EXPERTS IN PERFORATED METAL

IMPRINT

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CONTENT

"Having a vision is good, realising it without competent support is an illusion."

Hans-Ulrich Koch

COMPANY PROFILE
PRODUCTION | WORKFLOW
PRODUCTION | EQUIPMENT

EXPERT KNOWLEDGE

OUR EXPERIENCE AND OUR KNOW-HOW ALL-IN-ONE EXPERTISE STAND FOR YOUR SUCCESS COMPANY PROFILE

Founded in 1895, Dillinger Fabrik gelochter Bleche GmbH has more than 100 years' experience in the field of manufacturing and processing perforated plates and sheets.

Being one of the leading manufacturers in Europe and employing more than 350 people in the group, we are able to offer you a wide product range made unique by our further processing possibilities:

We are your competent partner, no matter if you need perforated thin sheets or plates with a thickness of up to 30 mm, complex casings for electrical switch cabinets or complete equipment manufacturing, perforated small screening tubes or ready-to-install screening drums for large preparation and screening installations.

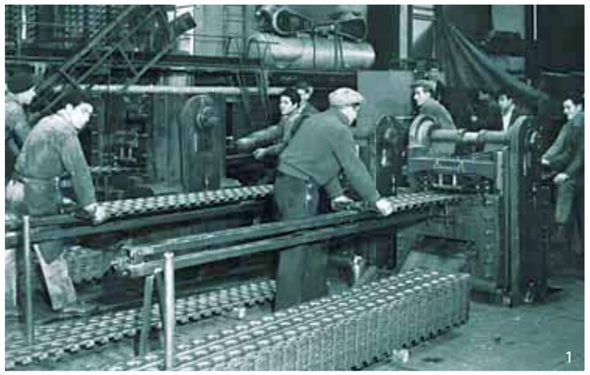
Thanks to our state-of-the-art equipment we are able to meet almost any customer requirement. Completely manufacturing the products from one source, we let our customers benefit at the best from existing synergy potentials.

In addition to straightforward manufacturing and processing, we offer advice to our customers already during product development in order to optimise together both the manufacture and the price of our products.

This catalogue gives you a brief overview on our production capabilities in various fields.

1. Dillinger Fabrik gelochter Bleche GmbH, founded in 1895. At that time ...
2. and today.

Left: DF administration building in Dillingen



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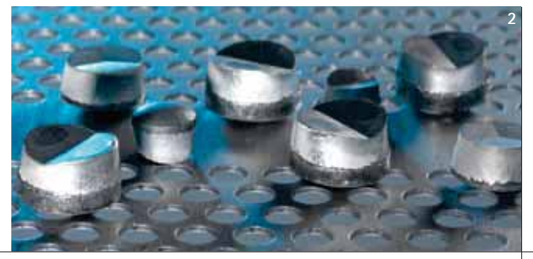
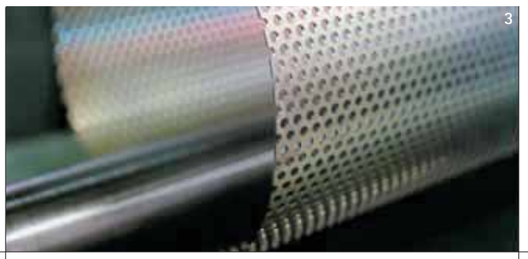
WELL COORDINATED AND SYNCHRONISED PROCESSES ALL-IN-ONE EXPERTISE IN CERTIFIED QUALITY WORKFLOW





Left: Tool workshop **1.** Perforating/punching **2.** Slugs from punching **3.** Further processing **4.** Assembly **5.** Logistics and dispatch

CONSULTING | ENGINEERING

Apart from straightforward manufacturing, we offer a comprehensive service package including **Consulting, Engineering and Design.**
Together with you, we develop and optimise solutions for difficult problems even up to the successful final application (Pro Engineer and Auto C.A.D.).

TOOL WORKSHOP

Our efficient in-house tool workshop as well as our stock of more than 6,000 different punching tools enable us to realise customer-specific solutions with a high degree of flexibility within the shortest possible period.

EQUIPMENT

Our state-of-the-art equipment consisting of
sectional presses
all-across presses
laser cutting systems
punching-nibbling-laser machines
numerous processing machines
enables us to carry out any perforation which is technically feasible.

MATERIAL

We process all punchable and laserable materials in various qualities of **steel, non-ferrous metals as well as plastics** in thicknesses from 0.3 mm up to 30 mm. **One of our specialties is the realisation of difficult perforations in materials with a high hardness degree (e.g. wear-resistant steel, composite steel) and a high thickness.** It goes without saying that we also perforate material supplied by the customer.

STOCK ASSORTMENT

Our large stock assortment contains more than 250 positions of sheets with the common round and square hole perforations in small, medium and large formats in steel, galvanised steel, stainless steel and aluminium. Along with the products made to customers' specification, this stock assortment perfectly rounds up our product range and is available anywhere in Germany within 48 hours.

FURTHER PROCESSING

In addition to the production of flat plates and sheets, particular attention has been given, in recent years, **to processing perforated sheets and plates into complex, ready-to-install units and supply parts.**

In the area of further processing we are capable of:
levelling, drawing
cutting, edging, profiling, lasering
bending, rounding
fitting, welding, clinching, etc.
assembling

SURFACE TREATMENT

On request our products may undergo the following surface treatments:
shot blasting, pickling
painting, powder-coating
hot-dip galvanising, electro-galvanising
chromising, nickel-plating
electrolytic polishing, anodising.

STOCK KEEPING AND JUST-IN-TIME DELIVERY

It is not only the quality of a product that is decisive, but also the price and delivery time. We take this into account by stocking products made to customers' requirements until delivery is requested. This enables you, on the one hand, to benefit from quantity discounts for large production runs and, on the other hand, to enjoy shorter delivery times for goods held in stock – quality just in time.

LOGISTICS

We endeavour to provide quick and reliable delivery. Therefore, our competent and experienced teams cooperate closely with our external logistics partners to ensure that our customers are satisfied.

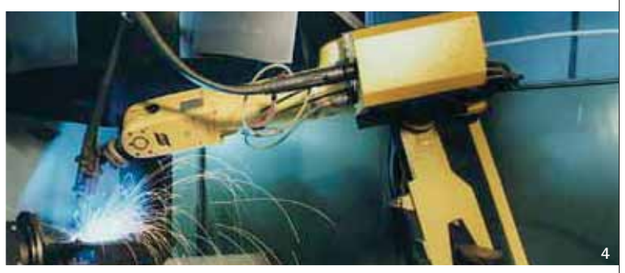
CERTIFIED QUALITY

We are certified according to **DIN EN ISO 001:2000**. All internal procedures are supervised by our "Quality Assurance" department. Be it the receipt of goods, the production or the dispatch of goods – a continuous and efficient quality management is the basis for satisfying our customers.

MAN AND MACHINE
ALL-IN-ONE EXPERTISE
AT THE HIGHEST LEVEL
EQUIPMENT

Left, above: Part of production workshop 1
Left, below: State-of-the-art production line with 4 all-across presses in a row

1. Efficient Soenen sectional press with automatic feeding unit **2.** Large bending rolls up to 4.5 m body length **3.** Detailed view on all-across press **4.** Fully automated robot welding system


4


soenen
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SECTIONAL PRESSES

Material thickness	up to 30 mm of steel
	up to 20 mm of stainless steel
	up to 30 mm of non-ferrous metal
Max. plate size	2,500 mm x 6,000 mm

ALL ACROSS PRESSES (MOSTLY USED WITH COILS)

Material thickness	up to 4 mm of steel
	up to 3 mm of stainless steel
	up to 4 mm of non-f. metal
Plate width	up to 1,500 mm

ECCENTRIC PRESSES

Strength	up to 300 t

HYDRAULIC PRESSES

Strength	up to 400 t

PUNCHING / NIBBLING / LASER CENTRE

Material thickness	up to 8 mm of steel
	up to 6 mm of stainless steel
	up to 8 mm of non-f. metal
Max. plate size	1,500 mm x 3,000 mm

LASER CUTTING SYSTEM 6,000 WATT

Material thickness	up to 25 mm in of steel
	up to 25 mm of stainless steel
	up to 16 mm of non-f. metal
Max. plate size	2,000 mm x 6,000 mm

LEVELLING MACHINES

Material thickness	0.4 mm - 30 mm
Plate width	up to 2,500 mm

SQUARING SHEARS

Material thickness	up to 20 mm of steel
	up to 15 mm of stainless steel
Cutting length	up to 6,000 mm

FORMING ROLLS

Material thickness	up to 22 mm
Length to be formed	up to 4,500 mm

FLANGING PRESSES / AUTOM. FLANGING CENTRE

Material thickness	up to 12 mm of steel
	up to 8 mm of stainless steel
Length to be formed	up to 6,000 mm

WELDING MACHINES

Transfer range	X-axis up to 6,000 mm
	Y-axis up to 15,000 mm
	MIG / MAG / WIG welding Plasma welding

WELDING ROBOTS

	up to 160 kg workpiece holding capacity (MIG / MAG welding)

2 DEGREASING SYSTEMS

Material thickness	up to 10 mm
Max. plate size	2,000 mm x 6,000 mm

MAN AND MACHINE
ALL-IN-ONE EXPERTISE
AT THE HIGHEST LEVEL
EQUIPMENT

Left: Fully automated bending centre "Salvagnini P4" with mechanic feeding and discharging station

1. Punching / nibbling / laser centre "Trumatic 6000L" with storage areas and automatic feeding unit **2.** Degreasing system on water basis for parts up to 2,000 mm large, 6,000 mm long and 10 mm thick **3.** Laser cutting system "Trumatic 5060" with 6,000 Watt laser


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"Perfectionism and motivation are our motor
for continuous visions and innovations."

Andreas Poss

ARCHITECTURE | EXTERIOR FACADES
ARCHITECTURE | CEILINGS AND FACINGS
ARCHITECTURE | INTERIOR DESIGN
MECHANICAL AND PLANT ENGINEERING | EQUIPMENT MANUFACTURING
FOOD INDUSTRY | PROCESS TECHNOLOGY
FILTER INDUSTRY
ELECTRONIC INDUSTRY | MEDICAL ENGINEERING
AUTOMOTIVE ENGINEERING
PROCESSING INDUSTRY | RECYCLING
SCREENING TECHNOLOGY | MISCELLANEOUS

APPLICATIONS

FORM AND PERFECTION
APPLICATIONS
NEED AN EXPRESSIVE FACADE
ARCHITECTURE, EXTERIOR FACADES

Left: BMW World in Munich, 20,000 m² complete facade and interior ceiling made of perforated stainless steel sheets

1. Facade of perforated sheets for new AUDI terminals made from anodised complexly bent aluminium perforated sheets
2. Detailed view of an AUDI terminal facade 3. Rear view perforated facade BMW World in Munich

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BEST FUNCTIONALITY AND DURABILITY
APPLICATIONS IN APPEALING AESTHETICS
ARCHITECTURE, CEILINGS AND FACINGS

Left: Noise protection ceiling made of micro-perforated aluminium sheets, underground station Lohring, Bochum

1. Ceiling of a shopping centre in London made of perforated, bent and powder-coated sheets. 2. Perforated aluminium sunscreen slats 3. Partitions for acoustic absorption 4. Detailed view micro-perforation underground station Lohring


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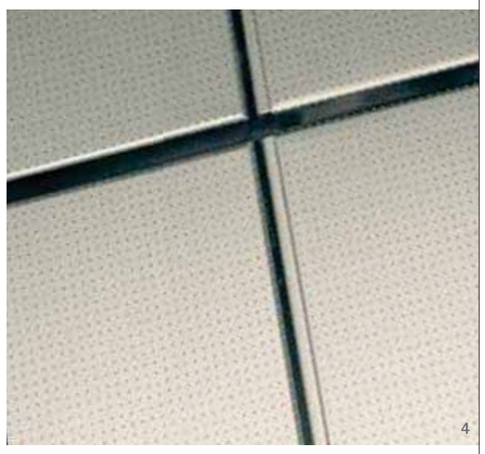
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BEST FUNCTIONALITY AND DURABILITY
APPLICATIONS
IN APPEALING AESTHETICS
ARCHITECTURE, INTERIOR DESIGN

Left: Railing made of powder-coated perforated sheets

1. Railing made of perforated stainless steel sheets 2.+4. Ceiling and floor lamps made of electro-polished stainless steel
3. TV rack made of electro-polished stainless steel 5. Ultramodern stainless steel furniture for indoors and outdoors


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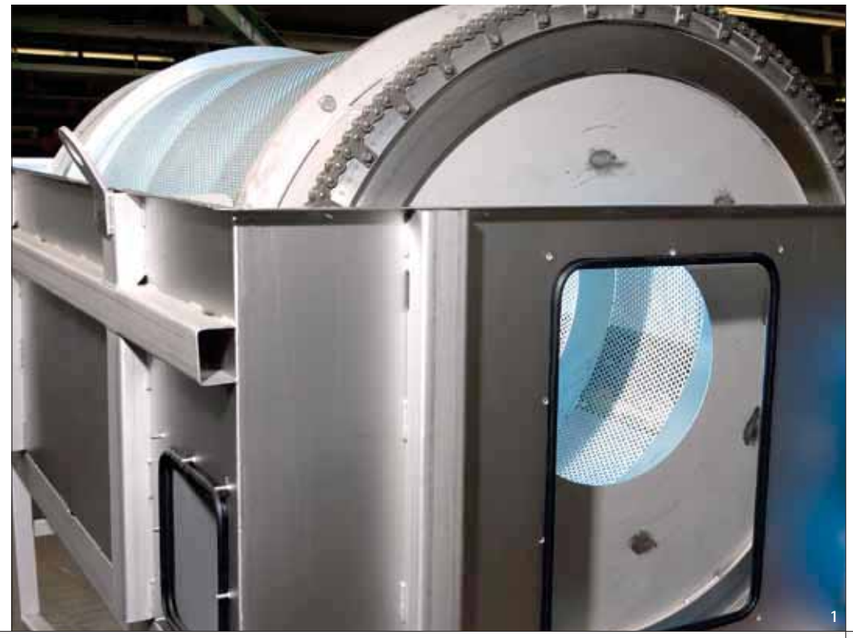
EFFICIENCY AND DURABILITY
APPLICATIONS FOR CONTINUOUS USE
MECHANICAL AND PLANT ENGINEERING EQUIPMENT MANUFACTURING

Left: Complex filter elements of perforated plates for cooling circuits in power plants

1. Perforated drum with spiral as pre-screen for the preparation of sewage sludge 2. Support basis elements as noise protection inlets for machines 3. Screw conveyor in a perforated pan



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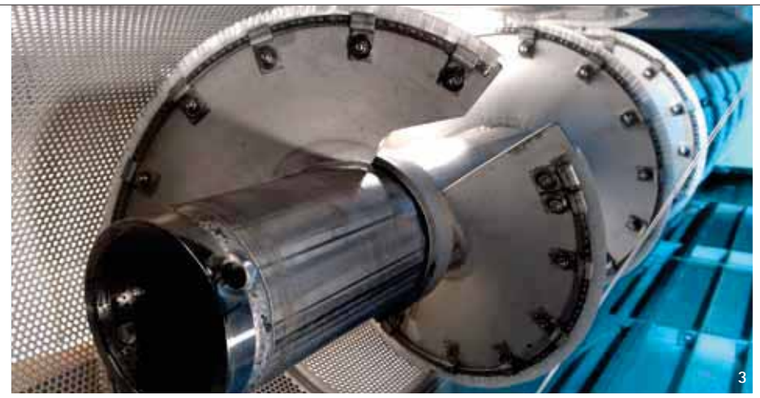

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EFFICIENCY AND DURABILITY
APPLICATIONS FOR CONTINUOUS USE
MECHANICAL AND PLANT ENGINEERING EQUIPMENT MANUFACTURING

Left: Welding of perforated sheets to ready-to-install units

1. Stainless steel star filter 2. Centrifuge baskets for galvanising small parts 3. Silencer links welded from perforated sheets for power plants 4. Perforated stainless steel sheets as filter element in installations 5. Welding workshop for stainless steel with 4 welding stations


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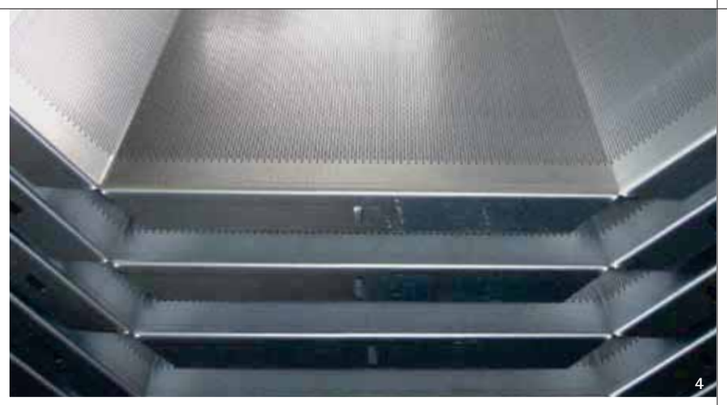
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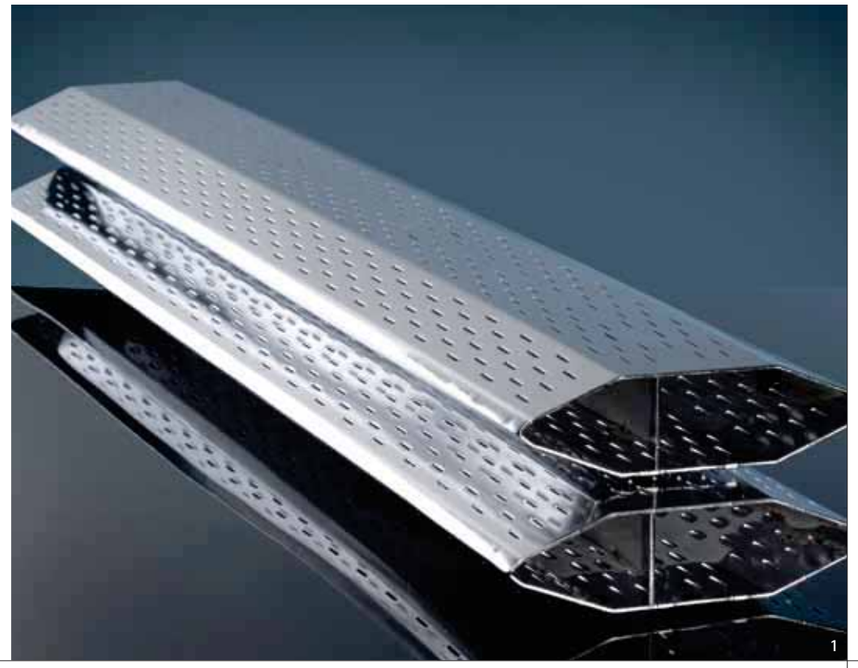
TRANSGRESSING BORDERS
APPLICATIONS
FOR OPTIMISING YOUR PRODUCTION
FOOD INDUSTRY, PROCESS TECHNOLOGY

Left: Embossed trieur sheets as screening inlet in hammer mills

1. Electro-polished stainless steel juice channels for whine presses 2. + 4. Complexly bent and folded perforated sheets as conveyor elements 3. Perforated and embossed plates for transporting bearing races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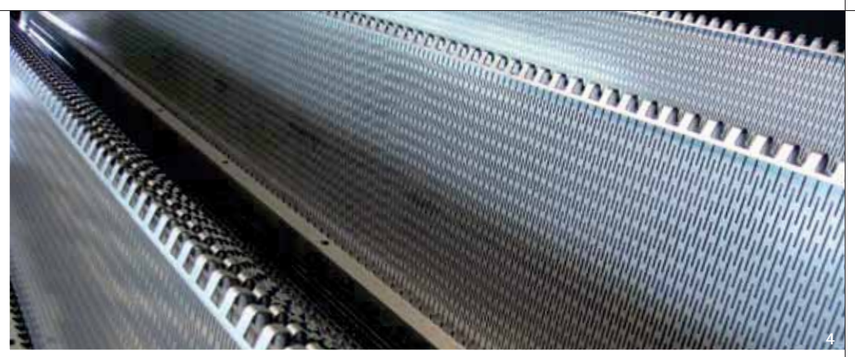
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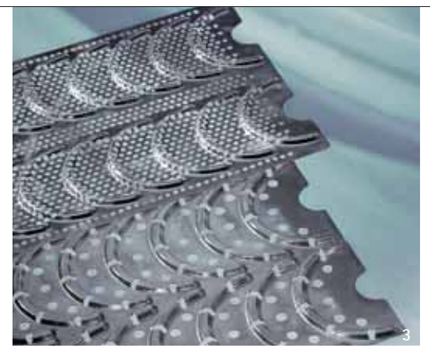
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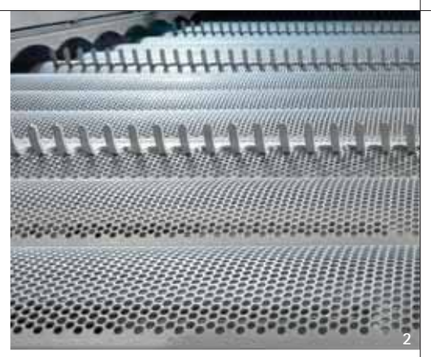
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PROFESSIONAL SOLUTIONS
APPLICATIONS
FOR SOPHISTICATED TASKS
FILTER INDUSTRY

Left: Tubes for sound insulation, exhaust gas, air conditioning and ventilation technology

1.+3.+5. Perforated sheets used as support tubes for filter cartridges 2. Perforated filter tubes and supports for filter elements 4. Hot-dip galvanised tubes with slotted bridge perforation used as well filters


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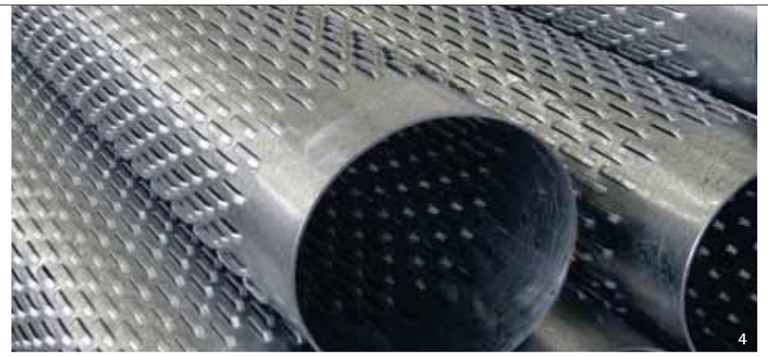
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PERFECT SURFACES
APPLICATIONS
FOR HIGHLY SENSITIVE COMPONENTS
ELECTRONIC INDUSTRY, MEDICAL ENGINEERING

Left: Switch cabinets with components (insert racks, doors, etc.) made of perforated sheets

1. Trays for medical high-performance ovens 2. Washing drums for industrial applications
3. Hexagonal perforation with the highest possible open surface 4. Detailed view: Component rack for switch cabinets assembled by clinching.

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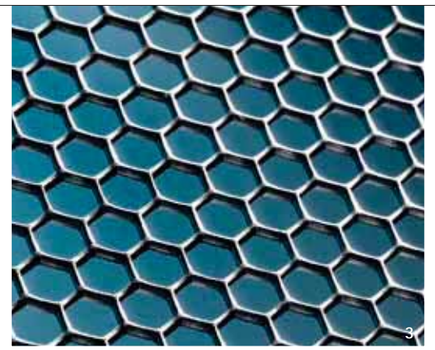
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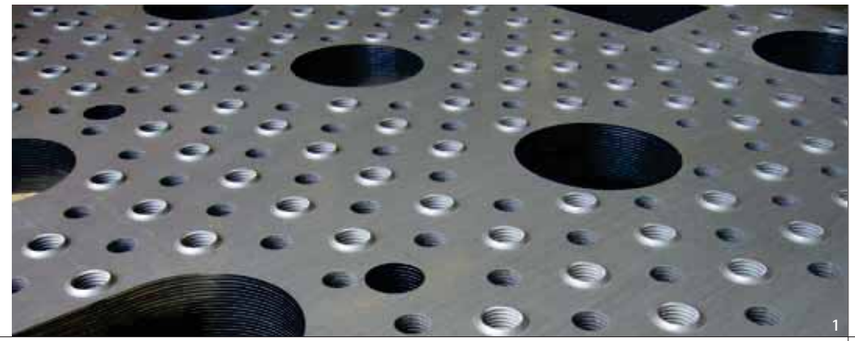
HIGH-END COMPONENTS
APPLICATIONS
FOR THE HIGHEST DEMANDS
AUTOMOTIVE ENGINEERING

Left: Exhaust gas systems and mufflers made of rounded and bent perforated stainless steel sheets

1. Perforated sheets with embossed perforation used in airfield transport technology 2. Chain protection casing for agricultural machines 3. Lasered mounting part for agricultural machines 4. Muffler inlet for motorbikes 5. Grid rings as explosion protection for airbag systems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WEAR-RESISTANT SCREENINGS MADE OF THE BEST MATERIAL
APPLICATIONS
FOR CONSTANT QUALITY
PROCESSING INDUSTRY, RECYCLING

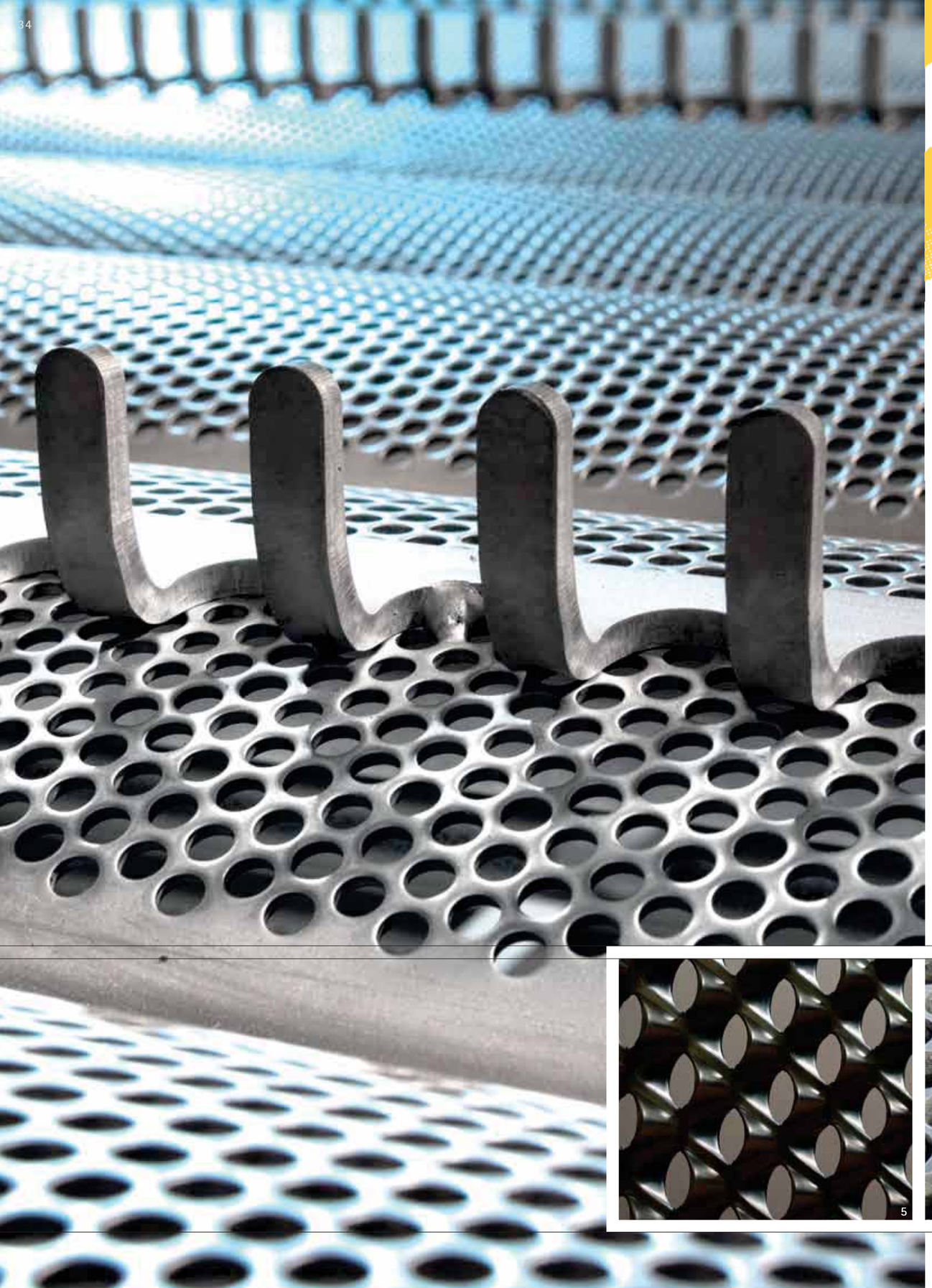
Left: Screening plates in all variations

Right: Screening and sorting drums including race and conveying screw in all sizes and variations during assembly at DF and during final use.

WEAR-RESISTANT SCREENINGS MADE OF THE BEST MATERIAL
APPLICATIONS
FOR CONSTANT QUALITY
SCREENING TECHNOLOGY, MISCELLANEOUS

Left: Screening plate made of wear-resistant material

1.– 4. Various screening plates with round and half-pear shaped holes to be used in various screening installations
5. Nose-type perforation

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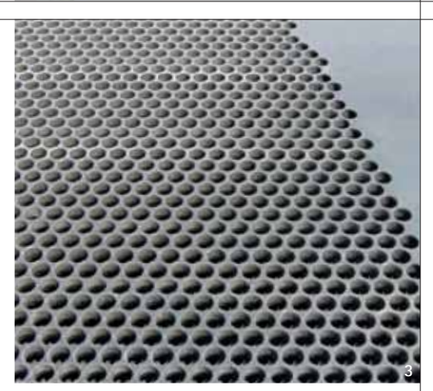
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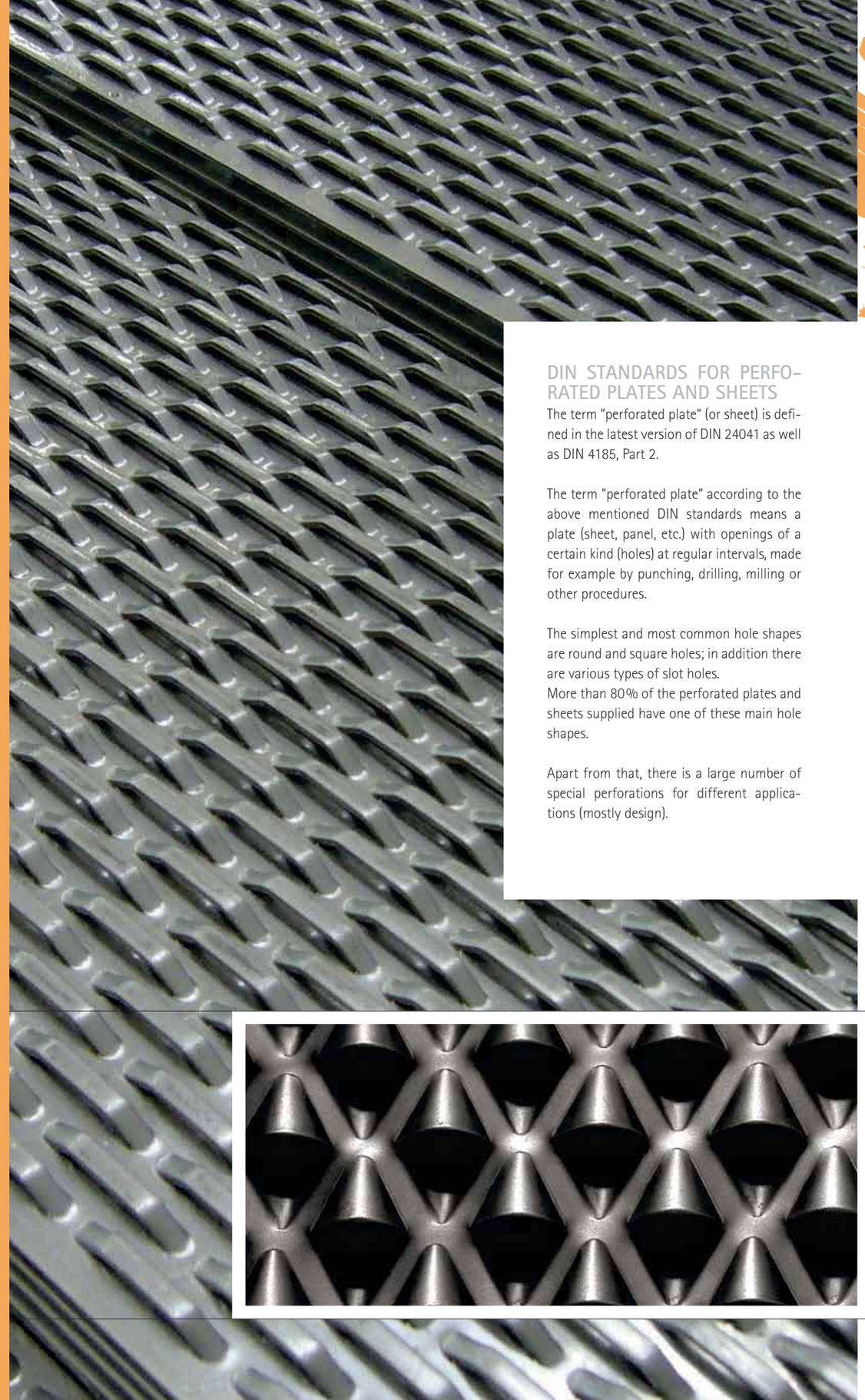
"Our high degree of flexibility in manufacturing
and our long-time experience
guarantee high performance in all areas."

Hans-Peter Krämer

ENGINEERING

ROUND HOLE
SQUARE HOLE
SLOT HOLE rounded
SLOT HOLE angular
HEXAGONAL HOLE
STAR-SHAPED HOLE
KEYHOLE
TRIANGULAR HOLE
DIAMOND-SHAPED HOLE



THE RIGHT TOOL
ENGINEERING
FOR OPTIMUM RESULTS
MAIN HOLE SHAPES, BASIC TERMS

DIN STANDARDS FOR PERFORATED PLATES AND SHEETS

The term "perforated plate" (or sheet) is defined in the latest version of DIN 24041 as well as DIN 4185, Part 2.

The term "perforated plate" according to the above mentioned DIN standards means a plate (sheet, panel, etc.) with openings of a certain kind (holes) at regular intervals, made for example by punching, drilling, milling or other procedures.

The simplest and most common hole shapes are round and square holes; in addition there are various types of slot holes.
More than 80% of the perforated plates and sheets supplied have one of these main hole shapes.

Apart from that, there is a large number of special perforations for different applications (mostly design).

HOLE DIMENSIONS

Hole width w = smallest dimension for the hole opening, i.e. diameter of the round hole and edge length of the square hole, and width of the slot hole.

Hole length l = length of slot hole (larger clear dimension).

Note: The technically feasible hole diameter is determined by the thickness and the type of material.

Approximate figures for steel, aluminium and similar material: The hole diameter should not be inferior to the material thickness (relation 1:1). For stainless steel and high-strength steel this relation is less favourable. In many cases, DF can go below this relation. These cases, however, need prior technical clarification.

HOLE CROSS-SECTION

Perforated plates and sheets have usually a slightly conical hole pattern.

Therefore, the relation of the bridge c to the thickness of the plate s indicated below should not be inferior to 1 mm.
Otherwise the bridges between the holes may break. In the case of screening plates, the conical form of the hole is advantageous since it reduces the risk of holes being blocked.

NUMBER OF HOLES

Two terms are used to describe the distance between the holes:

Hole pitch t: The pitch is defined as the distance from hole centre to hole centre in two adjacent rows.

Bridge width c: This signifies the smallest unperforated space between 2 holes in adjacent rows.

Note: **t = w + c**
(refer also to the schemes starting on page 41)

For slot holes, a distinction is made between head bridge and side bridge.

Guideline: Approximately the same relation of bridge c to material thickness s is applicable as for the hole diameter w (relation bridge width c to thickness s approx. 1:1). Depending on the material, the hole diameter w and the pitch t, relations of less than 1 are also possible.

FORMATION OF BURRS

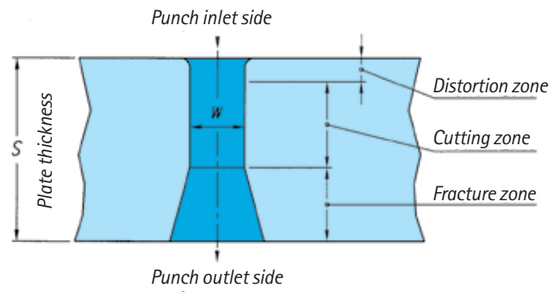
Minimal burr formation on the outlet side of the punch is unavoidable.
The degree of burr depends on the material, the tolerances of the punching tools, the wear of the tool and various other factors.

Our tools, manufactured with state-of-the-art machinery, guarantee punching with the smallest possible burr. Nevertheless, an absolutely smooth surface can only be obtained by suitable treatment (such as brushing, grinding).

DIRECTION OF FEED

The direction of feed is very important with screening plates. It indicates the direction in which the goods are carried across the plate. The best screening result is achieved if the holes are staggered across the feeding direction.

The direction of feed is defined clearly in the DIN standards 24041 and 4185. It is always parallel to dimension a1 (refer also to the schemes starting on page 41).



RELATIVE OPEN SURFACE (OPEN SECTION, OPEN AREA)

The relative open surface is often called "open section" or "open area". This means the percentage of open surface (holes) in relation to the perforated area (without margins).

The relative open surface is important for screening and the determination of the flow rate as well as for the calculation of the load-bearing capacity and weight saving.

UNPERFORATED MARGINS, STRIPES OR AREAS

The unperforated margin is the distance from the plate's outer edge to the first line of punched holes. The unperforated margin depends on the spacing of the tool as well as the dimensions of the plate.

If no indications are given on the unperforated margins, the term "smallest possible unperforated margin" is often used. In this case, the smallest possible unperforated margins are chosen taking into consideration the tools used.

Plates without unperforated margins are usually cut out from larger plates.

Unperforated stripes or areas may be manufactured by using tool variations, blank advancing, or automatic tool control.

In this case, however, particular attention must be given to the tension in the plate (see levelness).

LEVELNESS, SABRE SHAPE

Levelness

Generally, perforated plates are levelled once mechanically in order to keep their levelness within the DIN standards.
Particularly in the case of:

- dissimilar side margins
- unperforated areas or stripes
- large open surface
- certain materials

residual tensions in the plate are sometimes unavoidable. In such cases, it is essential to clarify beforehand the levelness required and the resulting additional treatment.

Sabre Shape

Perforated plates with dissimilar side margins e1, e2 may become sabre shaped.
The extent of the sabre shape is affected by the material, its thickness, the length and width of the plate and the relative open surface A_0.

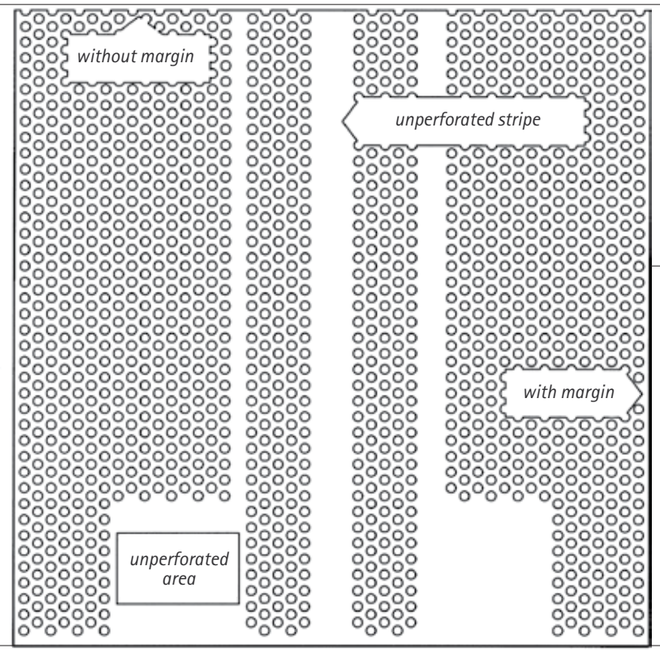
While the sabre shape of the whole plate can be eliminated by cutting, the sabre shape of the perforated area cannot be eliminated. Here too it is advisable to clarify the admissible tolerances.

BEGINNING OF THE PERFORATED AREA

For tool-related reasons, the punch and the matrix are arranged in the tool at distances larger than the hole distances in the plate.

This results in a hole pattern with incomplete hole rows (doubled staggered rows), also called "big beginning"; the hole pattern is complete only after the second stroke.

Should you wish the complete hole pattern on the first stroke (normally staggered rows, or "small beginning"), please indicate this in you enquiry.



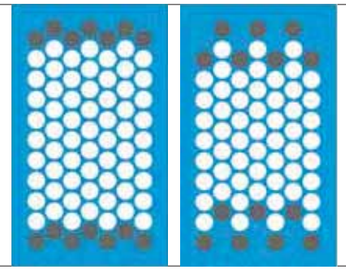


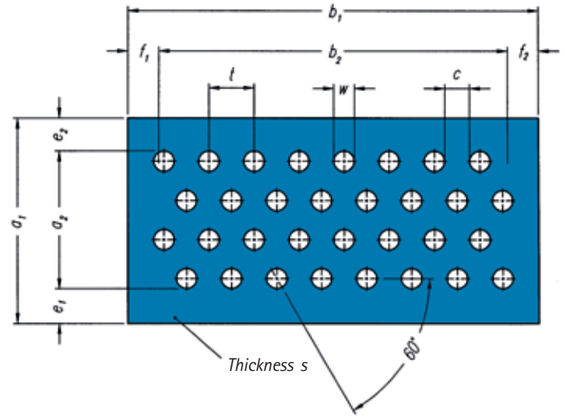
Illustration left:
normal staggered rows
(complete hole pattern)

Illustration right:
double staggered rows
(incomplete hole pattern)

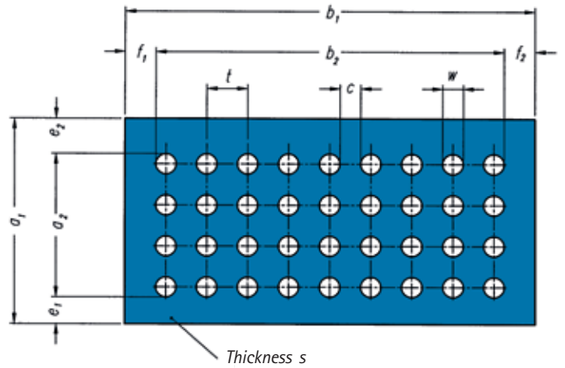
THE RIGHT TOOL
ENGINEERING
FOR OPTIMUM RESULTS
ROUND HOLES

REFER TO PAGE 46
FOR DEFINITIONS ...

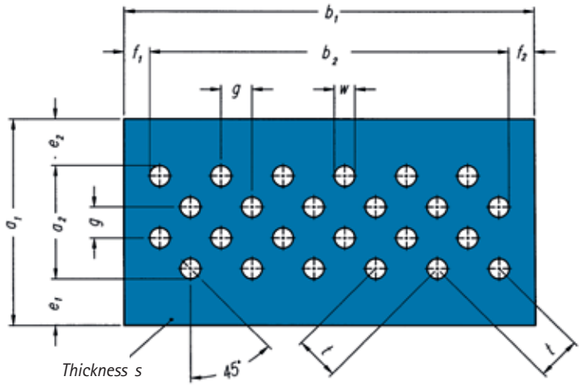
ROUND HOLES IN STAGGERED ROWS (RT)



ROUND HOLES IN STRAIGHT ROWS (RU)



ROUND HOLES IN DIAGONAL STAGGERED ROWS (RZ)



THE RIGHT TOOL
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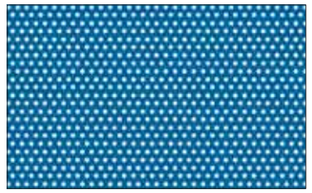
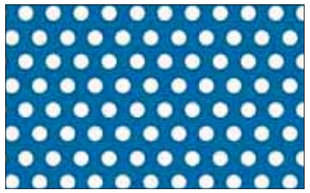
ROUND HOLES, EXAMPLES 1:1

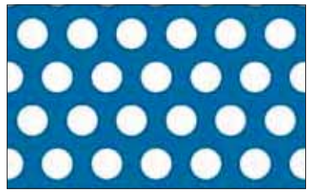
ROUND HOLES IN STAGGERED ROWS (RT)



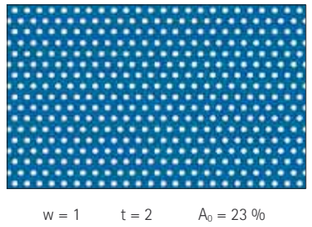
w = 0,8 t = 1,5 A_0 = 26 %



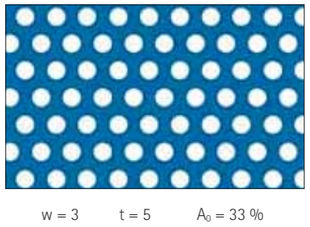
w = 2,5 t = 4,5 A_0 = 28 %



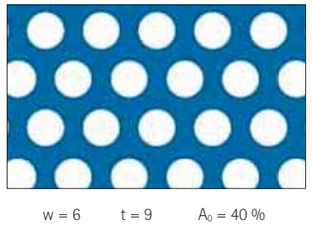
w = 5 t = 8 A_0 = 35 %



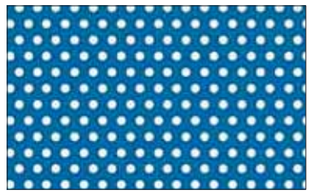
w = 1 t = 2 A_0 = 23 %



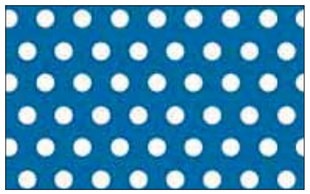
w = 3 t = 5 A_0 = 33 %



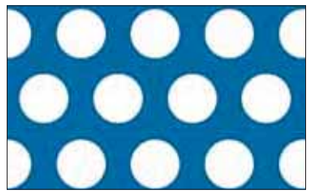
w = 6 t = 9 A_0 = 40 %



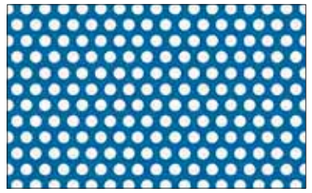
w = 1,5 t = 3 A_0 = 23 %



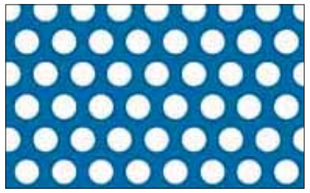
w = 3 t = 6 A_0 = 23 %



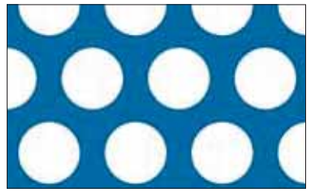
w = 8 t = 12 A_0 = 40 %



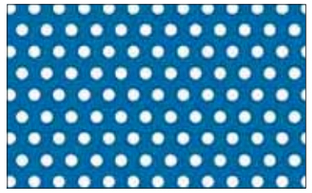
w = 2 t = 3 A_0 = 40 %



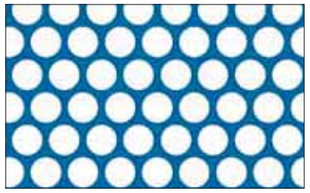
w = 4 t = 6 A_0 = 40 %



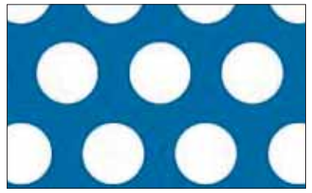
w = 10 t = 14 A_0 = 46 %



w = 2 t = 4 A_0 = 23 %

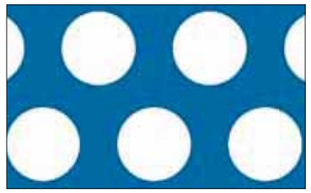


w = 5 t = 6 A_0 = 63 %

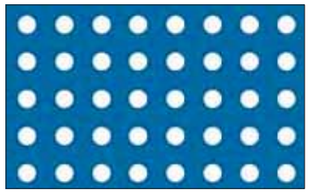


w = 10 t = 15 A_0 = 40 %

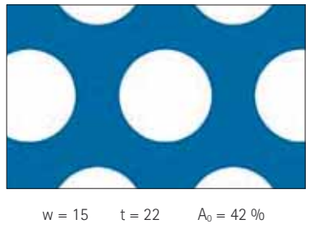
IN STRAIGHT ROWS (RU)



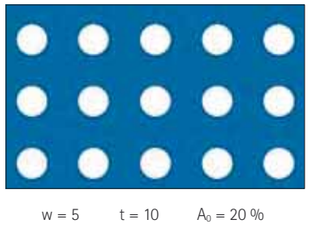
w = 12 t = 18 A_0 = 40 %



w = 3 t = 6 A_0 = 20 %

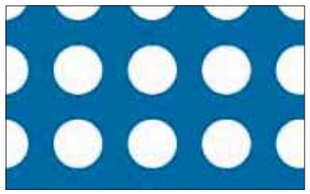


w = 15 t = 22 A_0 = 42 %

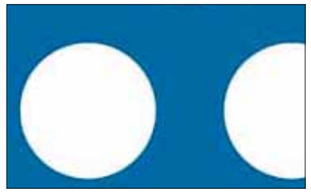


w = 5 t = 10 A_0 = 20 %

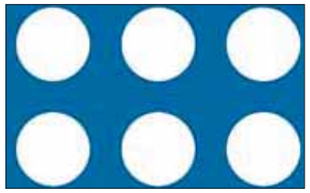
w = 20 t = 30 A_0 = 40 %



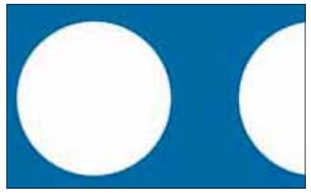
w = 8 t = 12 A_0 = 35 %



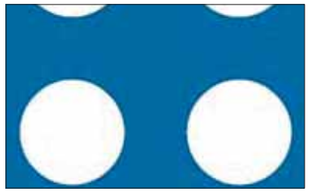
w = 22 t = 33 A_0 = 40 %



w = 12 t = 17 A_0 = 39 %

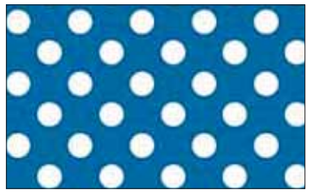


w = 25 t = 36 A_0 = 44 %

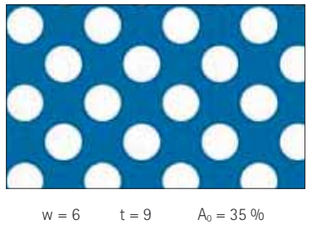


w = 17 t = 27 A_0 = 31 %

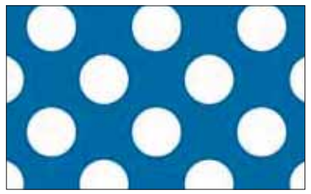
IN DIAGONAL STAGGERED ROWS (RZ)



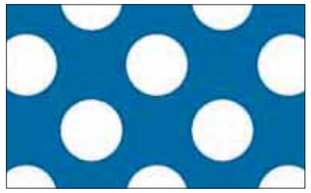
w = 4 t = 7 A_0 = 26 %



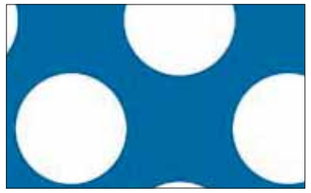
w = 6 t = 9 A_0 = 35 %



w = 8 t = 12 A_0 = 35 %



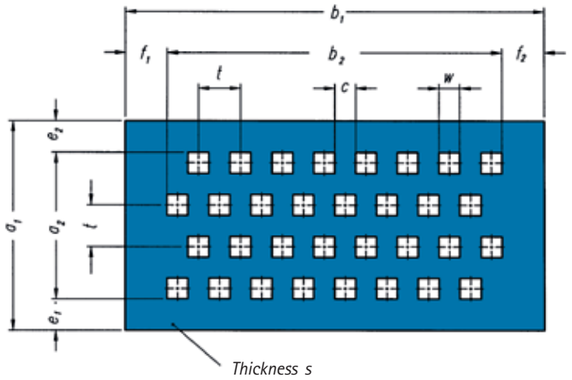
w = 10 t = 15 A_0 = 35 %



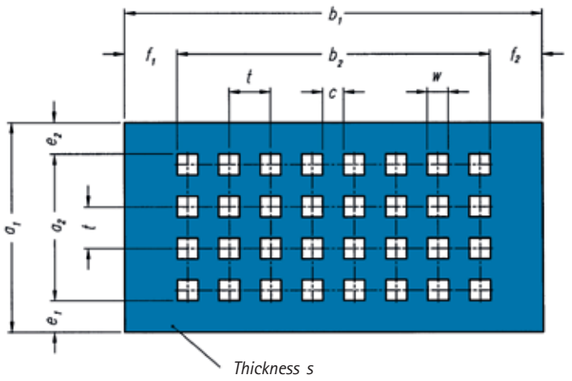
w = 18 t = 25 A_0 = 41 %

REFER TO PAGE 46
FOR DEFINITIONS ...

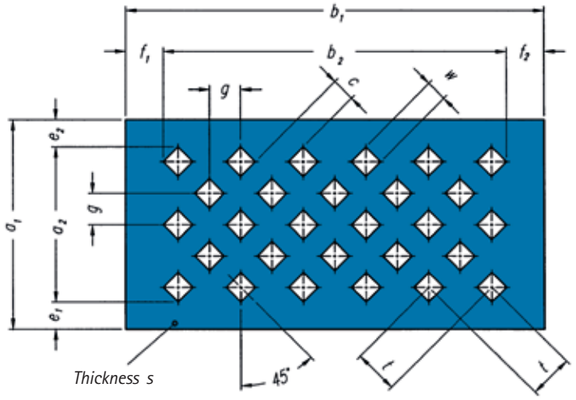
SQUARE HOLES IN STAGGERED ROWS (CZ)

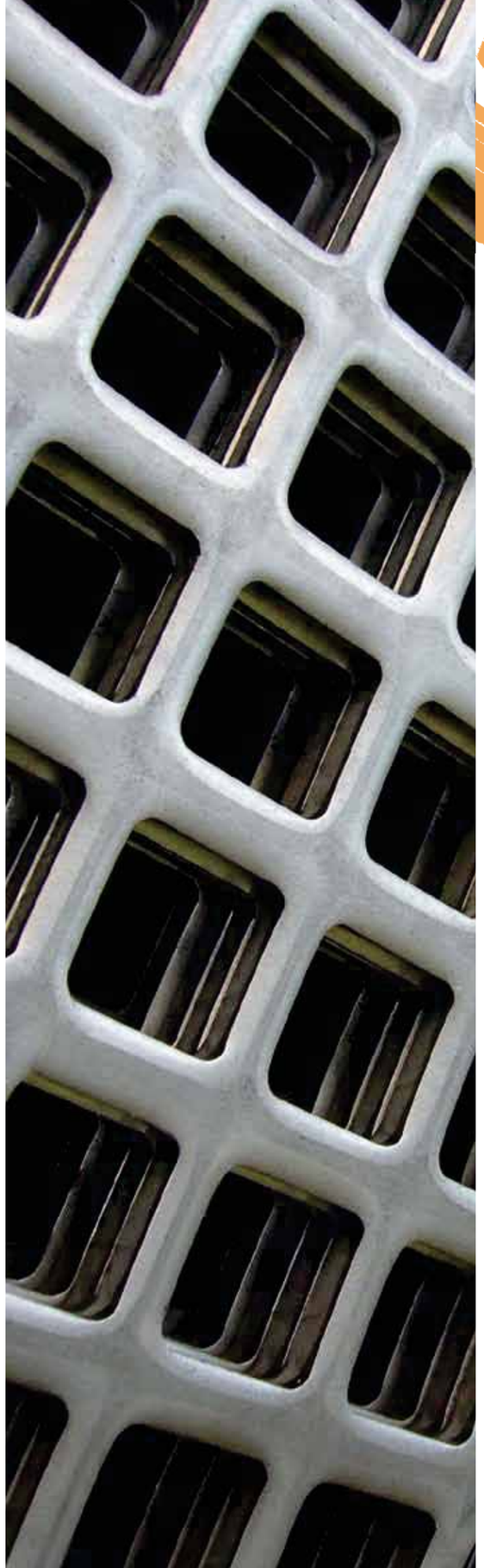


SQUARE HOLES IN STRAIGHT ROWS (CU)



SQUARE HOLES IN DIAGONAL STAGGERED ROWS (CD-Z)





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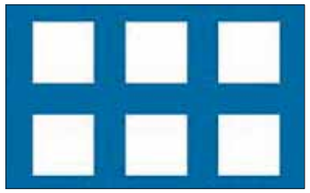
SQUARE HOLES, EXAMPLES 1:1

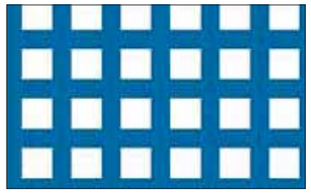
SQUARE HOLES IN STRAIGHT ROWS (CU)

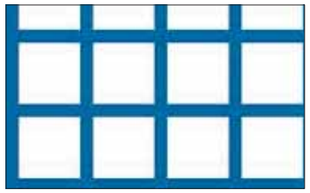
IN DIAGONAL STAGGERED ROWS (CD-Z)
IN STAGGERED ROWS (CZ)


w = 4 t = 12 A_0 = 11 %

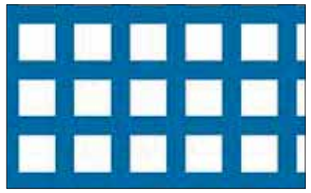

w = 10 t = 15 A_0 = 44 %


w = 5 t = 10 A_0 = 25 %

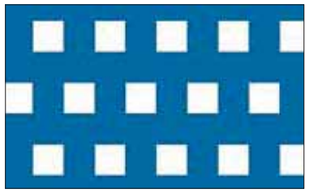

w = 5 t = 8 A_0 = 39 %

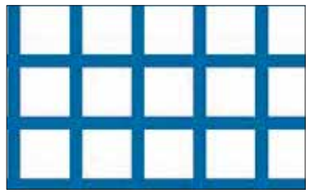

w = 10 t = 12 A_0 = 69 %


w = 8 t = 13 A_0 = 38 %

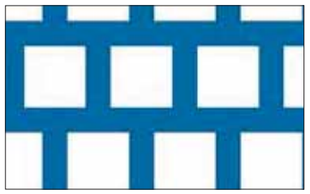

w = 6 t = 9 A_0 = 44 %

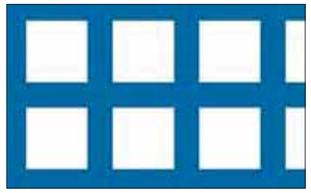

w = 15 t = 21 A_0 = 51 %


w = 5 t = 10 A_0 = 25 %


w = 8 t = 10 A_0 = 64 %


w = 16 t = 20 A_0 = 64 %

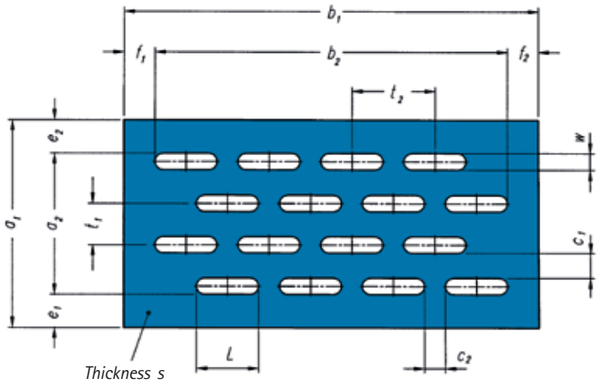

w = 10 t = 14 A_0 = 51 %


w = 10 t = 14 A_0 = 51 %

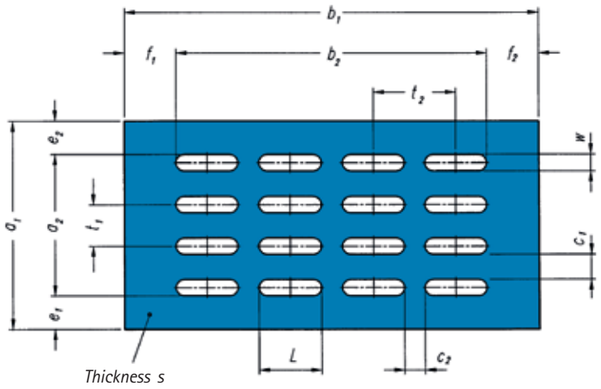

w = 20 t = 26 A_0 = 59 %


w = 15 t = 21 A_0 = 51 %

SLOT HOLES IN STAGGERED ROWS (LR)



SLOT HOLES IN STRAIGHT ROWS (LU)



DEFINITIONS

A_0	= Relative open surface
a_1	= 1st external dimension of plate (width of plate)
a_2	= Dimension of perforated area parallel dimension a_1
b_1	= 2nd external dimension of plate (length of plate)
b_2	= Dimension of perforated area parallel dimension b_1
c	= Width of bridge
c_1	= Width of side bridge - slot hole
c_2	= Width of end bridge - slot hole
e_1, e_2	= Width of plain margin parallel to long side
f_1, f_2	= Width of plain margin parallel to small side
l	= Length of hole
s	= Thickness of plate
t	= Spacing
t_1	= Side pitch - slot hole
t_2	= End pitch - slot hole
w	= Size of hole

THE RIGHT TOOL
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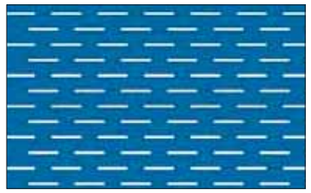
SLOT HOLES, EXAMPLES 1:1

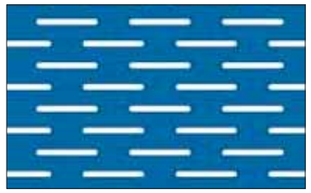
SLOT HOLES IN STAGGERED ROWS (LR) — IN STRAIGHT ROWS (LU)



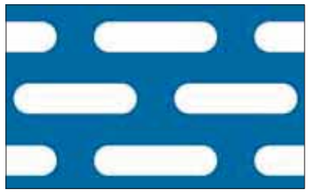
w = 0,5 x l = 5
t_1 = 2,5 x t_2 = 7,5 A_0 = 14 %

w = 4 x l = 20
t_1 = 9 x t_2 = 26 A_0 = 33 %

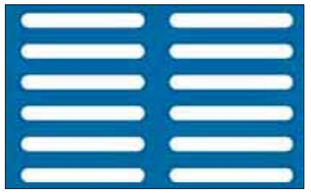
w = 1,2 x l = 20
t_1 = 3 x t_2 = 26 A_0 = 33 %



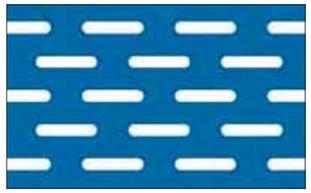
w = 1 x l = 10
t_1 = 3,5 x t_2 = 15 A_0 = 19 %



w = 5 x l = 20
t_1 = 10 x t_2 = 26 A_0 = 36 %

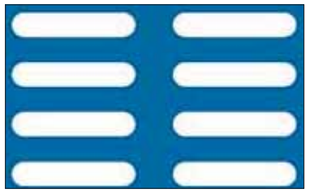


w = 2,4 x l = 20
t_1 = 5 x t_2 = 25 A_0 = 39 %

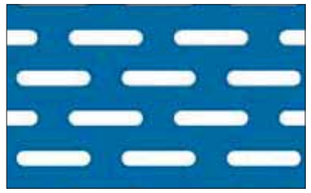


w = 2 x l = 10
t_1 = 5,5 x t_2 = 15 A_0 = 23 %

w = 5 x l = 25
t_1 = 10 x t_2 = 30 A_0 = 40 %

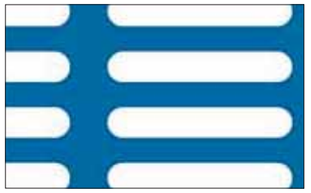


w = 4 x l = 20
t_1 = 8 x t_2 = 26 A_0 = 37 %

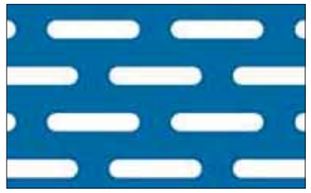


w = 2,5 x l = 12
t_1 = 6,5 x t_2 = 17 A_0 = 26 %

w = 6 x l = 35
t_1 = 13 x t_2 = 44 A_0 = 35 %



w = 5 x l = 30
t_1 = 9 x t_2 = 36 A_0 = 45 %

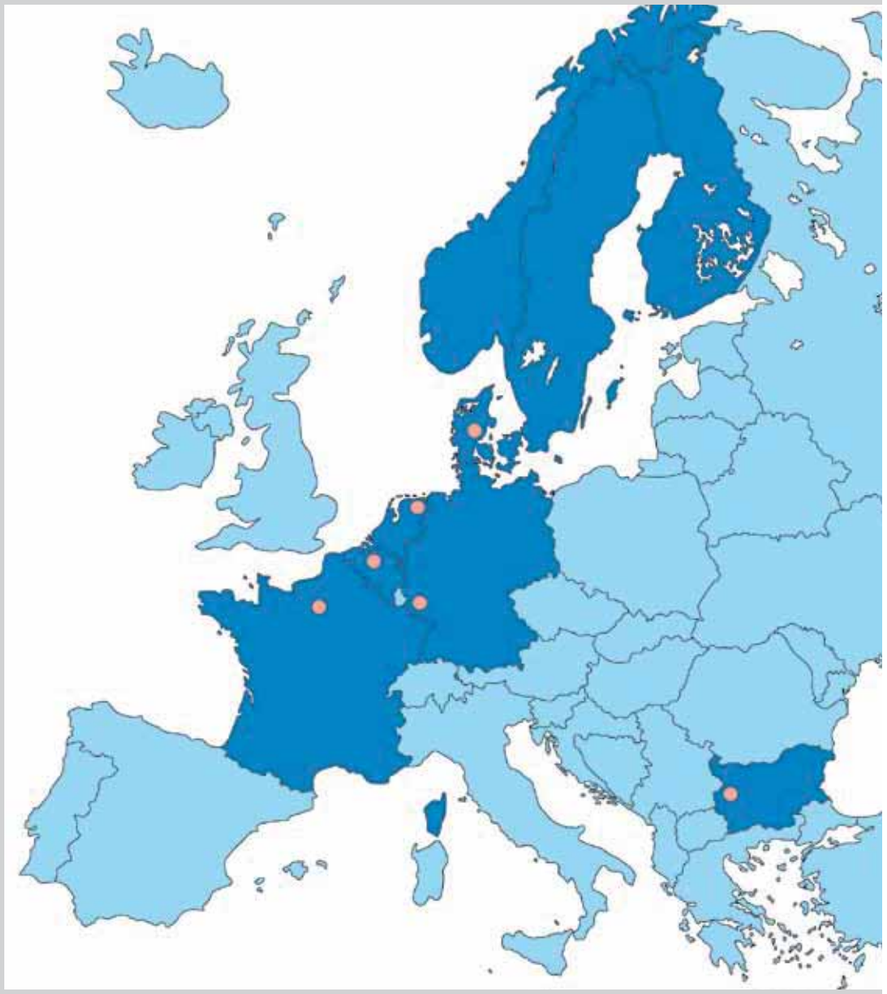


w = 3 x l = 15
t_1 = 7,5 x t_2 = 20 A_0 = 29 %

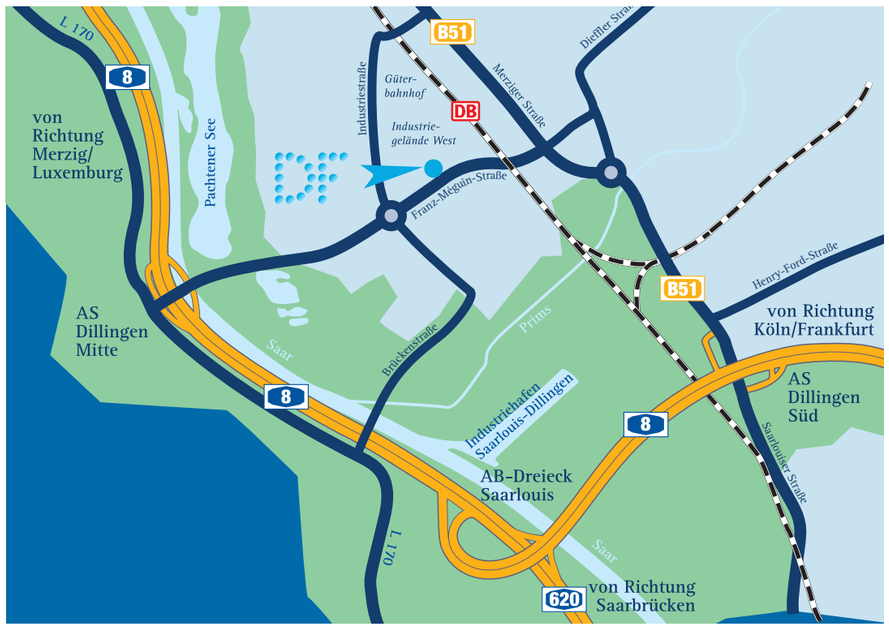
w = 8 x l = 35
t_1 = 15 x t_2 = 44 A_0 = 40 %

w = 8 x l = 30
t_1 = 12 x t_2 = 37 A_0 = 51 %

Locations of DF-Group



Map of the German manufacturing sites of DF, DE and Preziehs



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