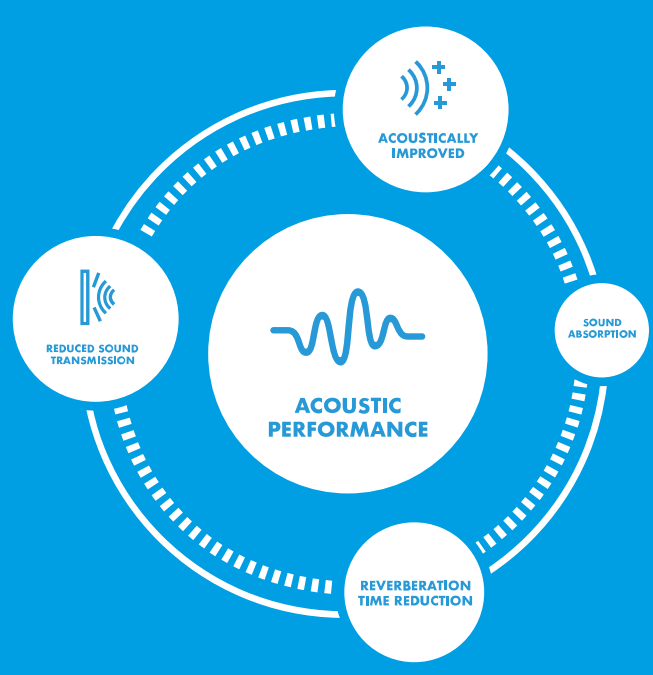


**KNAUF**CEILING  
Solutions

**METAL ACOUSTIC  
PERFORMANCE**

**Build on us.**



# Create quieter spaces with acoustic ceilings to think out loud

We provide acoustic ceilings for every space, with ceilings that are as pleasing to the eye as they are to the ear. High sound absorption, high flanking transmission or a perfect balance of both, our high performing acoustical offer can help optimise comfort, intelligibility and privacy to focus the mind and collaborate more effectively.

## Weighted sound absorption coefficient, $\alpha_w$

A single-number rating for random incidence sound absorption coefficients calculated by reference to EN ISO 11654. With this method measured values obtained in accordance with EN ISO 354, are converted into octave bands at 250, 500, 1000, 2000 and 4000 Hz and are plotted onto a graph. A standard reference curve is then shifted towards the measured values in steps of 0.05 until a "best fit" is obtained. The derived value of  $\alpha_w$  will vary between 0.00 and 1.00 but is only expressed in multiples of 0.05, e.g.  $\alpha_w = 0.65$ .

## Shape indicator

With reference to EN ISO 11654, the calculated value of  $\alpha_w$  may be qualified by one or more letters (in brackets) to indicate if the product has excess sound absorption at low (L), medium (M) or high (H) frequencies.

## Sound absorption class

With reference to EN ISO 11654, the calculated value of  $\alpha_w$  may additionally be allocated into one of six descriptive classes in accordance with the following table:

Sound Absorption Class	$\alpha_w$
A	0.90, 0.95, 1.00
B	0.80, 0.85
C	0.60, 0.65, 0.70, 0.75
D	0.30, 0.35, 0.40, 0.45, 0.50, 0.55
E	0.15, 0.20, 0.25
Not classified	0.00, 0.05, 0.10

## Weighted suspended ceiling normalised flanking transmission level normalised, $D_{n,f,w}$

A single-number rating of the laboratory measurement of room-to-room (horizontal) airborne flanking sound transmission of a suspended ceiling above adjacent rooms sharing a common ceiling plenum. It is determined in accordance with EN ISO 717-1 from measurements made in accordance with EN ISO 10848-2.

## Weighted sound reduction index, $R_w$

A single-number rating of the laboratory measurement of (vertical) airborne sound reduction of a suspended ceiling. It is determined by reference to EN ISO 717-1 from measurements of sound reduction index made in accordance with EN ISO 140-3.

## Noise reduction coefficient, NRC

A single-number descriptor of random incidence sound absorption coefficients. Defined in ASTM C423-01 as the arithmetical average, to the nearest multiple of 0.05, of the measured sound absorption coefficients for the four one-third octave band centre frequencies of 250, 500, 1,000 and 2,000 Hz.

## Ceiling attenuation class, CAC

A single-number rating, expressed in decibels, of the laboratory measured frequency dependent room-to-room sound attenuation of a ceiling sharing a common ceiling plenum above adjacent rooms. It is determined by reference to ASTM E 413 from measurements of normalised ceiling attenuation made in accordance with ASTM E 1414 over the one-third octave band frequency range 125 - 4000 Hz. This USA based system is principally used in North America and Australia but references to it may also be seen in Europe. CAC is similar but not identical to Weighted Suspended Ceiling Normalised Flanking Transmission Level Difference  $D_{n,f,w}$ .

## Sound reduction

A term used in relation to the vertical transmission of sound through a suspended ceiling.

## Sound attenuation

A term used in relation to the horizontal transmission of sound through a suspended ceiling above adjacent rooms share a common ceiling plenum.

## Equivalent absorption area (EAA)

The equivalent absorption is a measure of the total sound absorption by discrete objects (canopies, screens, furniture, etc.) when installed in an architectural space. Because these types of absorbers have more than one surface and may be irregular in form, it is not meaningful to assign sound absorption coefficients to them. Hence the Equivalent Absorption Area per unit (measured in Sabines) is preferred to characterise the absorption provided by an individual 'space absorber' such as METAL Sonic Element canopies.

# Acoustic solutions – standard options

Knauf Ceiling Solutions offer a range of popular perforation patterns and standard acoustic infill options.

## Black acoustic fleece VLSRX

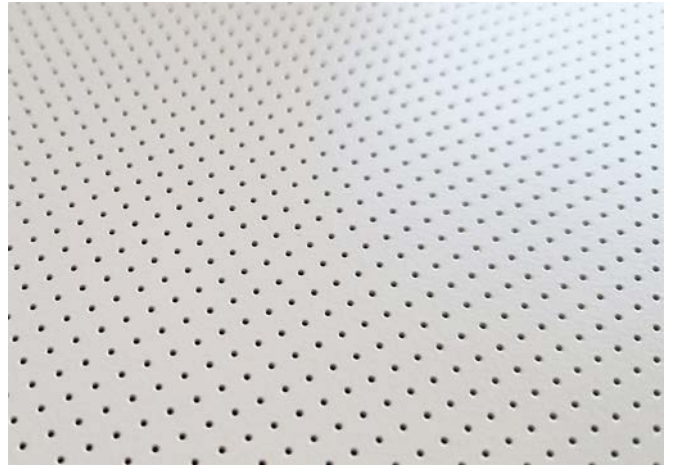


The standard VLSRX black non-woven acoustic fleece provides a cost-effective solution for metal ceiling tiles to meet general sound absorption requirements.

Bonded to the back of the perforated metal tile the non-woven fleece helps to eliminate pattern staining on the surface of the tile that can be associated with loose-laid or non-bonded solutions.

In addition to the standard perforations shown on the next page, there is a wide range of Vario Design perforations available, as well as additional acoustic solutions, to meet a broader range of performance requirements.

## Rg 0704 Optimicro Perforation



The Rg 0704 Optimicro perforation utilises the optimum ratio between perforation diameter and the open surface area to achieve our highest acoustic performance when combined with a black acoustic fleece.

Not only does Optimicro perforation provide great acoustics, thanks to the small diameter and low open area it also has a brighter whiter appearance with high light reflectance that can help to contribute to reducing energy costs in buildings.

## Perforation description

The following product prefixes describe the shape and arrangement of perforations:

- Rd = Round perforations, 45° diagonal pitch
- Rg = Round perforations, 90° straight pitch
- Rv = Round perforations, various angle pitches
- Qg = Square perforations, 90° straight pitch
- Qd = Square perforations, 45° diagonal pitch
- Lg = Slotted perforations, 90° straight pitch
- Tv = Diamond perforations, various angle pitches

The numbers define the perforation size and free area.

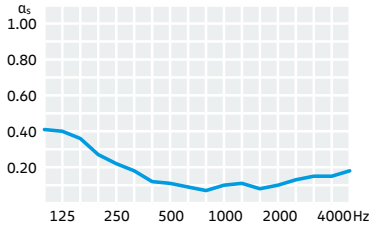
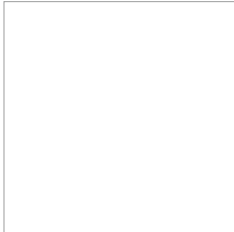
The first two, and occasionally three, numbers denote the hole diameter in tenths of millimetres, while the last two digits represent the proportion of free cross-sectional area.

Example: Rg 2516 = round perforation, 90 straight pitch or

Rg 2516 indicates a round perforation with a 90 degree straight pitch, a hole diameter of 2.5 mm, and free cross-section of 16%.

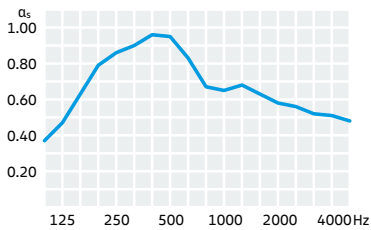
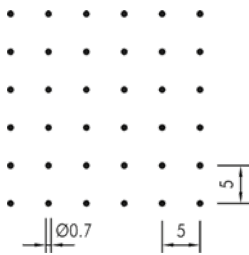
## Unperforated

Without acoustic infill



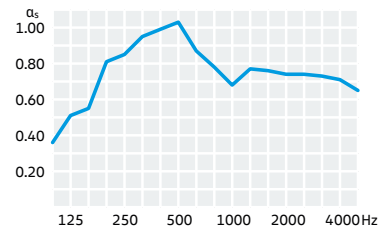
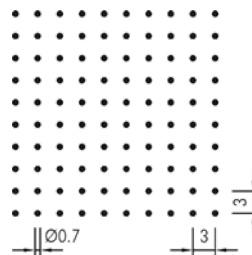
## Rg 0701 Extramicro Perforation

1.5% open area, over border perforated, for a steel gauge of max. 0.7 mm



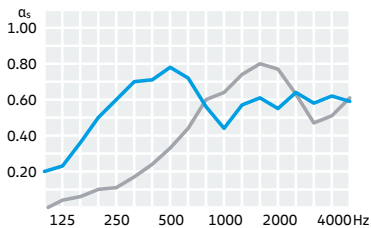
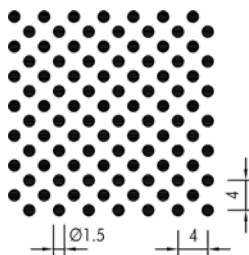
## Rg 0704 Optimicro Perforation

4% open area, over border perforated, for a steel gauge of max. 0.7 mm



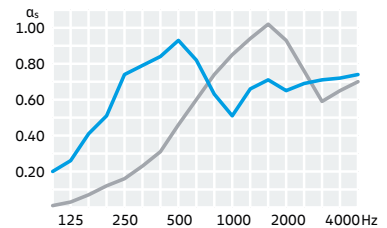
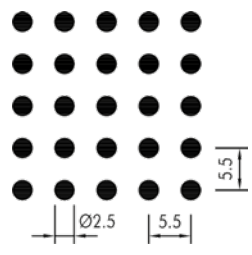
## Rd 1522 Micro Perforation

22% open area, unperforated border, for a steel gauge of max. 1.25 mm



## Rg 2516 Standard Perforation

16% open area, unperforated border, for a steel gauge of max. 1.0 mm



Perforation	Acoustic infill	EN ISO 354										EN ISO 10848-2	EN ISO 10140-2	CAC [dB]
		$\alpha_w$	Cavity [mm]	Class	Frequency [Hz] $\alpha_w$						NRC	$D_{n,w}$ [dB]	$R_w$ [dB]	
					125	250	500	1000	2000	4000				
Unperforated	-	0.10(L)	200	NC	0.40	0.20	0.10	0.10	0.10	0.15	0.15	34	19	35
Rg 0701	VLSRX	0.65(LM)	200	C	0.50	0.85	0.90	0.65	0.60	0.50	0.75	19	10	20
Rg 0704	VLSRX	0.80(L)	200	B	0.45	0.85	0.95	0.75	0.75	0.70	0.85	19	10	19
Rd 1522	VLSRX	0.60	200	C	0.25	0.60	0.75	0.60	0.50	0.60	0.60	14	6	15
		0.40(MH)	60	D	0.05	0.15	0.35	0.65	0.75	0.55	0.45			
Rg 2516	VLSRX	0.70	200	C	0.30	0.70	0.85	0.60	0.70	0.70	0.70	16	6	16
		0.45(MH)	60	D	0.05	0.15	0.45	0.85	0.90	0.65	0.60			

$\alpha_w$ : as per EN ISO 11654 / NRC: as per ASTM C 423-01 /  $D_{n,w}$ : as per EN ISO 717-1 / CAC: as per ASTM E 413-10  
60 mm cavity for wall solutions

# Acoustic solutions – additional options

In addition to the standard VLSRX black acoustic fleece, Knauf Ceiling Solutions offers a range of premium infill acoustic solutions to meet higher acoustic demands. These solutions prevent pattern staining or filter effects from incorrectly fitted loose acoustic pads.

Premium infill solutions are factory-fitted to the back of standard metal ceilings with VLSRX black acoustic fleece to create an easy to install “out-of-the-box” solution, staying perfectly in position during installation and any subsequent access or maintenance. For standard ceiling tiles and modules, the premium infills are bonded to the reverse of the VLSRX non-woven fleece.

For the Vario Design range of configurable rectangular panels and additional edge details mechanical fixing tabs ensure the premium infills remain in place.



There are two options available in the premium infills range:

## Premium OP15



The Premium OP15 solution uses a 15 mm thick medium-low density mineral infill that is designed to maximise the sound absorption performance with up to Class A performance possible.

## Premium B17

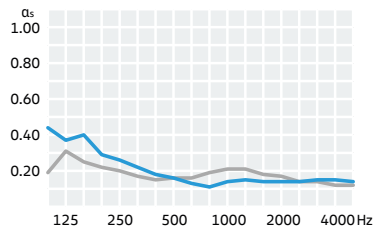
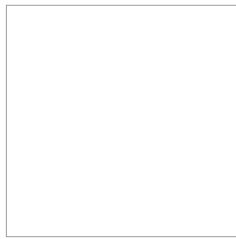


The Premium B17 infill uses a 17mm thick, higher density infill when higher attenuation performance is required – achieving up to 44 dB  $D_{n,f,w}$  for unperforated tiles. Even with perforated tiles, up to 41 dB  $D_{n,f,w}$  can be achieved using Premium B17 infills, whilst maintaining up to 0.75  $\alpha_w$  sound absorption to provide a balanced acoustic performance.

Further acoustic infill options are available on request.

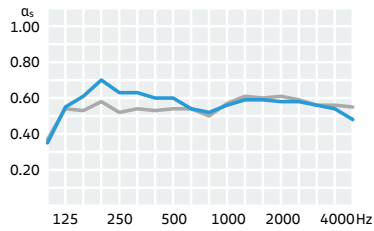
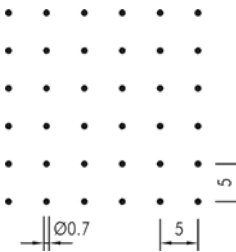
## Unperforated

Without acoustic infill



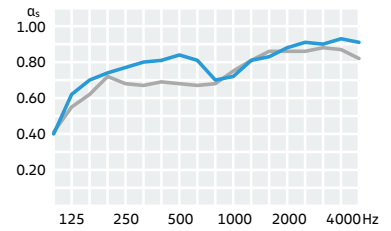
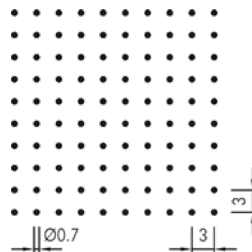
## Rg 0701 Extramicro Perforation

1.5% open area, over border perforated, for a steel gauge of max. 0.7 mm



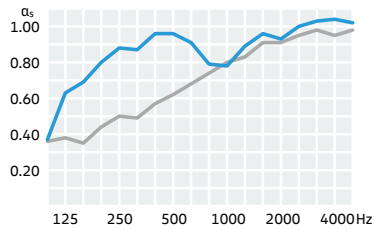
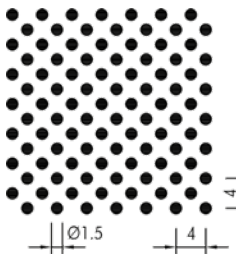
## Rg 0704 Optimicro Perforation

4% open area, over border perforated, for a steel gauge of max. 0.7 mm



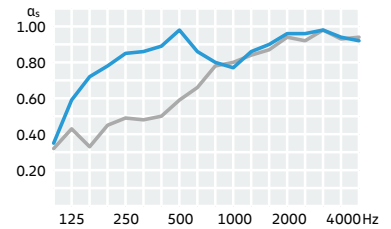
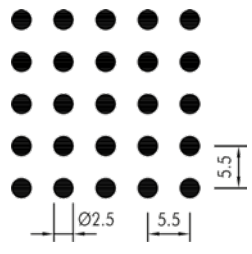
## Rd 1522 Micro Perforation

22% open area, unperforated border, for a steel gauge of max. 1.25 mm



## Rg 2516 Standard Perforation

16% open area, unperforated border, for a steel gauge of max. 1.0 mm



Perforation	Acoustic infill	EN ISO 354										EN ISO 10848-2	EN ISO 10140-2		
		$\alpha_w$	Cavity [mm]	Class	Frequency [Hz] $\alpha_p$						NRC	$D_{n,f,w}$ [dB]	$R_w$ [dB]	CAC [dB]	
					125	250	500	1000	2000	4000					
Unperforated	Premium OP15	0.15(L)	200	NC	0.40	0.25	0.15	0.15	0.15	0.15	0.15	0.20	43	23	45
	Premium B17	0.20	200	E	0.25	0.20	0.15	0.20	0.15	0.15	0.20	44	23	45	
Rg 0701	Premium OP15	0.65(L)	200	C	0.50	0.65	0.60	0.55	0.60	0.55	0.60	27	16	28	
	Premium B17	0.60	200	C	0.50	0.55	0.55	0.55	0.60	0.55	0.55	41	20	43	
Rg 0704	Premium OP15	0.80	200	B	0.55	0.75	0.80	0.75	0.85	0.90	0.80	27	16	28	
	Premium B17	0.75	200	C	0.55	0.70	0.70	0.75	0.80	0.80	0.75	41	20	42	
Rd 1522	Premium OP15	0.90	200	A	0.55	0.85	0.95	0.80	0.95	1.00	0.90	24	13	25	
	Premium B17	0.70(H)	200	C	0.35	0.50	0.60	0.80	0.90	0.95	0.70	30	16	31	
Rg 2516	Premium OP15	0.90	200	A	0.55	0.85	0.90	0.80	0.95	0.95	0.90	24	13	25	
	Premium B17	0.65(H)	200	C	0.35	0.45	0.60	0.80	0.90	0.95	0.70	31	16	32	

$\alpha_w$ : as per EN ISO 11654 / NRC: as per ASTM C 423-01 /  $D_{n,f,w}$ : as per EN ISO 717-1 / CAC: as per ASTM E 413-10

# Vario design perforations

Knauf Ceiling Solutions offers an extensive range of more than 40 perforations, providing a wide choice of aesthetic options: large apertures for specialised uses such as airflow or loudspeakers to slotted perforations for a more linear appearance. Hereunder is a sample of the possibilities at your reach. For more information, please get in touch with us.

## Acoustic values

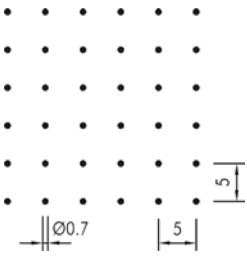
Perforation	Acoustic infill	EN ISO 354										EN ISO 10848-2	EN ISO 10140-2	
		$\alpha_w$	Cavity [mm]	Class	Frequency [Hz] $\alpha_p$						NRC	$D_{n,f,w}$ [dB]	$R_w$ [dB]	CAC [dB]
					125	250	500	1000	2000	4000				
Rg 0501	-	0.45(L)	200	D	0.25	0.65	0.65	0.40	0.40	0.35	0.55	-	-	-
Rd 1506	VLSRX	0.75(LM)	200	C	0.40	0.85	1.00	0.70	0.65	0.60	0.80	-	-	-
Rg 1511 / Rd 1511	VLSRX	0.65	200	C	0.30	0.65	0.85	0.60	0.65	0.65	0.70	14	6	15
Rg 1821	VLSRX	0.60	200	C	0.25	0.55	0.75	0.55	0.60	0.60	0.60	13	6	14
Rg 3013 / Rd 3013	VLSRX	0.75	200	C	0.35	0.75	0.95	0.70	0.75	0.70	0.75	14	6	15
		0.50(MH)	60	D	0.05	0.20	0.55	0.95	0.90	0.65	0.65			
Rv 4058	VLSRX	0.50	200	D	0.20	0.50	0.65	0.40	0.50	0.55	0.50	-	-	-
Rg 14023	VLSRX	0.75(LM)	200	C	0.40	0.85	1.00	0.70	0.75	0.65	0.80	-	-	-
		0.55(MH)	60	D	0.05	0.25	0.60	1.00	0.95	0.60	0.70			
Rg 25020	VLSRX	0.65(LM)	200	C	0.45	0.90	1.00	0.75	0.65	0.50	0.80	-	-	-
		0.55(M)	60	D	0.10	0.25	0.65	0.95	0.75	0.50	0.70			
Qg 4025	VLSRX	0.70	200	C	0.30	0.70	0.90	0.65	0.70	0.70	0.70	14	8	15
Qg 10565	VLSRX	0.60	200	C	0.25	0.55	0.75	0.50	0.60	0.55	0.60	-	-	-
Tv 26845	VLSRX	0.65	200	C	0.30	0.65	0.80	0.55	0.65	0.60	0.65	-	-	-

$\alpha_w$ : as per EN ISO 11654 / NRC: as per ASTM C 423-01 /  $D_{n,f,w}$ : as per EN ISO 717-1 / CAC: as per ASTM E 413-10  
60 mm cavity for wall solutions



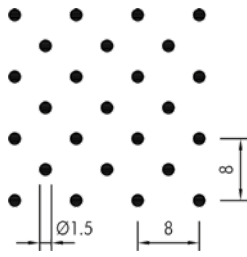
### Rg 0501

0.64 % open area, over border perforated for a steel gauge of max. 0.5 mm



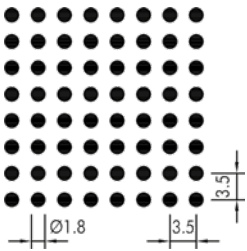
### Rd 1506

6% open area, unperforated border for a steel gauge of max. 1.25 mm



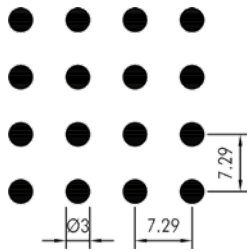
### Rg 1821

21% open area, unperforated border for a steel gauge of max. 0.7 mm



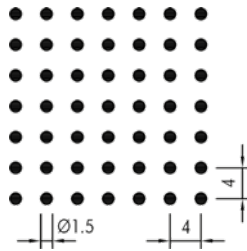
### Rg 3013

13% open area, unperforated border for a steel gauge of max. 1.0 mm



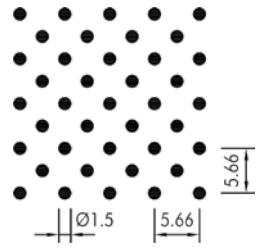
### Rg 1511

11% open area, unperforated border for a steel gauge of max. 1.25 mm



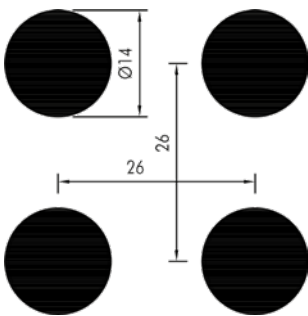
### Rd 1511

11% open area, unperforated border for a steel gauge of max. 1.0 mm



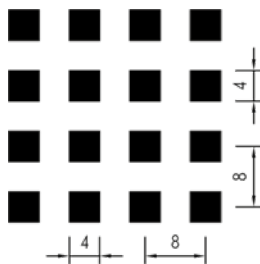
### Rg 14023

23% open area, unperforated border for a steel gauge of max. 1.0 mm



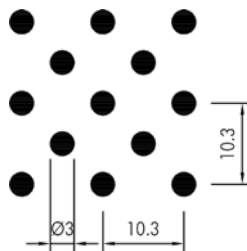
### Qg 4025

25% open area, unperforated border for a steel gauge of max. 0.7 mm



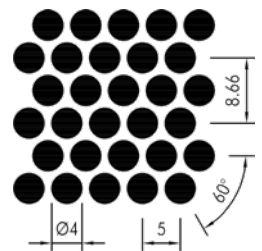
### Rd 3013

13% open area, unperforated border for a steel gauge of max. 1.0 mm



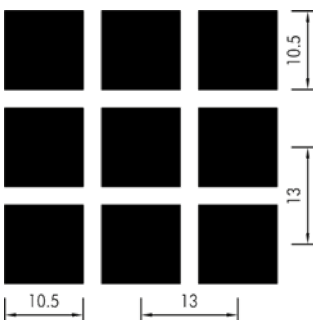
### Rv 4058

58% open area, unperforated border for a steel gauge of max. 0.7 mm



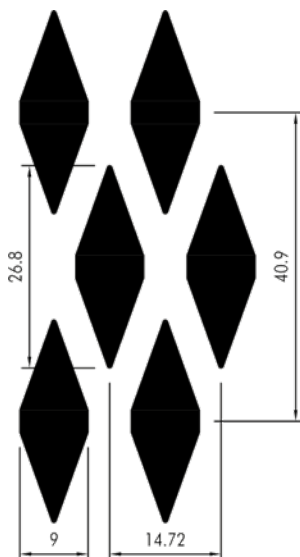
### Qg 10565

65% open area, unperforated border for a steel gauge of max. 0.8 mm



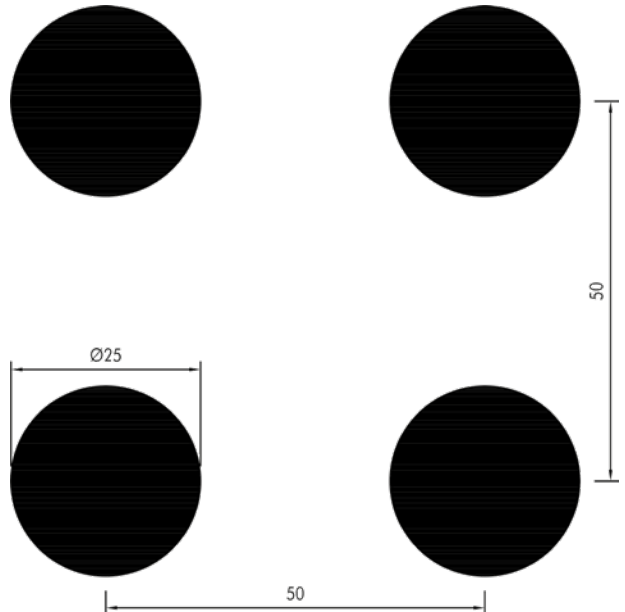
### Tv 26845

45% open area, unperforated border for a steel gauge of max. 0.8 mm



### Rg 25020

20% open area, unperforated border for a steel gauge of max. 1.0 mm



***Build on us.***

**Knauf Ceiling Solutions GmbH & Co. KG**

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Registration No.: HRB 1023  
VAT No. pursuant to § 27a of the German VAT Act  
(Umsatzsteuergesetz): DE131249009  
Managing Director: Karl Wenig