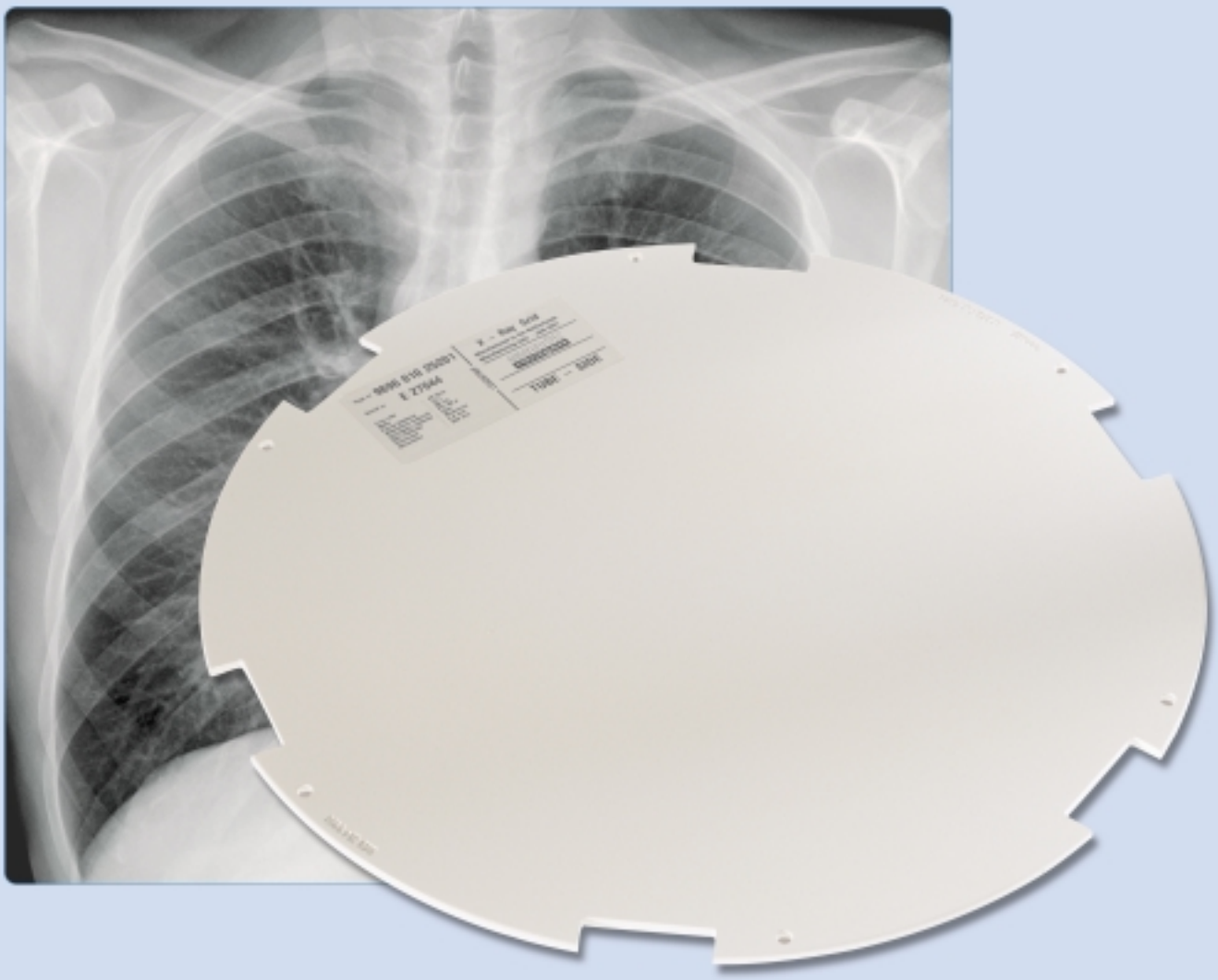
Your worldwide source of grids

What a difference a grid makes



smit röntgen

The right assembly to meet your every need

Trust the experts

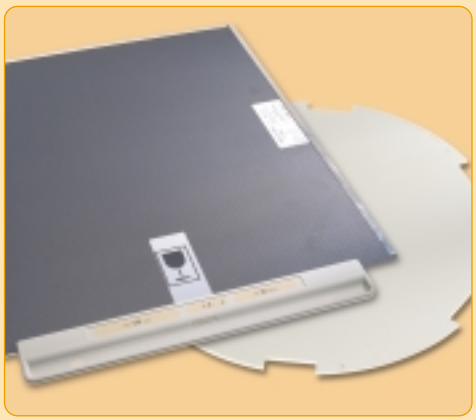
A high degree of expertise is required to design and manufacture quality X-ray grids. A degree of expertise which Smit Röntgen, as one of the very few, has mastered.

Two is better than one

Our knowledge of grids is unparallel and our customers rely on us to satisfy their grid requirements. Our distribution partner, Dunlee, is the perfect customer liaison. Dunlee specializes in the Original Equipment Manufacturer (OEM) and direct replacement tube business, thus giving you a confidential sales channel.

Three is much more than two

As a part of Philips Medical Systems, our plant is located in Eindhoven, Netherlands. Access to Philips research and development laboratories not only boosts our level of grids expertise, but has also enabled us to become the company with the greatest knowledge of X-ray systems in the entire grids industry. Our grids expertise, Dunlee's OEM know-how and Philips' systems knowledge puts three dimensional understanding at your disposal.



All major mammography system manufacturers trust the performance of our grids.
Likewise, we also play the central role in the general X-ray market.

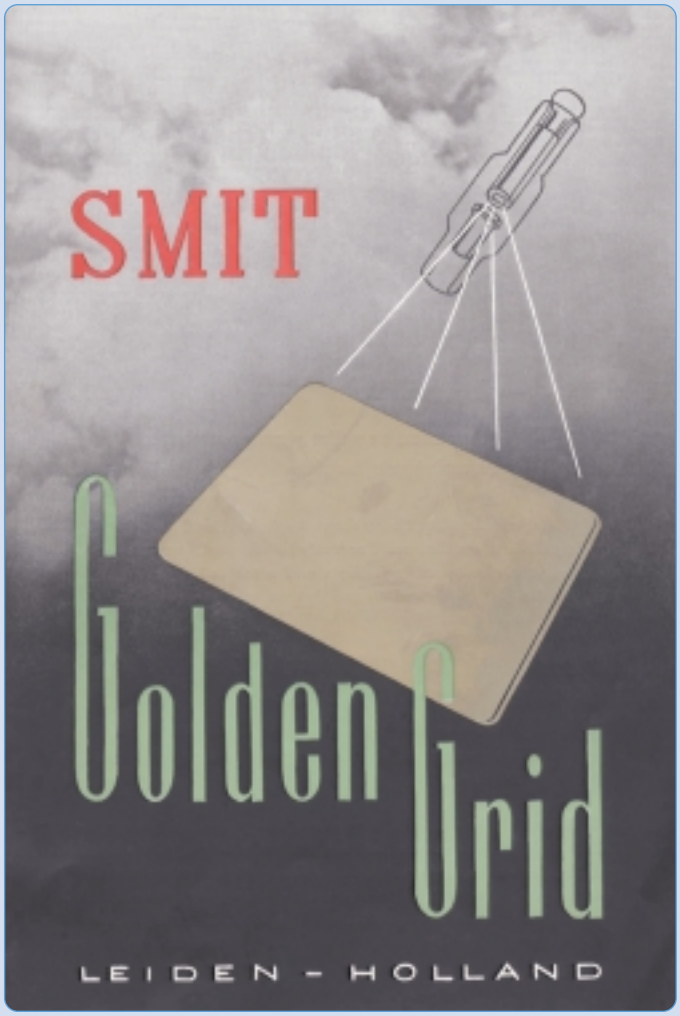
A strong foundation

Based on experience ...

Founded 1930 in Leiden, Netherlands and with a history of more than 50 years producing grids, we are one of the most advanced manufacturers of X-ray grids worldwide. Our grids are shipped to almost all major medical companies throughout Europe, Asia, and North and South America.

We are the global market leader in mammography, supplying all major mammography system manufacturers. In the general X-ray market we also hold the leading position with rapidly increasing market shares in Japan and we are a key player in Europe and the USA.

Our customers appreciate the fact that our engineering department is available for their every need. In exchanging information with you, we can manufacure grids for specific systems and customized solutions.



A decisive step in the composition of grids was the move from wood to fiber.

... and high organizational standards

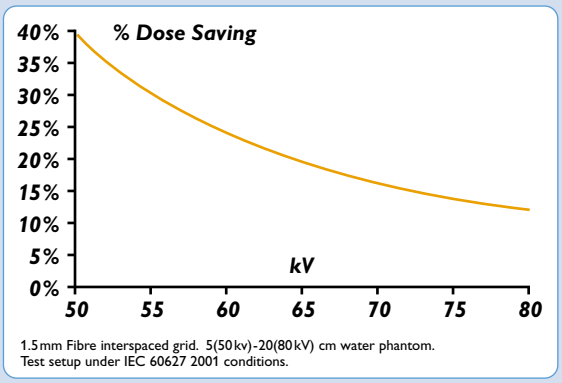
Statistical process control (SPC) based on the 6-sigma methodology, automated processes and customer specific final testing guarantee the highest quality products and optimal performance for our grids. We are proud to have received a 98 % audit score in a Q-audit from a leading system manufacturer. We also place great value on meeting and exceeding environmental standards.

On top of that, you'll benefit from our great accuracy and knowledge, plus a high level of flexibility due to our planning resources and logistic awareness. We enjoy the challenge to our production capacity our more than 120 customers have given us. The result is over 300 grid types and product portfolio modifications of more than 40 % each year.

Quality that comes in all shapes and sizes

Our grids fit all

We have the right grid for every X-ray system. Manufactured by experts who understand the key aspects of a grid.



1.5 mm Fibre interspaced grid. 5(50 kv)-20(80 kV) cm water phantom.
Test setup under IEC 60627 2001 conditions.

Compared to aluminum interspaced grids, fiber interspaced grids enable a smaller dose. Thus, fiber interspaced grids should be used for the welfare of patients and practitioners.

Small component, big impact

An X-ray grid's only function is to improve the contrast in the final image by absorbing the scattered rays while maintaining the optimal transmission of primary radiation. These aspects must be fully appreciated in order to understand the quality of any grid from basic RAD systems to advanced cardio-vascular systems.

K factor ...

A grid's effectiveness in absorbing scattered rays is determined by the K factor in film processing. A typical quality grid from Smit Röntgen can improve the contrast of an image 3 to 4 times.

$$K = \frac{\textit{image contrast with grid}}{\textit{image contrast without grid}}$$

Therefore, the higher the K factor, the better the image. K is based mainly on the total lead content in the grid.

Our range comprises standard grids and grids designed for special applications.
We can also make custom designs especially for your company.

... divided by B factor ...

Without a grid to absorb them, the scattered rays would blacken the film. However, using a grid unavoidably absorbs part of the information-bearing primary X-rays. These losses must be reclaimed by increasing the intensity of the primary X-ray beam in order to obtain the desired image density. The B factor or Bucky factor of a grid is equal to the increase in total X-ray intensity when a grid is applied. Thanks to our expertise, Smit Röntgen has the lowest B factor in the industry.

$$B = \frac{1}{\text{transmission of primary and scattered radiation}}$$

... equals primary transmission

The quality of a grid is defined by both its K and B factors. To improve the contrast, K should be high and B must be low for low absorption. Therefore the quality factor is determined by K:B.

$$T_p = \frac{K}{B}$$

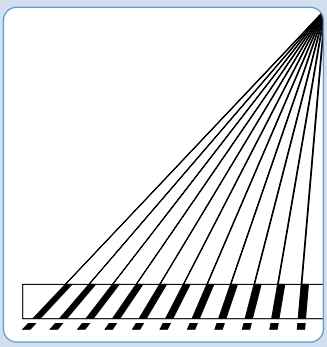
Fiber interspacing makes the difference

The B factor is kept low by using a special non-metallic fiber-interspacer material which permits excellent transmission of the primary X-ray beam. This results in a dose reduction of 10 to 40 % compared to an aluminum-interspaced grid. A fiber-interspaced grid also enables the voltage to be reduced by 3–5 kV, thereby producing a visibly higher image contrast.

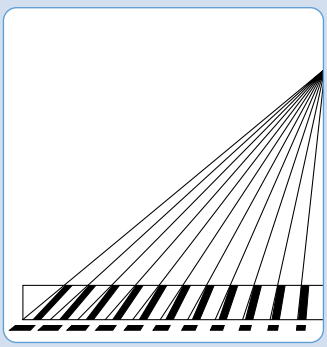
Discover incomparable image contrast

The perfect combination

At Smit Röntgen, our optimal design combines lead and fiber to create precise uniformity in the grid pattern. The result is high image contrast.



When the grid is in focus, the lamella shadows are uniform across the entire surface.



If the grid is un-focused, the lamella shadows increase towards the edge of the grid.

Mastering the grids composition

A grid is an assembly of equally spaced lamella consisting of a strip of lead and a strip of interspacer material. The amount of lead in a grid measures its ability to improve image contrast. However, a high lead content also increases the absorption of information-bearing primary X-rays. That's why designing and applying grids with high primary radiation transparency and adequate scatter absorption is especially important.

Perfect balance

Smit Röntgen grids are perfectly balanced due to their use of low absorption interspacer material and optimized lead thickness.

As you can see, constructing a grid is an ongoing process of customization and research. Only reputable, quality-oriented companies like Smit Röntgen, backed by the systems knowledge of Philips Medical, invest in these important factors.

Good ratio

Ratio equals the height (h) of the lead strips divided by the width (D) of the interspacer material. For general purpose applications, the ratio should be around 10 or higher to have good scatter rejection. For mammography, lower ratios (5 to 10) already give good results.

$$r = \frac{h}{D}$$

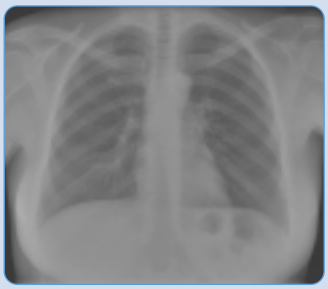
Excellence in all applications

The fiber interspacer allows maximum grid performance in general purpose applications at a reduced X-ray dose. Not only that, it is the sole interspacer that can be used in mammography applications. Thanks to our expertise, Smit fiber interspaced grids are the most used mammography grids in the world.

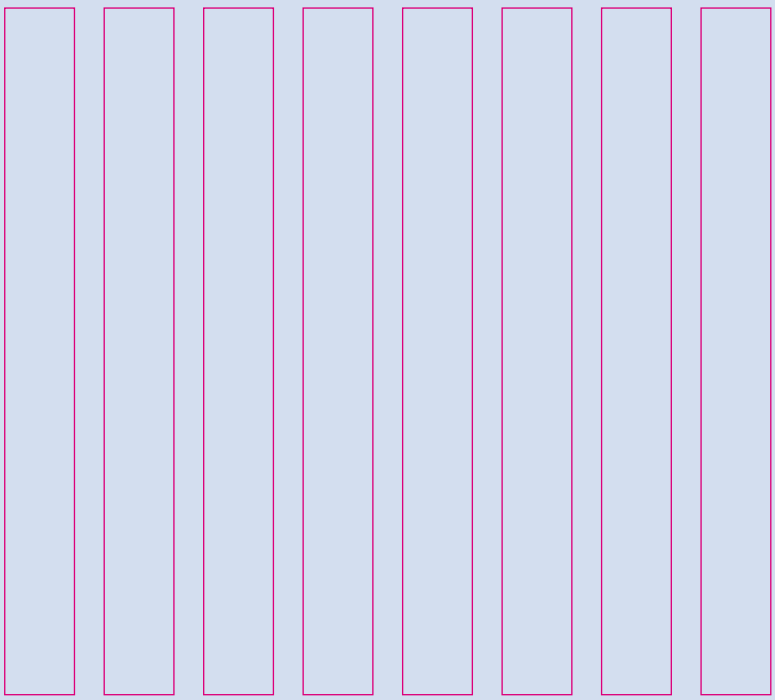
Maximum improvement

We offer a grid with the best primary X-ray transparency offset by excellent scattered ray blocking capabilities to result in maximum contrast improvement.

Plus, our range of line rates and heights perfectly fit any system parameters. At Smit Röntgen, we continue our drive for excellence by developing materials which improve grid function even more.



Lack of grids equals low image contrast, increasing the probability of an inaccurate diagnosis.



Use of a grid gives you sharp image contrast for making accurate diagnoses. Take a closer look at the best image quality possible!

Count on grids when it comes to digital

Choose the complete image

Digital post-processing does have limitations. That's why grids remain an indispensable part of digital radiography.

Vote for high SNR

All systems generate scatter and electronic noise. They are unavoidable and can mask clinically relevant information. A system's "noise" performance is expressed as the signal-to-noise ratio (SNR).

$$\frac{\textit{signal}}{\textit{noise}} = \frac{\textit{object image information}}{\textit{disturbing image information}}$$

Image quality in a digital environment is determined by the highest possible level of SNR, which is the lowest degree of noise possible. One way to compensate for poor SNR is to increase the radiation dose, an unacceptable trade-off.

Eliminate scatter beforehand

Grids enhance the signal-to-noise ratio (SNR) in a digital system. Digital post-processing cannot improve the SNR. This can only be done using a proper grid.

The physical nature of radiation and the digital detector conversion process, which changes X-rays to an electrical signal, cause quantum and electronic noise. This is true for both scattered radiation and primary radiation containing the original object contrast. The amount of scattered radiation can be 5 to 10 times greater than primary radiation.

Unfortunately, restoring contrast in post-processing simultaneously increases the noise. Therefore, it remains of utmost importance to eliminate the scatter component before it enters the digital detector. And this is precisely what Smit Röntgen grids do.

Scattered rays cause scatter quantum noise and thus reduce image contrast.

Digital post-processing restores the original contrast, but it also increases the noise and obscures low-contrast details.

Enhance your DQE with Smit Röntgen

The crucial benchmark in digital imaging is detected quantum efficiency (DQE). This parameter expresses the system's ability to detect small, low-contrast objects. DQE is directly related to the amount of radiation required to visualize anatomical objects. A high DQE means a lower dose. The standard formula for this is:

$$DQE = \frac{SNR^2_{out}}{SNR^2_{in}}$$

A fiber interspaced grid improves the system DQE with the factor Q, which is defined as:

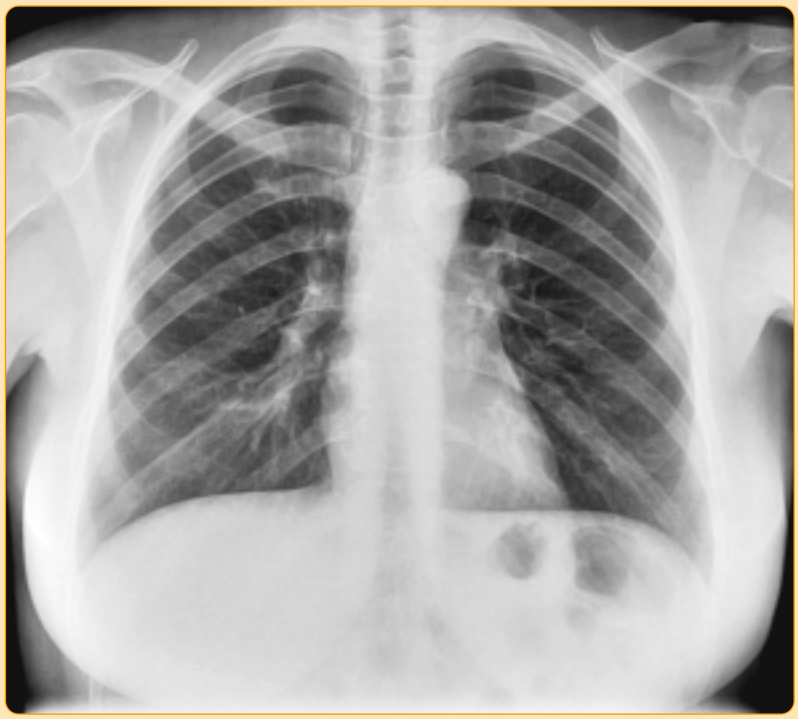
$$Q = \frac{\textit{DQE with fiber interspaced grid}}{\textit{DQE without fiber interspaced grid}}$$

This equation related to grid parameters is:

$$Q = \frac{K^2}{B} = \frac{T_p^2}{T_t} = \frac{\left[\textit{transmission of primary radiation}\right]^2}{\textit{transmission of primary and scattered radiation}}$$

A common 70 line fiber interspaced grid has a quality factor (Q) of 2.65; the SNR is enhanced by 63%. These figures show that in a digital environment the greatest signal-to-noise improvement is achieved by using a fiber interspaced grid.

Conclusion: whether with analog or digital radiography, if you desire ideal image contrast, Smit Röntgen has what you need!



Using a Smit Röntgen grid removes scatter and scatter quantum related noise, maintaining the original object contrast at the most optimal SNR.

Facts that give you the big picture

No matter which systems you manufacture, Smit Röntgen has the right grid for you, covering all focal distances you may encounter in practice.

What can we do for you?

Whether you manufacture mammography, bucky, digital systems or image intensifiers, you'll find the right grid in our range, which includes standard grids and grids designed for special applications. We also custom build grids to your specifications. Make your systems complete with the experts in the field.

X-ray performance data of fiber interspaced grids for general purpose applications

Grid Type	Primary Trans-mission	B (+-10%)	K (+-10%)	S (+-10%)	Q (+-10%)
36 8	76%	4.5	3.4	5.9	2.6
36 10	76%	5.0	3.8	7.2	2.9
36 12	75%	5.5	4.1	8.6	3.1
40 8	78%	4.3	3.4	5.6	2.6
40 10	77%	4.7	3.6	6.4	2.8
40 12	75%	5.2	3.9	7.8	2.9
40 15	74%	5.8	4.3	9.7	3.2
44 8	78%	4.1	3.2	5.0	2.5
44 10	77%	4.7	3.6	6.4	2.8
44 12	75%	5.2	3.9	7.9	2.9
44 15	74%	5.7	4.2	9.4	3.1
60 10	72%	5.3	3.8	7.4	2.7
60 13	71%	5.7	4.1	8.5	2.9
60 15	70%	6.1	4.2	9.7	3.0
70 13	78%	5.1	4.0	8.2	2.6
70 17	77%	5.7	4.4	11.8	2.9
80 13	70%	5.0	3.5	6.4	2.5
80 15	69%	5.5	3.8	7.3	2.6

All values measured according IEC 60627 2001 second edition. Figures object to change.

All dimensions of our grids

Our grids are available in a wide range of sizes and shapes. We even manufacture circular grids for use with image intensifiers.

All focal distances

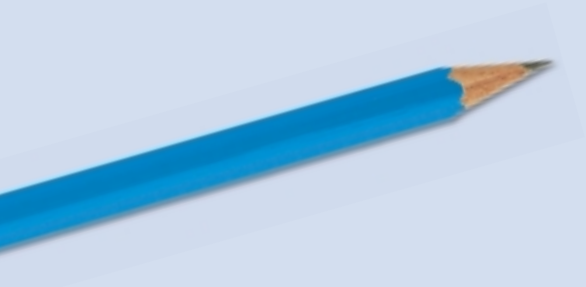
We design our grids to conform to all focal distances arising in practice. This means we can deliver them with any focal distance between 50 cm (20 inch) and 300 cm (118 inch).

All the best: carbon fiber covered grids

Our range also encompasses grids with carbon fiber covers. The result is a visibly higher contrast due to reduction in X-ray absorption and less hardening of the beam.

All channels open

Feel free to contact our engineering department with any questions or issues you may have. We are always available to assist you in optimizing products for your specific applications and are flexible in setting up customized solutions.



Application limitations of various grids and dimensions (figures in cm)

Ratio 8:1

f_0	18	24	30	36	43
80	55–144	60–120	63–109	65–103	67–99
100	64–225	71–171	75–150	78–138	81–131
140	78–630	87–340	95–265	101–225	105–210
180	90–~	103–720	113–450	120–360	126–315

Ratio 10:1

f_0	18	24	30	36	43
80	59–124	63–109	66–102	68–97	69–94
100	69–180	75–150	79–136	82–129	84–124
140	86–370	95–260	102–225	106–200	110–190
180	100–900	113–450	122–346	129–300	134–274

Ratio 12:1

f_0	18	24	30	36	43
80	62–114	65–103	68–97	70–94	71–92
100	73–159	78–138	82–129	84–123	86–119
140	92–285	101–230	106–205	110–190	115–180
180	108–540	120–360	129–300	135–270	140–252

Ratio 13:1

f_0	18	24	30	36	43
80	63–110	66–101	69–95	71–93	72–91
100	74–153	79–135	83–127	85–121	87–117
140	94–268	103–220	108–198	112–185	116–176
180	110–480	123–337	132–287	138–261	142–245

Ratio 15:1

f_0	18	24	30	36	43
80	65–105	68–97	70–92	72–91	73–89
100	78–141	83–127	85–122	87–117	89–114
140	102–235	107–200	114–184	117–175	119–169
180	118–360	129–292	137–260	143–242	148–230

The table shows the application limits of a selection of grid dimensions and focal film distances. This is only a small selection. Please contact us for more information.

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Smit Röntgen grids are exclusively available through Dunlee.

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