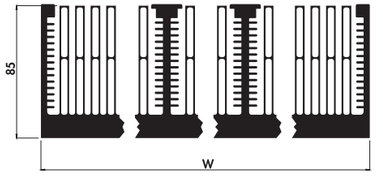


C20 86
Kg/mt: 2.618



F10 86
Kg/mt: 1.508





PA10 85

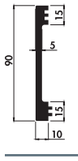
W: 100 mm

L: 150 mm

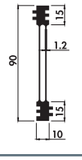
Rth,N: 0,37 K/W

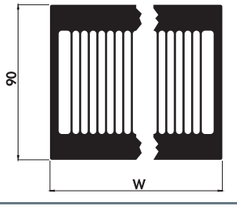
Rth,F: 0,125 K/W

MF10 90
Kg/mt: 1.617



I10 90
Kg/mt: 1.204





PA10 90

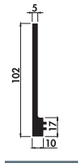
W: 100 mm

L: 150 mm

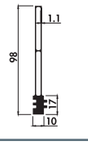
Rth,N: 0,40 K/W

Rth,F: 0,137 K/W

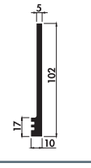
M10 102
Kg/mt: 1.657

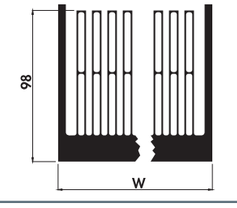


A10 98
Kg/mt: 1.058



F10 102
Kg/mt: 1.551





PA10 98

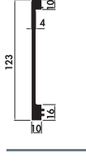
W: 100 mm

L: 150 mm

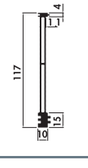
Rth,N: 0,37 K/W

Rth,F: 0,124 K/W

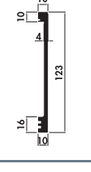
M10 123
Kg/mt: 1.798

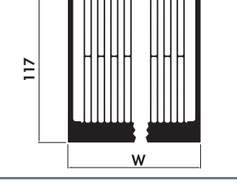


A10 117B
Kg/mt: 1.115



F10 123
Kg/mt: 1.671





PA10 117

W: 100 mm

L: 150 mm

Rth,N: 0,32 K/W

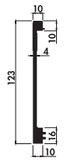
Rth,F: 0,107 K/W

serie **PA**

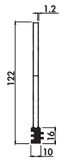
Alta efficienza

High performance heat sink

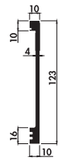
M10 123B
Kg/mt: 1.798

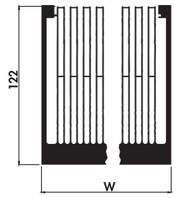


A10 122
Kg/mt: 1.145



F10 123B
Kg/mt: 1.671





PA10 122

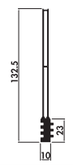
W: 100 mm

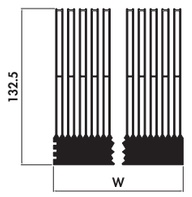
L: 150 mm

Rth,N: 0,31 K/W

Rth,F: 0,104 K/W

A10 132
Kg/mt: 1.434





PA10 132

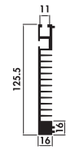
W: 100 mm

L: 150 mm

Rth,N: 0,28 K/W

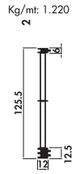
Rth,F: 0,095 K/W

M16 125B
Kg/mt: 2.656

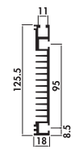


M16 125
Kg/mt: 2.330

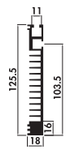
I12 125
Kg/mt: 1.220

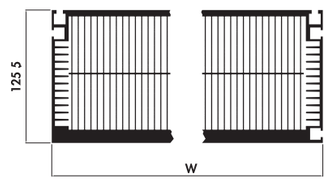


F18 125
Kg/mt: 2.282



F18 125B
Kg/mt: 2.633





PA12 125

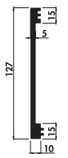
W: 106 mm

L: 150 mm

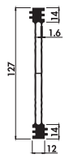
Rth,N: 0,32 K/W

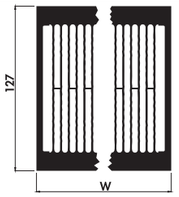
Rth,F: 0,109 K/W

MF10 127
Kg/mt: 2.113



I12 127
Kg/mt: 1.784





PA12 127

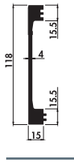
W: 104 mm

L: 150 mm

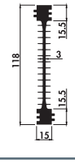
Rth,N: 0,33 K/W

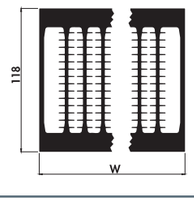
Rth,F: 0,112 K/W

MF15 118
Kg/mt: 2.25



I15 118
Kg/mt: 2,55





PA15 118

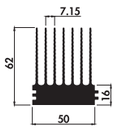
W: 105 mm

L: 150 mm

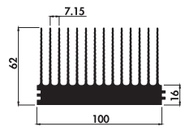
Rth,N: 0,39 K/W

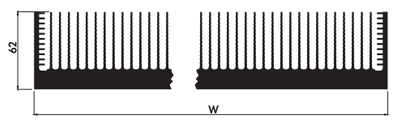
Rth,F: 0,131 K/W

A50 62
Kg/mt: 3.7



A100 62
Kg/mt: 7.41





PA50 62 & PA100 62

W: 100 mm

L: 150 mm

Rth,N: 0,62 K/W

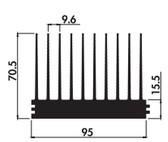
Rth,F: 0,209 K/W

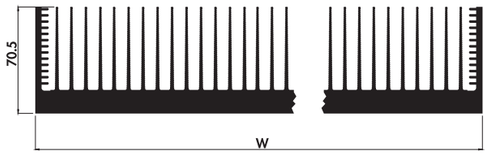
serie **PA**

Alta efficienza

High performance heat sink

A95 70
Kg/mt: 6,63





PA95 70

W: 95 mm

L: 150 mm

Rth,N: 0,64 K/W

Rth,F: 0,215 K/W

MeccAL heatsinks

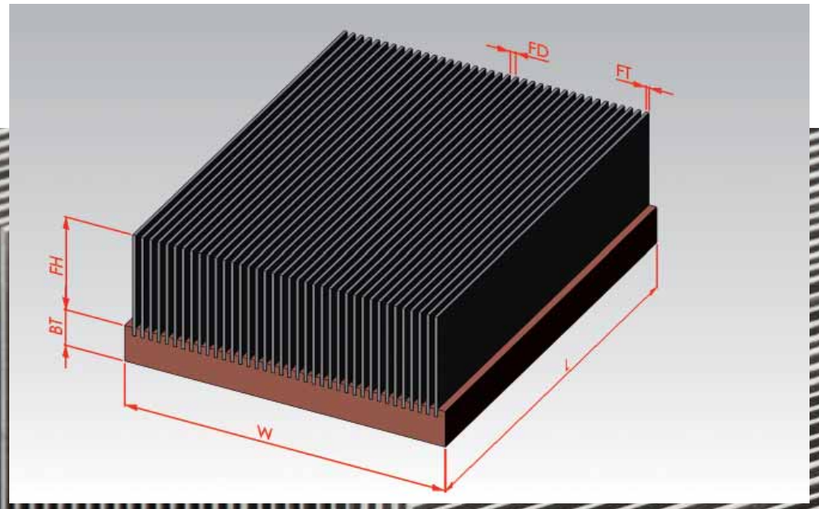
Alette resinate
Bonded fins heat sink

serie PR

Alette resinate

Bonded fins heat sink

Heat sink Width (W)	**<= 500 mm** (Single piece, without welding)
Heat sink Lenght (L)	**<= 700 mm**
Base Thickness (BT)	**>= 8 mm**
Fins Height (FH)	**<= 150 mm**
Fins Thickness (FT)	**<= 3 mm**
Fins Distance (FD)	**>= 3 mm**
Material Base-Fin	**Aluminium-Aluminium** **Copper-Aluminium** **Copper-Copper**



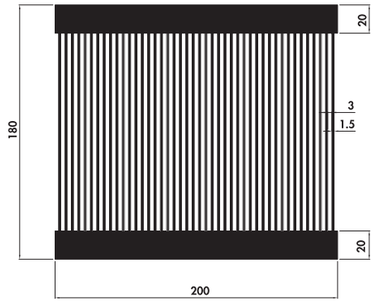
serie PR

Alette resinate

Bonded fins heat sink

I seguenti prodotti sono solo a scopo esemplificativo. Le dimensioni del dissipatore possono essere variate in accordo ai valori indicati nella precedente tabella.

The following products are for illustrative purposes only. The dimensions of the heat sink can be varied according to the values indicated into table above.



PR200 180

Kg/mt: 46,55

L: 200 mm

Rth,N: 0,12 K/W

Rth,F: 0,040 K/W

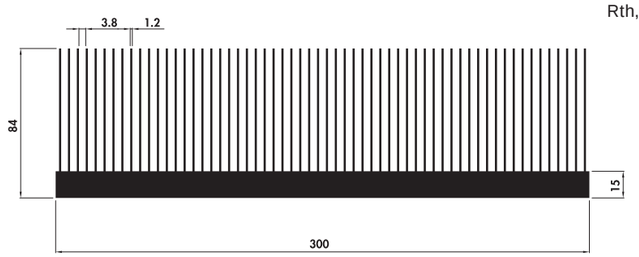
PR300 84

Kg/mt: 25,55

L: 300 mm

Rth,N: 0,12 K/W

Rth,F: 0,039 K/W



MeccAL heatsinks

A liquido
Liquid cooled plate

Liquid cooled plate

I dissipatori a liquido **Mecc.Al** sono realizzati partendo da una base costituita da un piatto in alluminio o in rame e di spessore variabile dai 10 ai 30 mm, sul quale viene realizzato in alternativa il sistema di canalizzazione del liquido:

- con tubi sagomati
- direttamente da estrusione o con fori passanti.

Sulle terminazioni del circuito del liquido di raffreddamento possono essere avvitati o saldo brasati raccordi GAS filettati internamente o esternamente da 1/4", 1/2" o 3/8" o altri raccordi su specifica del cliente.

Il nostro ufficio tecnico è a disposizione per ogni tipo di simulazione e informazione di carattere implementativo.

Mecc.Al liquid cooled plates are made starting from an aluminum or copper base plate of a variable thickness from 10 to 30 mm and obtaining the cooling liquid circuit on the plate through two different alternative processes:

- **with assembled shaped tubes**
- **directly by extrusion or by through holes drilling process.**

1/4", 1/2", 3/8" GAS or specific customized connectors internally or externally threaded can be screwed or braze welded on the tube ending.

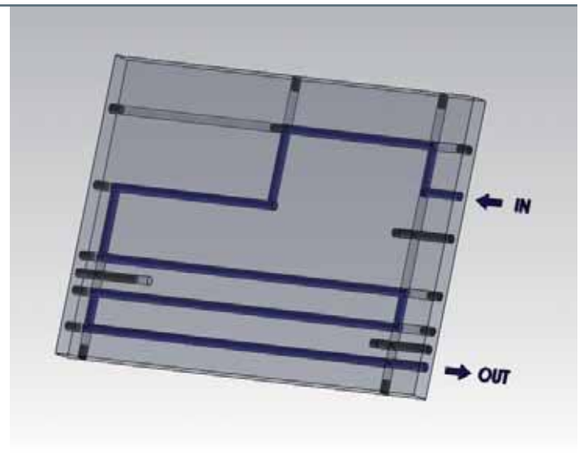
Mecc.Al technical department is available to provide thermal simulations data and any kind of further construction information.

Fori passanti

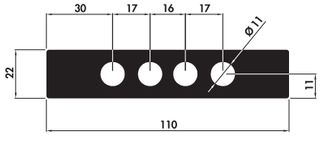
Nel piatto a liquido a fori passanti, i canali di raffreddamento sono ottenuti direttamente da estrusione e/o tramite lavorazione di foratura. Dalla combinazione dei due processi e con l'utilizzo di appositi tappi a vite, si possono ottenere complessi sistemi di canalizzazione in serie o in parallelo, offrendo le migliori prestazione termiche.

Through holes liquid cooled plates

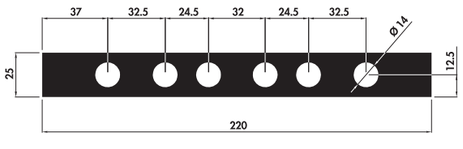
On though holes liquid cooled plates, the cooling liquid circuit is got directly from extrusion and/or mechanical drilling process. By combining the two processes and through screw plugs, it is possible to get complex cooling liquid circuits, giving to the through holes liquid cooled plates the best thermal performance being possible to have parallel cooling channels.



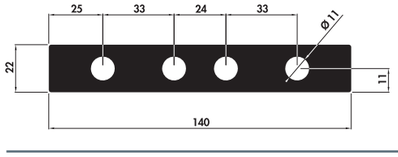
PF110 22



PF220 25



PF140 22



Liquid cooled plate

Serpentina assemblata

Il piatto a liquido a serpentina assemblata viene realizzato partendo da un piatto in rame o alluminio su cui viene incavato il profilo del sistema di canalizzazione desiderato dal cliente attraverso un processo di fresatura. Segue una fase di deposizione di resina epossidica ad elevata conduttività in grado di minimizzare la discontinuità termica fra piatto e serpentina successivamente sistemata, costituita da un tubo opportunamente curvato e sagomato da macchine automatiche a controllo numerico ad alta precisione. La superficie superiore del piatto viene infine planarizzata attraverso pressatura e fresatura.
I piatti a liquido a serpentina assemblata offrono la più alta flessibilità progettuale poiché, a seconda del diametro esterno, il tubo costituente la serpentina può essere piegato con diversi raggi di curvatura (vedi Tab. 1).
A seconda del liquido refrigerante utilizzato, che ne variano la resistenza alla corrosione, il materiale costituente la serpentina può essere in alluminio, rame o acciaio (vedi Tab. 2).

Tab. 1

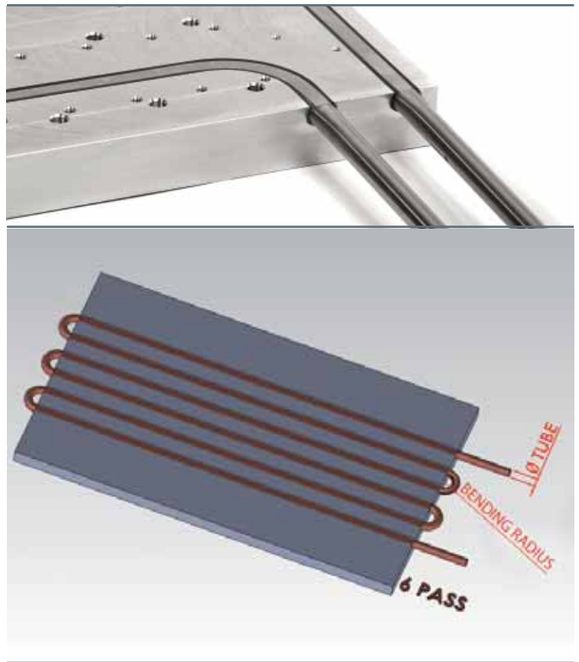
Tube External Diameter [mm]	Bending Radius [mm]
6	10 - 15 - 20
8	12,5 - 20 - 22
10	13 - 14 - 15 - 22,5 - 25 - 30 - 45
12	18 - 30
15	24 - 30 - 45
16	32 - 40

Assembled tube liquid cooled plates

**The assembled tube liquid cooled plate is made starting from an aluminium or copper base plate where the cooling liquid circuit is dug through a milling process.
A high thermal conductivity epoxy is then put over the canalization system to avoid thermal discontinuity between the base plate and the tube subsequently arranged on. The plate surface is than pressed and milled in order to get the best flatness.
The tube is opportunely bent and moulded by high precision numerical controlled machine tools, giving to the liquid cooled plates the maximum design flexibility since, depending on diameter, the tube can get several bending radius (see Tab. 1).
Varying the resistance to corrosion depending on used liquid material, the tube can be in aluminium, copper or stainless steel (see Tab. 2).**

Tab. 2

Channel Material	Liquid
Aluminium	Glycol/Water, Water with anticorrosive agent in closed circuits, Oil
Copper	Standard cooling liquids, Deionized Water, Industrial Water, Oil
Stainless Steel	Demineralised Water, Aggressive liquids



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