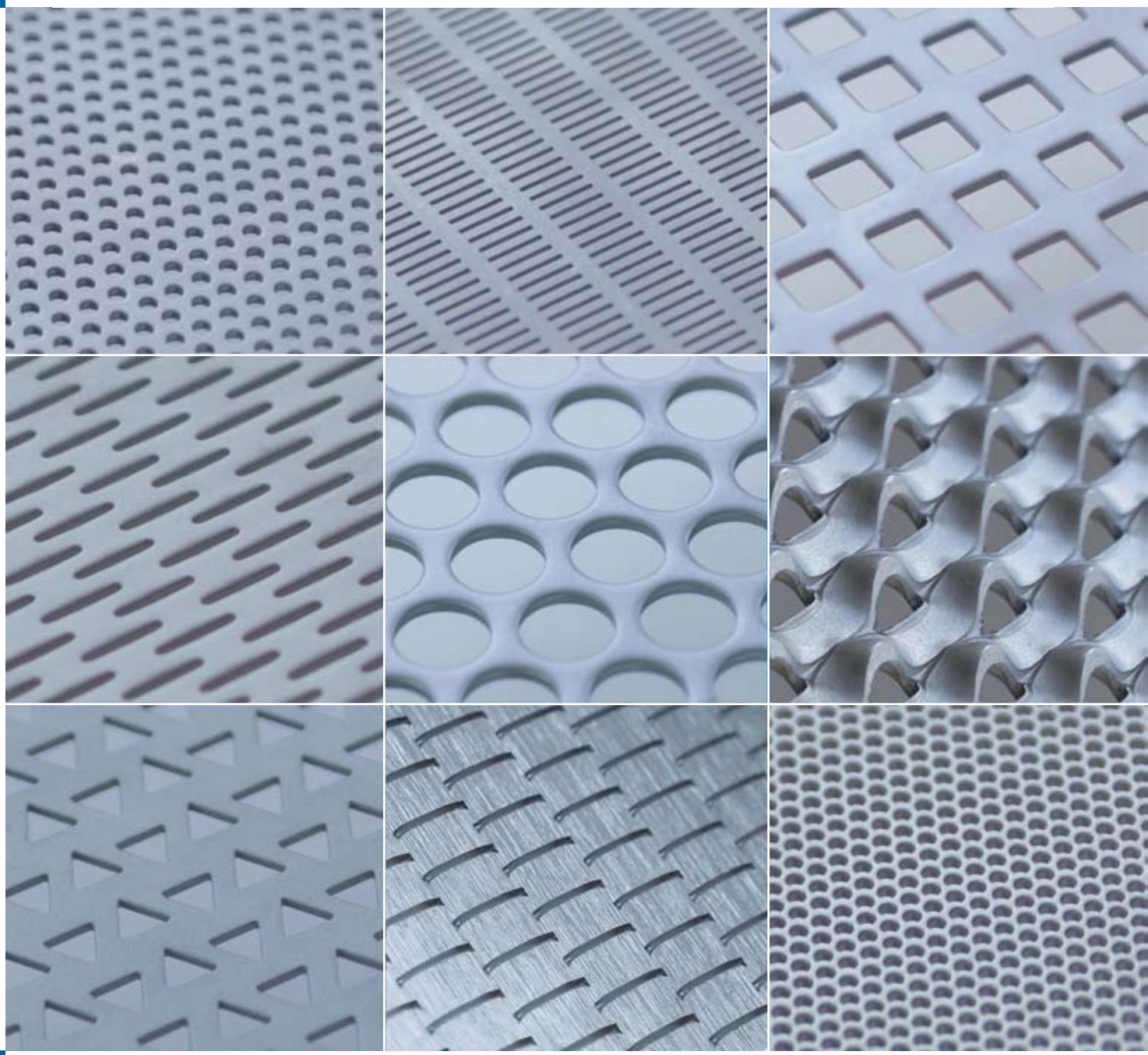
www.andritz.com/PerfTec

Perforations in metal

Andritz Fiedler PerfTec



We accept the challenge!

ANDRITZ

Andritz Fiedler PerfTec:
Tradition and innovation

Almost 120 years of experience in perforation technology ensures that we are able to meet the most challenging tasks in the production of perforated components to the complete satisfaction of our customers.

Andritz Fiedler is one of the world's leading companies specializing in all areas of perforation technology: Punching, drilling, milling, laser and electron-beam perforation as well as ConiPerf®. Our core strengths lie in the further processing of perforated plates to create machine components ready for installation.

Custom manufacturing to customer specifications is our bread and butter. It is here in particular that our customers benefit from technical consulting from our highly qualified sales staff and our technical division.
Specialist manufacturing staff, a modern machine fleet and strict quality assurance ensure the professional handling of your order.

Quality comes first

The quality of our products is a key factor enabling our customers to create reliable processes. Andritz Fiedler has an integrated management system for quality, safety and the environment. This includes both process monitoring and internal audits. Maintaining high quality standards, and continuous improvement of manufacturing processes and workflows are what makes Andritz Fiedler a reliable partner for its customers.
The quality audits required to ensure that customer requirements are met are conducted by qualified and experienced auditors.

Perhaps this is the reason why many of our loyal customers have been with us for decades. At the same time, their expectations of us as a supplier are growing continually. We accept this challenge each day anew.

Contents **Page**

Perforation and further processing

for ready-to-install components

Perforation
With punching, drilling, milling, laser and electron beam perforation as well as ConiPerf®, we have a range of options at our disposal to select the right perforation technology for your application.

Tool manufacturing
We have a large selection of standard tools for perforations. Thanks to our in-house tool manufacturing facility, we are able to develop the perfect tools for exceptional perforations and embossed finishes.

Surface treatment
The perforated plate surfaces can be finely ground, brushed, sand or glass bead blasted, electro-polished, resin-coated or chrome-plated on request.

Component manufacturing
Cutting, rolling, leveling, rounding, edging, bending or turning, as well as TIG and MAG welding. In component manufacturing the perforated plates are further processed in line with your requirements to produce half shells, cylinders, cones, funnels, and many more, and with attachment flanges on request.

Supplied ready for installation
There are a lot of perforated plate suppliers about. Andritz Fiedler stands out, not only for its wide range of perforation techniques, but also for its outstanding level of expertise with regard to further processing.
Highly qualified personnel and modern machinery are standing by to produce machine components precisely to your specific requirements - Components ready for installation that optimize your processes.

Benefits

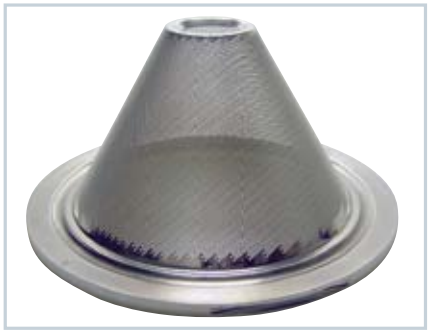
- ***Technical consulting***
- ***Wide range of standard perforations***
- ***Tool manufacturing for custom specifications***
- ***Surface treatment***
- ***Component manufacturing***

Punching technology: The desired result with the most cost-effective solution

Using a variety of tools we punch plates made from steel, aluminium, stainless steel, brass, copper, titanium, plastics, and more.
We manufacture using modern punching machinery. This means we are able to manufacture virtually any conceivable hole pattern, with unperforated sections wherever required: program-controlled, accurate repeatable and with maximum precision.
Small scale series or repeat single jobs can be produced efficiently via stored programs. We supply standardized plates conforming to DIN 24 041 and ISO standards, as well as custom design plates with a thickness between 0.4 mm (.016'') and 15 mm (.591'') from your technical drawings.

Punching is the most cost-effective process for the perforation of metals. However, the “critical ratio“ of approx. 1 : 1 : 1 between the hole diameter, plate thickness and the minimum web represents the limits of punching technology. Thanks to sophisticated technology, we are able to come very close to the limits of what is technically feasible.
In some cases we are even able to drop below the “critical ratio“.

As a specialist in small runs and custom manufacturing, we appreciate your understanding that we are unable to manufacture mass-produced goods, i.e. standard perforations from the coil.

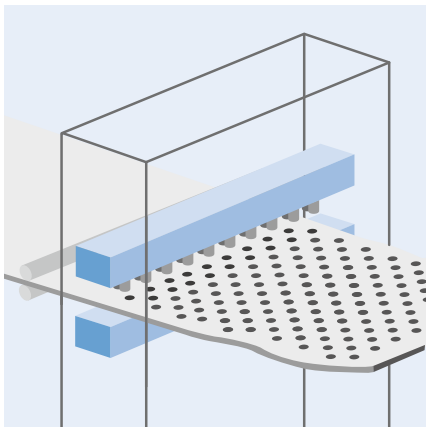


Benefits

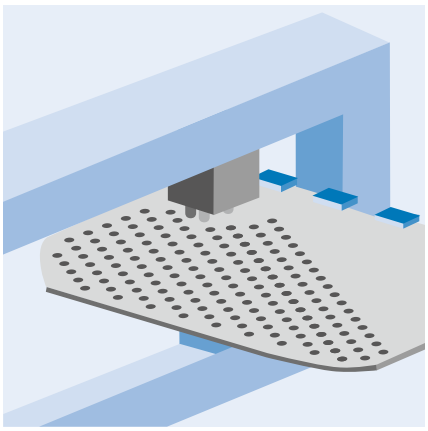
- ***Plate thicknesses of 0.4 - 15 mm (.016" - .591")***
- ***Hole diameters from 0.4 mm (.016")***
- ***Most cost-effective perforation process***
- ***Efficient series production via stored programs***

Technical explanations:

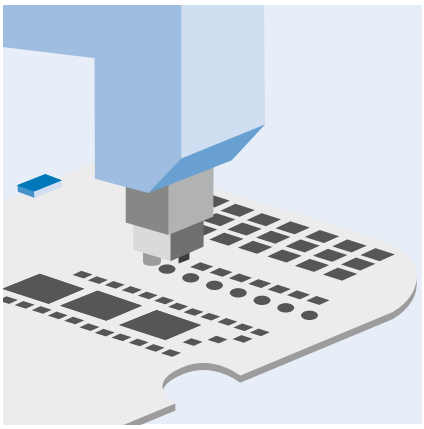
Punching



Wide press



Sectional press



Automatic punching / nibbling machine

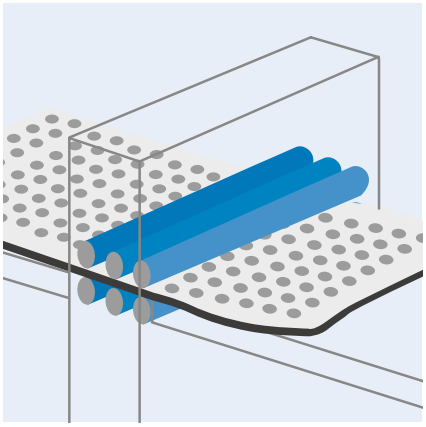
Wide press
Plates can be perforated in a variety of ways. The quickest and most economical procedure is perforation on a wide press. Here the whole width of the plate is worked in each stroke. In a rapid stroke rhythm one or several punch rows, one behind the other (up to 1000 punches simultaneously), perforate the plate which passes step by step through the machine.
Stress faults are not common using this procedure. In order to cover the higher tooling costs, the wide press is used for those perforations which are frequently requested.

Sectional press
Unlike the wide press, the sectional press requires less expensive tools with fewer punches (just one in extreme cases).
On a sectional press, the plate is perforated in sections. The production process is therefore slower. However, arbitrary perforated areas can be programmed using the modern CNC equipment. By reducing the number of punches and using the highest quality punch material, it is possible to work plates which are up to 20 mm thick.

Automatic punching / nibbling machine
The production process here is similar to the sectional press. In this economical way of producing the most diverse perforations in plates, the tools are changed automatically and the contours nibbled. The outer plate contours can also be finished if required.

Technical explanations:

Further processing



Leveler

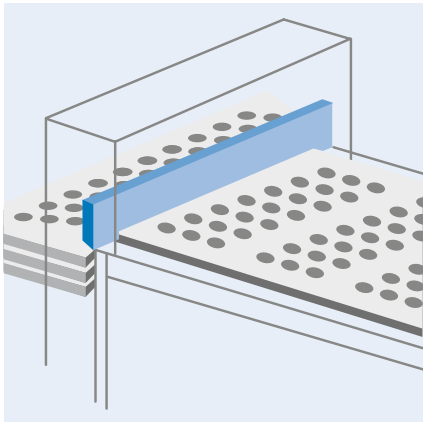
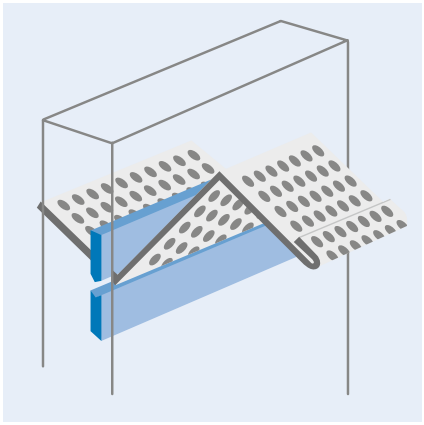


Plate shear



Folding press

Leveler
The punching procedure results in technically unavoidable plate stress or distortion.
The leveling requirements depend on the type of perforation and the perforated, or non-perforated, areas. After perforation, any stress is relieved by flattening the plates in special leveling machines.

Plate shear
Cutting a perforated plate properly is a highly technical task, because both the pattern and the position of the holes need to be taken into account. Straight cutting with a plate shear is a cost-effective solution. Our laser cutting system provides maximum precision and the most complex of cutting contours.

Folding press
Bent parts can be produced on a CNC folding press, for example. Even complex bent profiles can be created using this machine.
Bending and edging are just two of the many shaping methods we offer for perforated plates.

Welding
Andritz Fiedler always uses the appropriate welding procedure for the job at hand (TIG, MAG, etc.). Highly trained and experienced welders produce high quality components according to your technical drawings.

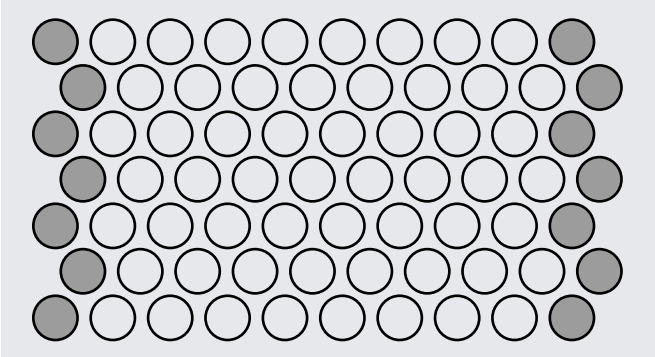
Surface
In the perforation process, fine burrs on the exit side of the punch are sometimes unavoidable. These can be removed or minimized using certain grinding and brushing procedures. Surfaces can also be degreased, mechanically polished, electro-polished, and sand or glass bead blasted.

Rounding
Another processing method available is rounding using a 3 or 4 roller rounding machine.
Particularly challenging bends can also be produced cost-effectively by hand.

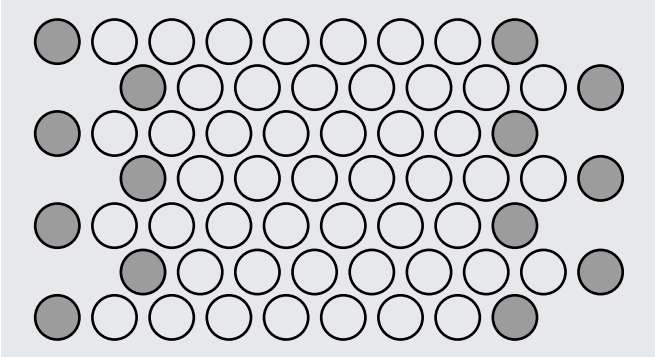
Hole patterns

Start and finish of perforated area

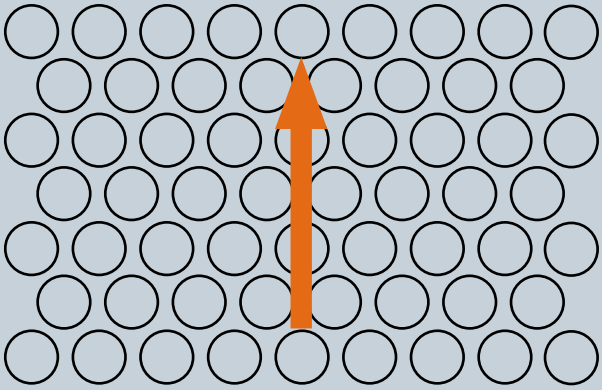
For technical reasons relating to the tools, the punches and dies in the tools are set further apart than the bridges between the holes in the perforated plate themselves. The first press stroke produces a hole pattern with incomplete rows, also known as a „large start“; the second press stroke then completes the hole pattern. If the complete hole pattern is required on the first press stroke, this must be agreed separately.



Normal staggered hole rows (complete hole pattern)



Double staggered hole rows (incomplete hole pattern)



Screening direction

The screening direction is the optimum direction of separation or screening, taking the hole pattern into consideration.
The closest possible hole pattern is 60°. This results in a preferred direction in which the material being screened is forced through a hole. This screening direction produces the most effective screening results.
The screening direction is especially important in bulk material processes.

Number of holes and free area

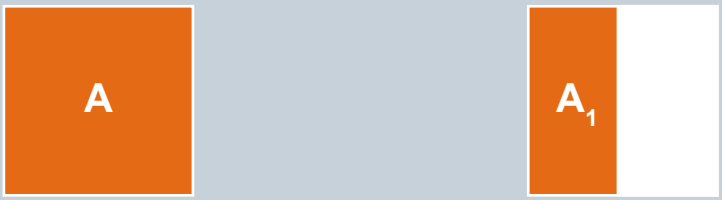
The number of holes and free area required is often the critical factor in selecting the optimum manufacturing technique. This is because the free cross-section of a perforated screening plate is decided by the opening and thus by the throughput during the entire process.
With considerable expertise we implement perforated products that are optimized to meet our customers‘ precise requirements.
Punching technology is restricted by the “critical ratio“ described on page 5, which we are able to overcome using high-tech manufacturing processes. These techniques permit not only the finest possible perforations in thick plates, but also a significant increase in the free area of the punched screen.

The example shown below clearly demonstrates how perforation technology and the associated free cross-section affect the screen surface. At the equivalent throughput, the size of the screen can be more than halved. A smaller screen size means that the screen unit or entire systems can be smaller in size, offering outstanding potential for savings.

Spacing **t**	holes per m² **n**
0.5	4 618 700
1	1 154 690
1.5	513 200
2	288 670
2.5	184 750
3	128 300
4	72 170
5	46 190
10	11 550
20	2 890
30	1 280
40	720
50	460

In addition, we offer expert advice and all perforation technologies from one source.

Comparison of the open screen surface
Stainless steel perforated plate with 3 mm (.118'') diameter holes



Punched sheet blank
Min. web width 3 mm (.118'')
Spacing 6 mm (. 236'')
Max. plate thickness 3 mm (. 236'')
Open screen area **Ao = 22.67 %**
A = 1 m²

Equivalent drilled area
Web width 1 mm (.039'')
Spacing 4 mm (.175'')
Plate thickness 5 mm (.197'')
Open screen area **Ao = 51.0 %**
A_1 = 0.44 m²

Round perforations

The round perforations are punched in steel, chrome steel, chrome nickel steel, brass, copper and numerous other metals, as well as many plastics. A variety of tools for other round perforations and intermediate sizes is available.

Dimensions of perforated plates
The external dimensions of round perforated plates (a1, b1, s) and the width of the unperforated edges (e1, e2, f1, f2) are to be agreed at time of order.

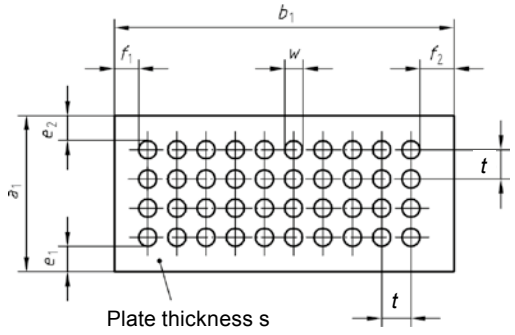
Dimensions of perforations
The dimensions of the perforations are covered by DIN 24041, unless otherwise agreed.

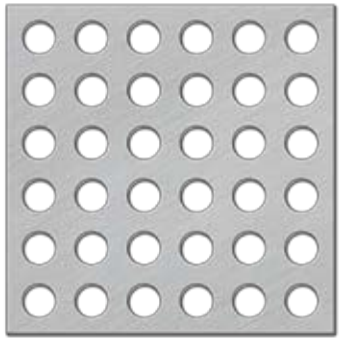
Rg – Round perforation in straight rows

Example: Rg 5.0 - 8.0 mm

Open area (%):

$$A_0 = \frac{78.5 \cdot w^2}{t^2}$$



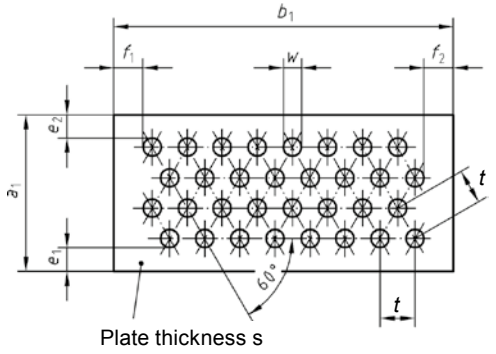


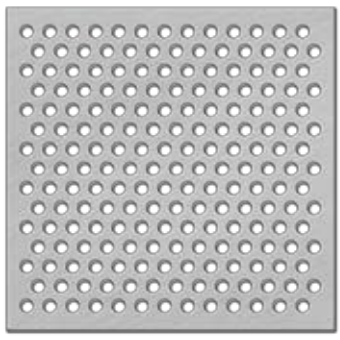
Rv - Round perforation in staggered rows

Example: Rv 2.0 - 3.5 mm

Open area (%):

$$A_0 = \frac{90.7 \cdot w^2}{t^2}$$



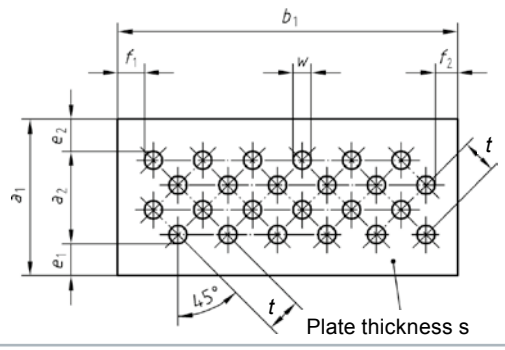


Rd - Round perforation in diagonally staggered rows

Example: Rd 2.0 - 3.5 mm

Open area (%):

$$A_0 = \frac{78.5 \cdot w^2}{t^2}$$



Square perforations

Square perforations are punched in sheet steel, stainless steel and numerous metals as well as plastics.
A variety of tools for other square perforations and intermediate sizes is available.

Dimensions of perforated plates
The external dimensions of round perforated plates (a1, b1, s) and the width of the unperforated edges (e1, e2, f1, f2) are to be agreed on ordering.

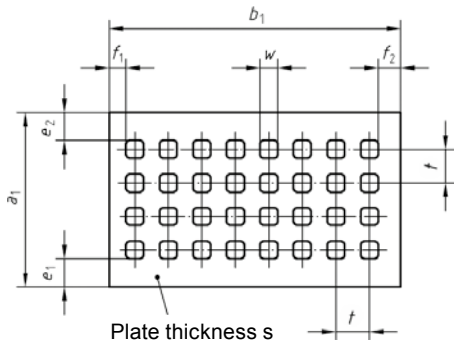
Dimensions of perforations
The dimensions of the perforations are covered by DIN 24041, unless otherwise agreed.

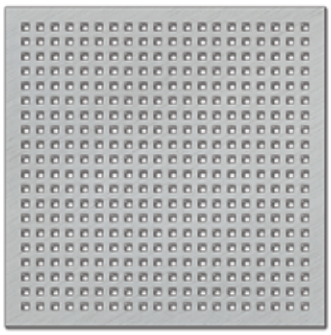
Qg - Square perforation in straight rows

Example: Qg 1.1 - 2.3 mm

Open area (%):

$$A_0 = \frac{100 \cdot w^2}{t^2}$$



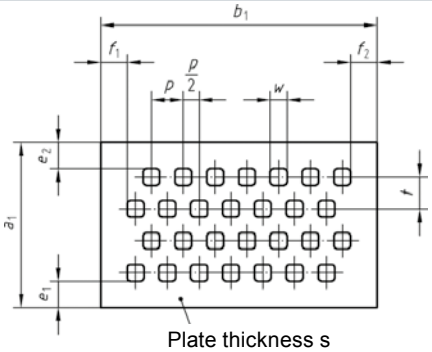


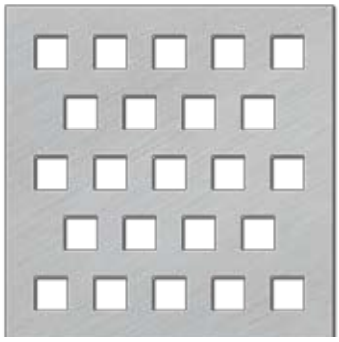
Qv - Square perforation in staggered rows

Example: Qv 4.0 - 9.0 mm

Open area (%):

$$A_0 = \frac{100 \cdot w^2}{t^2}$$



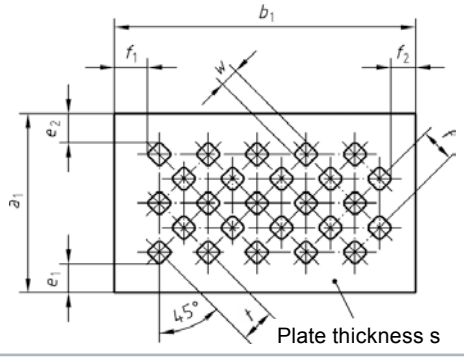


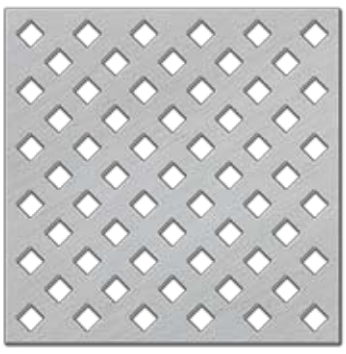
Qd - Square perforation in diagonally staggered rows

Example: Qd 3.0 - 6.0 mm

Open area (%):

$$A_0 = \frac{100 \cdot w^2}{t^2}$$





Slotted perforations

A large selection of tools is available for slotted perforations. Special tools can also be made for large orders. The standard slot is rounded. Rectangular slots are available on special request. Metals and plastics can be perforated.

Dimensions of perforated plates
The external dimensions of round perforated plates (a1, b1, s) and the width of the unperforated edges (e1, e2, f1, f2) are to be agreed on ordering.

Dimensions of perforations
The dimensions of the perforations are covered by DIN 24041, unless otherwise agreed.

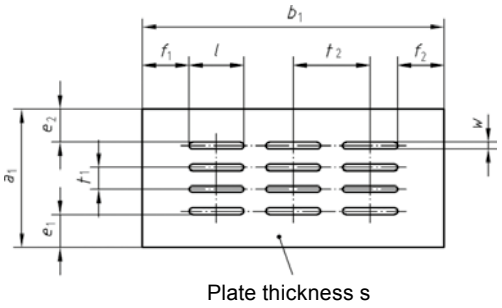
Note:
Please specify the desired slot arrangement when ordering:
longitudinal means parallel to plate length;
horizontal means parallel to the plate width.

Lg Slotted perforation in straight rows

Example: Lg 10 x 0.8 mm

Open area (%):

$$A_0 = \frac{w \cdot l - 0.215\ w^2}{t_1 \cdot t_2} \cdot 100$$

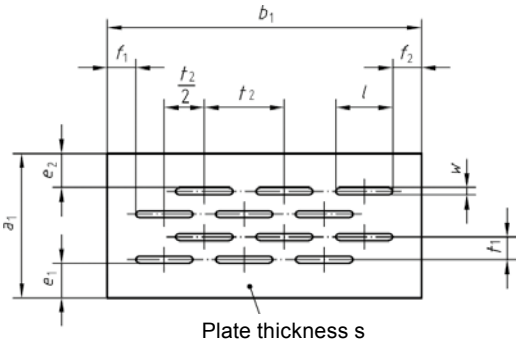


Lv Slotted perforation in staggered rows

Example: Lv 10 x 0.8 mm

Open area (%):

$$A_0 = \frac{w \cdot l - 0.215\ w^2}{t_1 \cdot t_2} \cdot 100$$

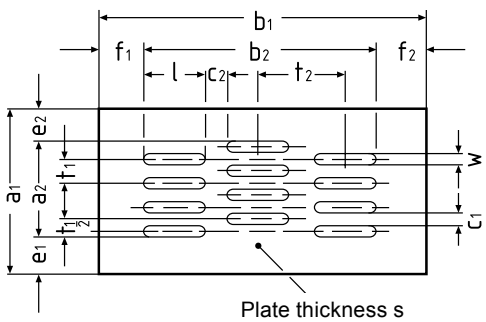


Lgv Slotted perforation in rows which are offset against each other (not a standard design)

Example: Lgv 12.5 x 1.0 mm

Open area (%):

$$A_0 = \frac{w \cdot l - 0.215\ w^2}{t_1 \cdot t_2} \cdot 100$$



Rasp perforations

Rasp perforations are punched primarily in sheet steel and stainless steel. Round holes are normally punched in rasp perforations.
However, there are reduced-size perforations (half-holes, three-quarter holes) so that lugs can be embossed even with very close hole spacing, and slotted perforations are also possible. A standardized designation is not possible due to the wide range of variations. Specifications for the hole diameter d, the spacing t and the row spacing a are normally used, however.

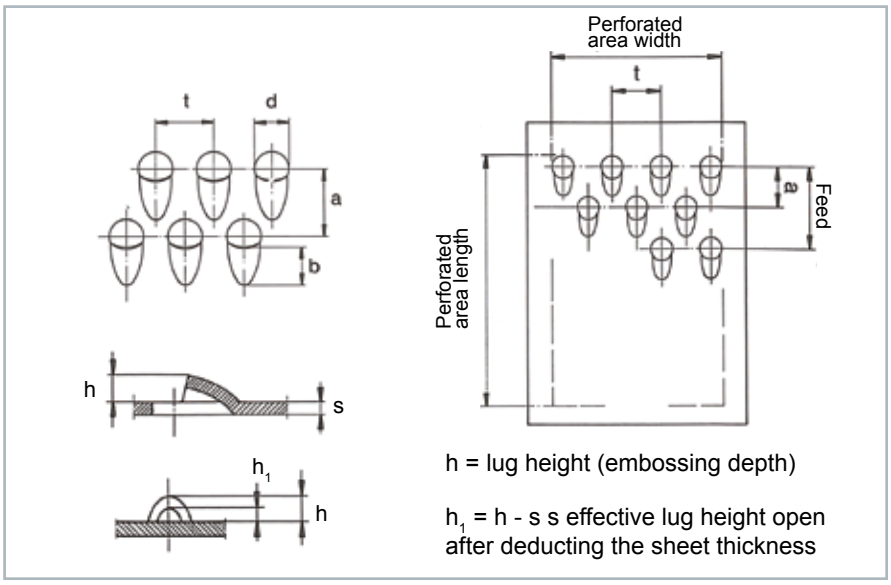
Calculating the open area
A distinction is drawn here between the theoretical and the actual value:

$$\text{Ao theor.} = 78{,}5 \frac{d^2}{t \times a} \cdot 100$$

The actual free area is calculated as the actual opening A in relation to the perforated area:

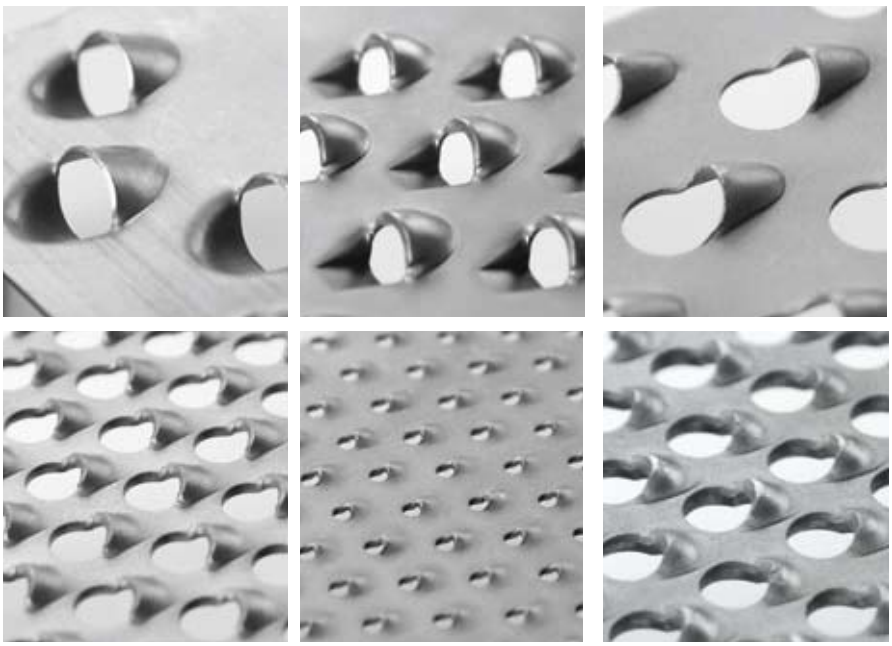
$$\text{Ao actual} = \frac{A \times 100}{t \times a}$$

The actual open area A can only be estimated.



h = lug height (embossing depth)

h_1 = h - s s effective lug height open after deducting the sheet thickness



Embossed plates

and indented surfaces

Custom embossing

Using the latest production systems with pressing forces of up to 300 tonnes, we manufacture embossed sheets to customer specifications.

Program-controlled tools allow us to specify any size and shape of embossed sections.

We process many different types of material and, depending on the embossed shape, sheet thicknesses of up to 5 mm (.197'') in stainless steel. Our embossed products can be used for many different applications, from supporting plates to our ConiPerf®, from drainage grilles and industrial platforms through to trays with low adhesions properties for thermal processes, and much more.

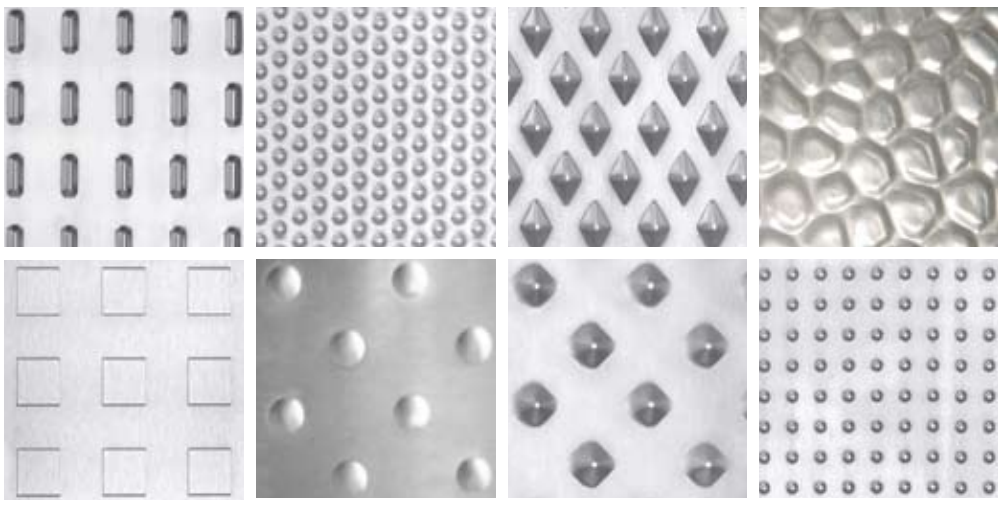
Safety

Several of our embossed finishes meet the highest non-slip requirements for trade associations, and are used in swimming pools, refrigerated rooms and machine walkways. Test certificates for the non-slip properties of the perforation or embossing used can be provided on request.

Architecture and design

Perforated, embossed, indented and shaped stainless steel or aluminium can be used to bring design ideas to life, but they also provide non-slip floor coverings for the most demanding safety requirements.

A wide range of standard embossing and indenting tools is available in our manufacturing facility. Our in-house tool manufacturing department enables us to realise also entirely new types of embossed and punched designs.

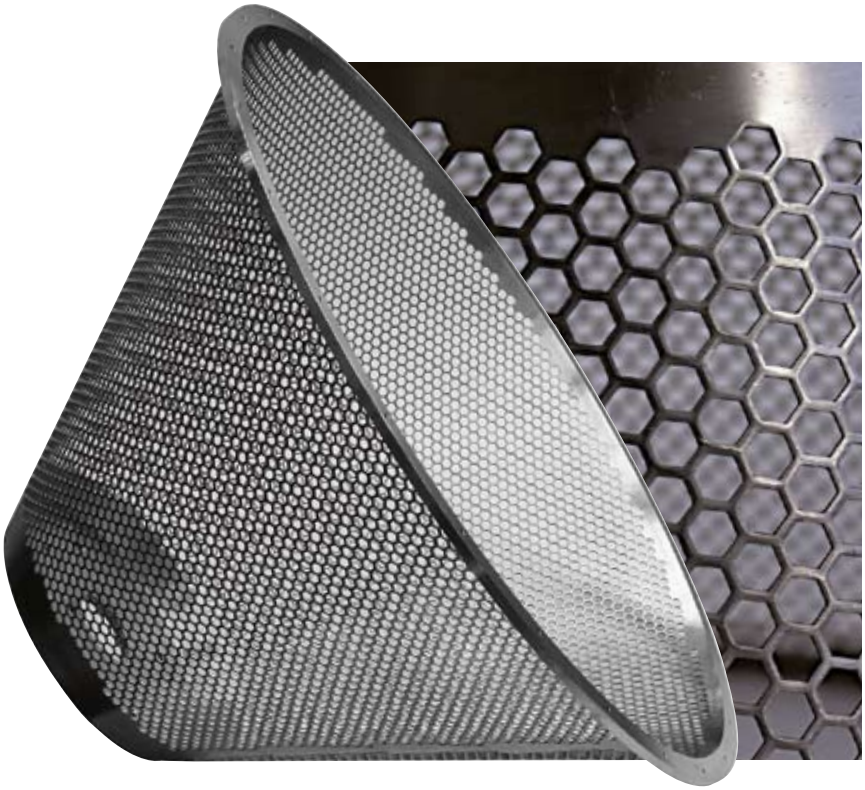


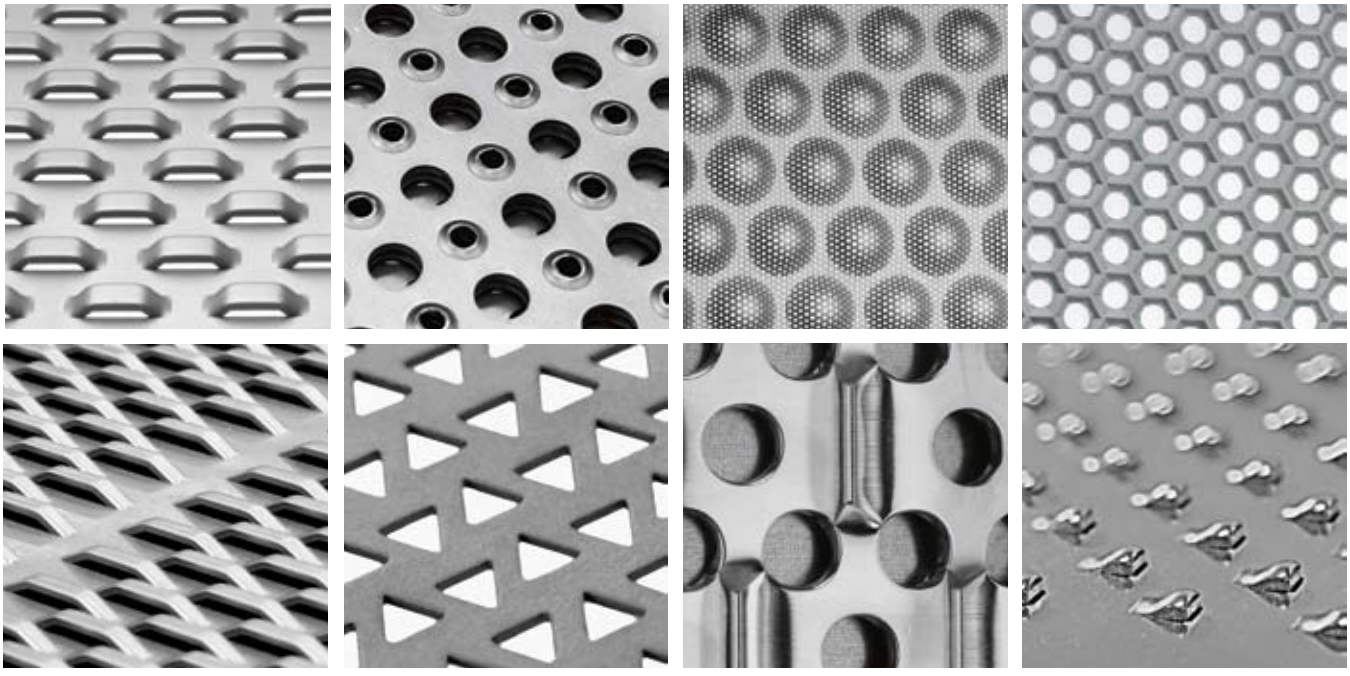
Applications

- Building facades
- Interior architecture
- Non-slip step and floor coverings
- Infilling of stairs and bridge railings
- Shaft covers
- Ventilation components
- Swimming pool panelling

Punched
special perforations

Special perforations include: Pressed-on or drawn-through round perforations, numerous rasp perforations, slotted bridge perforations, flapped perforations, triangular, hexagonal or chessboard perforations, decorative perforations, combined perforation shapes, and much more.
Combined hole shapes such as perforations with embossing are used in applications demanding high pressure stability. The embossed areas strengthen thin metals with fine perforations without reducing the free area. In combination with a support basket, perforations are used as spacers between two panels.
There are virtually no limits to the special requirements that we can fulfil for you thanks to our tool manufacturing facilities.



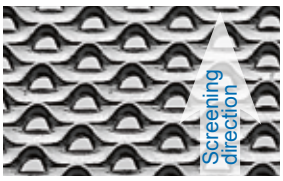


ConiPerf®:

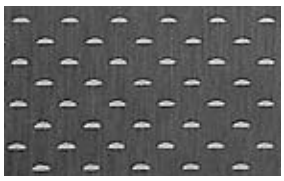
Multitalented in finely perforated plates

ConiPerf® triangular perforations

The openings in the ConiPerf® triangular perforation have a triangular to semi-elliptical shape. At the same time, the holes have a definite conical form. The rough surface is smoothed to the finish required using a rolling process for the triangular perforations. The hole shape is changed slightly, but the conical shape is retained.



ConiPerf® triangular perforation

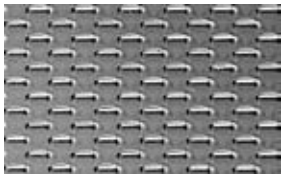


Ground triangular perforation

Material	Plate thickness	Hole width
Stainless steel	0.40mm - 1.50mm (.016'' - .059'')	0.10mm - 4.00mm (.004'' - .160'')
Unalloyed steel	0.50mm - 2.00mm (.020'' - .079'')	0.10mm - 6.00mm (.004'' - .236'')

ConiPerf® slotted perforations

The oblong openings in the ConiPerf® slotted perforations mean that the free areas produced are considerably larger than with ConiPerf® triangular perforations.
Depending on requirements, ConiPerf® slotted perforations have open areas of between **5%** and **27%**.



ConiPerf® rolled slotted perforation

Ground slotted perforation

Material	Plate thickness	Slot perfotation
Stainless steel	0.40mm - 1.00mm (.016'' - .040'')	0.10mm x 2.00mm - 0.80mm x 4.00mm (.004'' x .079'' - .031'' x .160'')
Unalloyed steel	0.50mm - 1.00mm (.020'' - .040'')	

Benefits

- ***Ratio of opening to plate thickness up to 1:10***
- ***Extremely resistant to wear***
- ***Stability***
- ***Conical shape of the openings***
- ***Directed flow***
- ***Documented pressure loss measurements***

Applications

General applications

- Ventilation grilles in silos and in hopper towers
- Pneumatic conveyor plates
- Screen linings in fine coal centrifuges

Food industry

- Process screen for starch centrifuges
- Drainage screens in centrifuges
- Mill screens
- Air or gas flow plates for agitator shaft and fluidized bed drying or cooling

Chemical industry

- As a centrifuge screen, e.g. for ammonia, iron sulphate, mirabilite, washing soda, potash, etc.
- As a mill screen for comminution processes

Preparation technology

- Plastics comminution
- Drying and cooling of foundry sand
- Wood particle production for chip-board

Micro-Perforation: Laser and electron beam technology for minimum-sized screen holes

Laser and electron beam technology is a logical extension of mechanical perforation methods and are used whenever minimum-sized screen holes are required.
This makes it possible to produce hole diameters of 0.3 mm (.012'') for the production of fruit and vegetable juices or 0.1 mm (.004'') for fibre reclamation from process water, for example.
Jet-drilled screens are manufactured from stainless steel or various other materials. They have millions of tiny conical holes or slits. Smooth surfaces and conical openings ensure good material flow and high efficiency in the sorting process.

Benefits

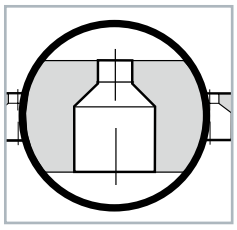
- ***Hole diameter smaller than the material thickness***
- ***Ratio of opening to plate thickness up to 1:10 or 1:15 possible***
- ***Slit diameters from 0.06 mm (.002'')***
- ***Hole diameters from 0.04 mm (.001'')***
- ***Plate thicknesses from 0.2 - 5.0 mm (.008''-.197'')***

Applications

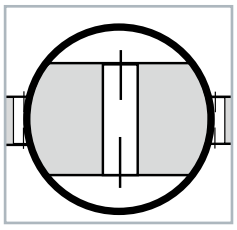
- Centrifuges in the sugar, food and chemical industries
- Preparation technology
- Screens in starch, fruit juice and other food industries
- For the preparation of chemical sludges and flowing waste water
- High performance screens for plastic recycling, paper and cellulose industries
- Screens for colour and pigment manufacturing
- Process filters/screens for catalyzers, ion exchangers, resin traps, etc.

Drilling: High stability with maximum free area

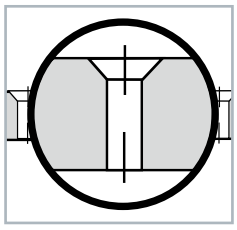
If the ratio is less than the critical ratio (minimum hole diameter = sheet thickness = narrowest possible web), a perforation cannot normally be punched.
Very small holes can be drilled very close together in thick plates. This means that a large free area with high stability is possible. Unlike punching, different hole shapes can be produced using drilling.
With screening processes in particular, the conical shape of the opening has a positive effect on the material throughput and risk of clogging.
Our computer-controlled multi-spindle drilling systems are used to produce holes from 0.3 mm (.118") to approx. 15 mm (.591") diameter even in extremely challenging metal and plastic materials.



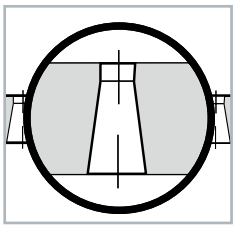
bicylindrical



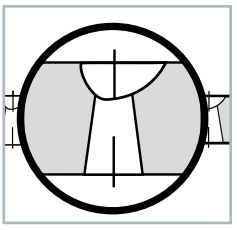
cylindrical



countersunk



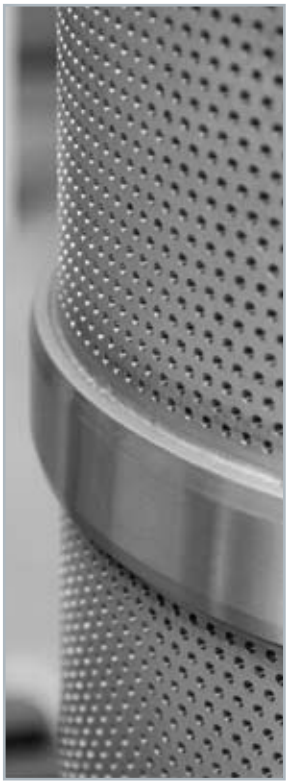
cylindrical conical

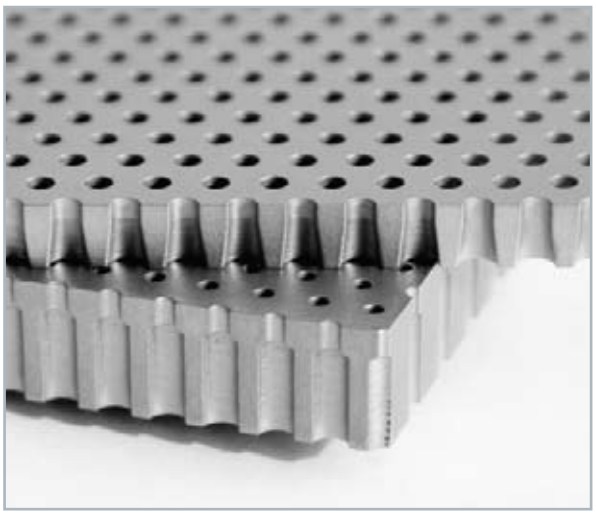


conical with profile

Benefits

- ***Holes can be very close together***
- ***Conical hole shapes are possible***
- ***Smooth hole walls***
- ***Jet-flow throughflow***
- ***Material surface has no hairline cracks and little distortion***
- ***No clogging***



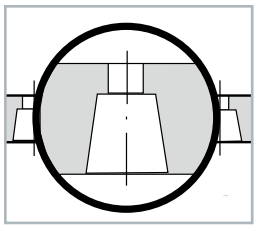


Milling: Slotted perforations for special screening processes

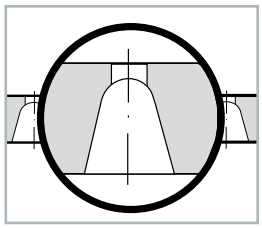
The same applies to drilled plates as for slot-milled plates: only slots that can't be punched are milled.

Slotted perforations are better than round holes in many processes. It is also possible to produce much smaller hole widths than by punching or drilling.

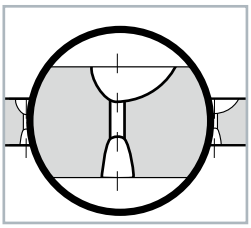
Slot widths of 0.2 mm (.008'') and smaller are not uncommon. Burr-free, treated surfaces guarantee a faultless application process.



trapezoidal



parabolic



parabolic with profile

Benefits

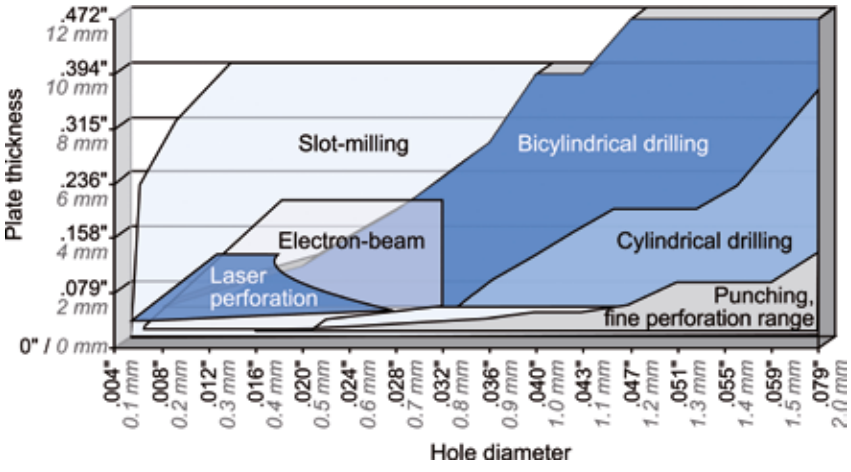
- ***Slit diameters from 0.1 mm (.004'')***
- ***A multitude of hole shapes***
- ***Smooth slot walls***
- ***Jet-flow throughflow***
- ***Material surface has no hairline cracks and little distortion***
- ***No clogging***

Andritz Fiedler PerfTec

Perforated components – ready for installation

All perforation techniques for plates and further processing to produce machine components ready for installation; that's Andritz Fiedler.
At our worldwide network of branches and sales offices we offer consulting, customer service and products „Made in Germany" for our customers around the world.
Please contact us at the address given below for the names and contact details for our sales partners closest to you.

- ***Drilling***
- ***Milling***
- ***Punching***
- ***Microperforation***
- ***ConiPerf®***
- ***Surface treatment***
- ***Component manufacturing***



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