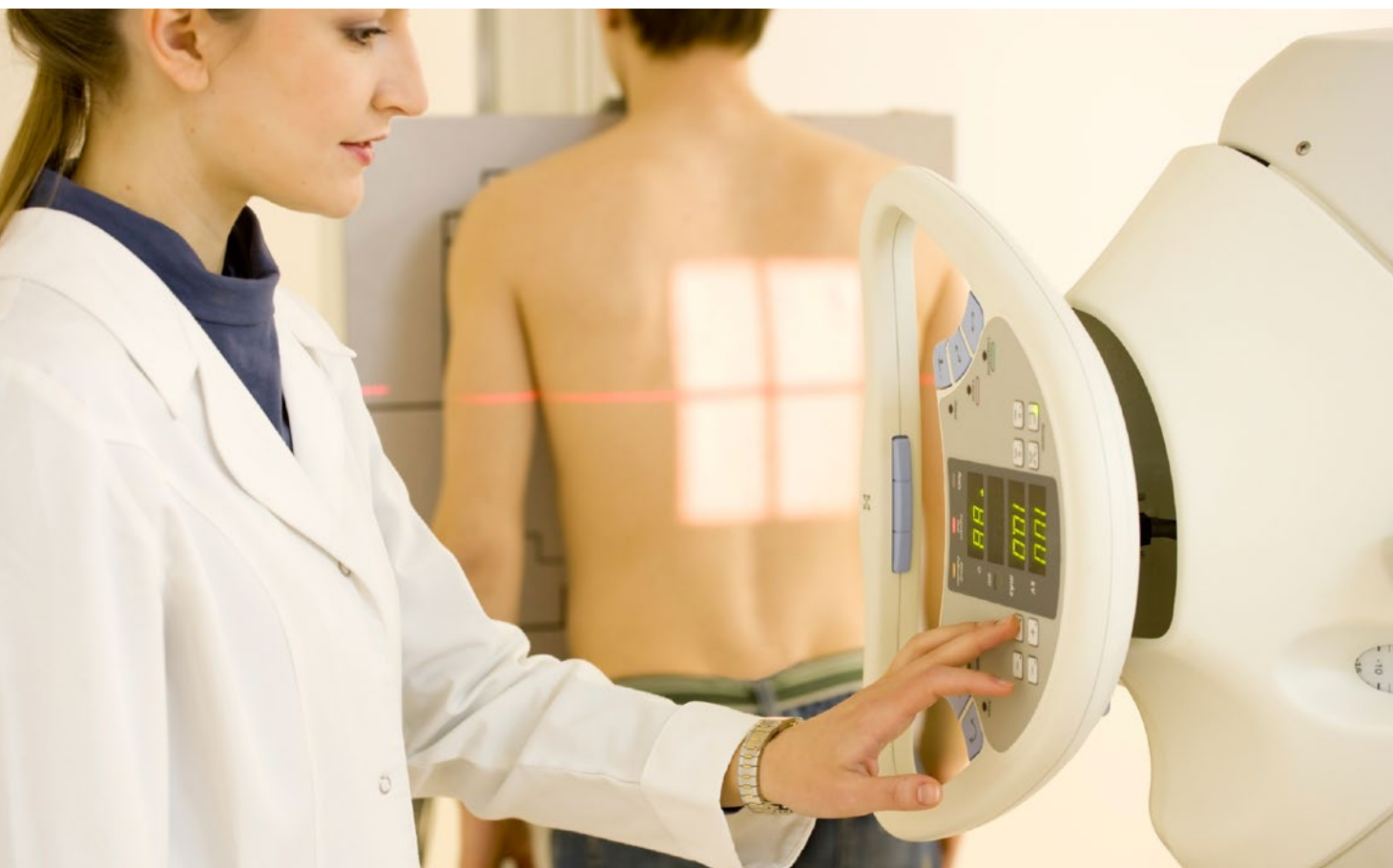


# Radiation protection.

## Electrical installation in screened walls.





# For screened X-ray rooms. Radiation protection technology.



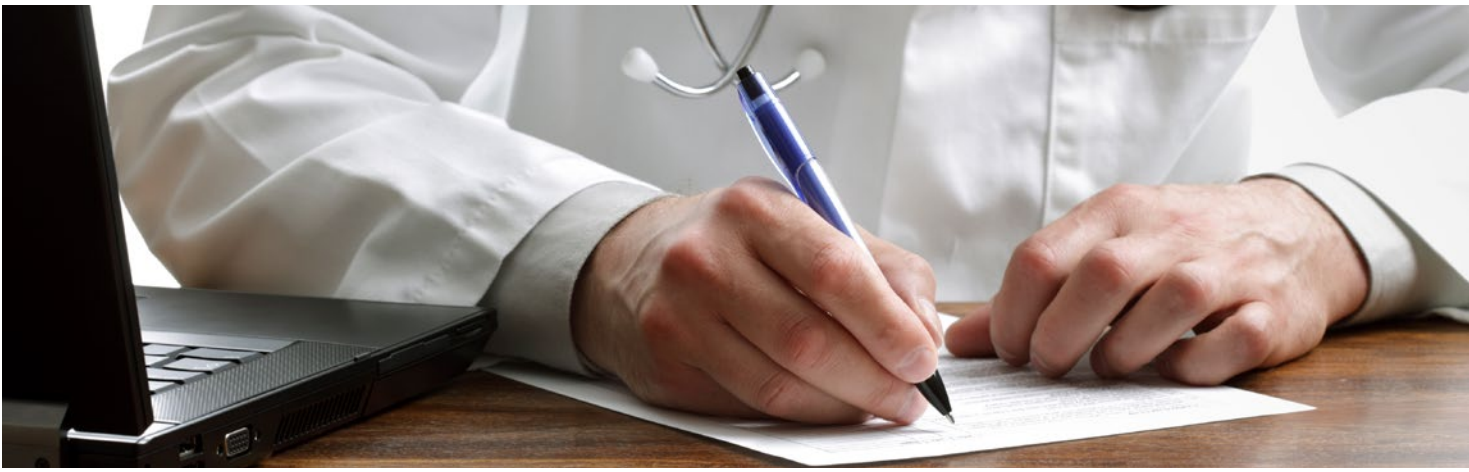
**Radiation protection in conjunction with electrical installations in radiation protection walls** represents a particular challenge. Radiation protection must be ensured by means of special structural measures. Hospitals, doctors' surgeries and all medical facilities in which X-ray and gamma irradiation equipment are used are particularly affected by this.

**The ionising radiation emitted** by X-ray machines is extremely harmful to people in the vicinity and, as a result, adjacent rooms must be screened.

Every installation opening in radiation-protection walls impairs the radiation protection function of the wall. Complex measures are required to subsequently restore this function. Screening in the form of lead encasings is frequently fitted around conventional electrical installation boxes.

Special care is required when planning the necessary electrical installations in radiation protection walls. It is essential that this is done in advance, as it is no longer possible to subsequently screen the installation boxes using the conventional method in radiation protection walls that have already been constructed.

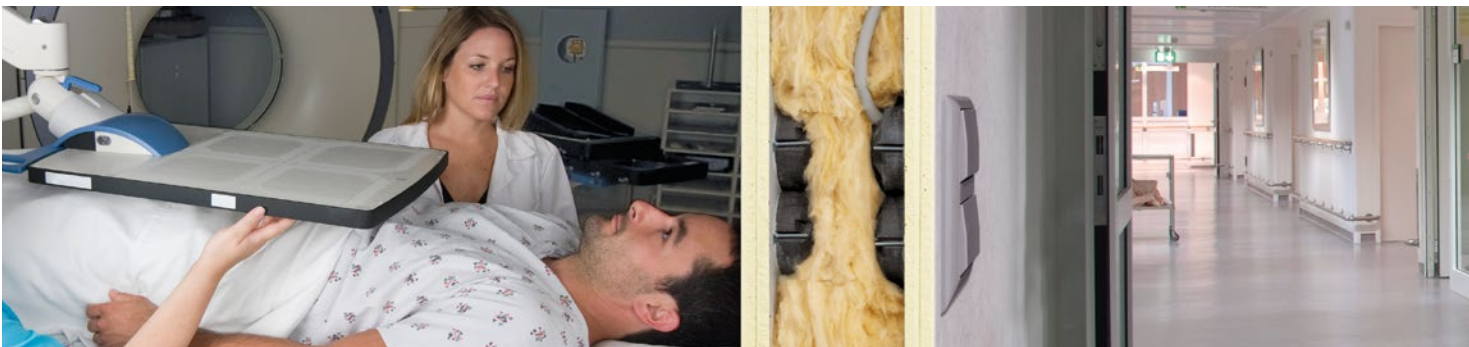




## Regulations and standards. StrlSchV and DIN 6812.

National and international laws and regulations, in addition to standards, have been issued to protect people who are constantly or occasionally exposed to X-rays from the dangers of ionising radiation. In Germany, this includes the Radiation Protection Ordinance (StrlSchV). This describes the protection against damage caused by X-rays and also applies to X-ray diagnostics and radiotherapy.

Structural radiation protection is regulated in DIN 6812 for medical X-ray systems up to 300 kV. In general, a distinction is made between useful radiation and interference radiation. The useful radiation occurs in the X-ray equipment in the direction intended for its purpose, while the interference radiation has scattering effects and occurs in different directions and intensities.

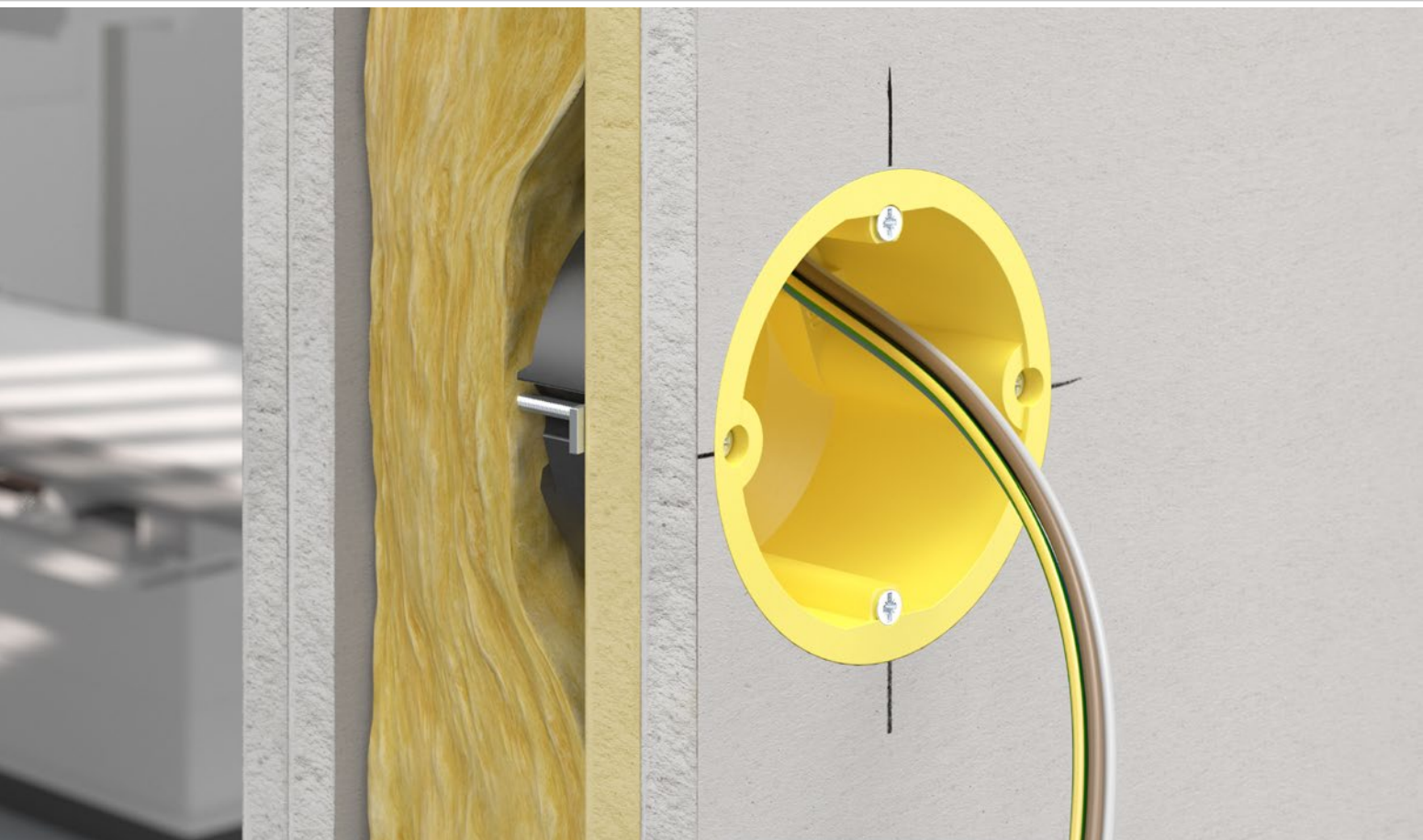


## Technical basics. Radiation-protection walls.



The required structural screening (lead layer thickness) is calculated depending on the type of radiation, the category of the room, which is determined depending on the length of time people are present, as well as the power of the irradiation system (tube voltage) and its distance from the neighbouring occupied zone. The screening effect of substances other than lead is specified as the equivalent lead layer thickness (lead equivalent). The higher the tube voltage, the greater the required lead layer thickness. Details of the required lead layer

thicknesses or their equivalents are specified in DIN 6812. An X-ray room must be protected against radiation from all sides. Special radiation-protection walls are used for this purpose. These are often lightweight walls with a lead lining on the boarding side facing the X-ray room. **However, as these are difficult to work with, radiation-protected wall construction systems without lead (e.g. Knauf Safeboard) are becoming increasingly popular in construction and finishing practice.**



# Safety for X-ray rooms. One-gang junction box for radiation-protection walls.



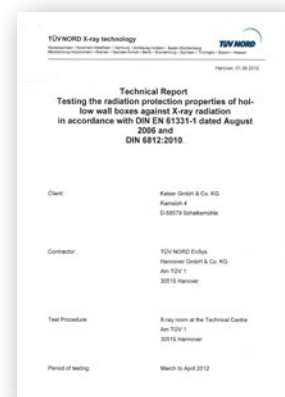
The **innovative radiation-protection one-gang box** from KAISER protects against medical radiation, e.g. in X-ray facilities. Due to the high density of the radiation protection compound, soft and hard X-rays are absorbed. The box is particularly suitable for **lead-free radiation-protection walls** and, due to its dose-reducing effect in the tube voltage range between 40–150 kV, guarantees a lead equivalent value of the wall up to 3 mm Pb even in the case of opposing installation.

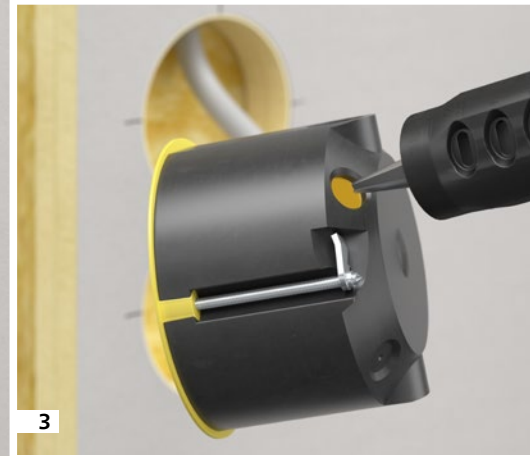
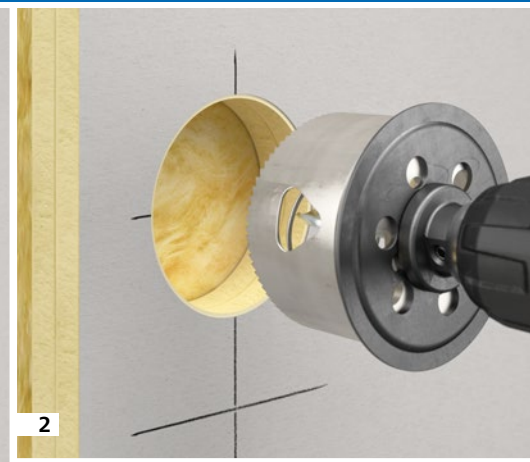
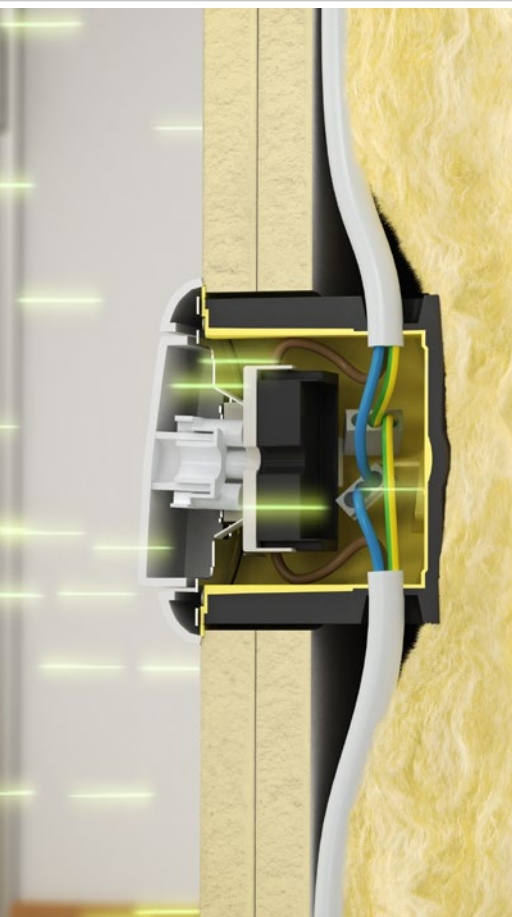
- Protection against X-rays
- Suitable for lead-free radiation-protection walls
- Lead-free – no health risks
- Retrofitting possible
- Fast installation without additional screening measures
- Opposing installation possible

The radiation-protection one-gang box is simply mounted like a conventional cavity wall box in a Ø 74 mm installation opening. The exact cable entry is made using the universal opening cutter. For combinations with a standardised distance of 71 mm, the marked edge strip is simply cut off.

Fully insulated through-wiring can be realised with the straight coupling. With the universal VDE cover (Art. no. 1184-90), the box can also be used as a junction box. Existing installation openings can be enlarged from Ø 68 mm to Ø 74 mm, e.g. in existing buildings, using the centring tool 68/74 (Art. no. 1083-99).

The certificate can be [downloaded](#) as a PDF file from our website.





The radiation protection of the wall remains completely intact even when installation boxes are fitted.

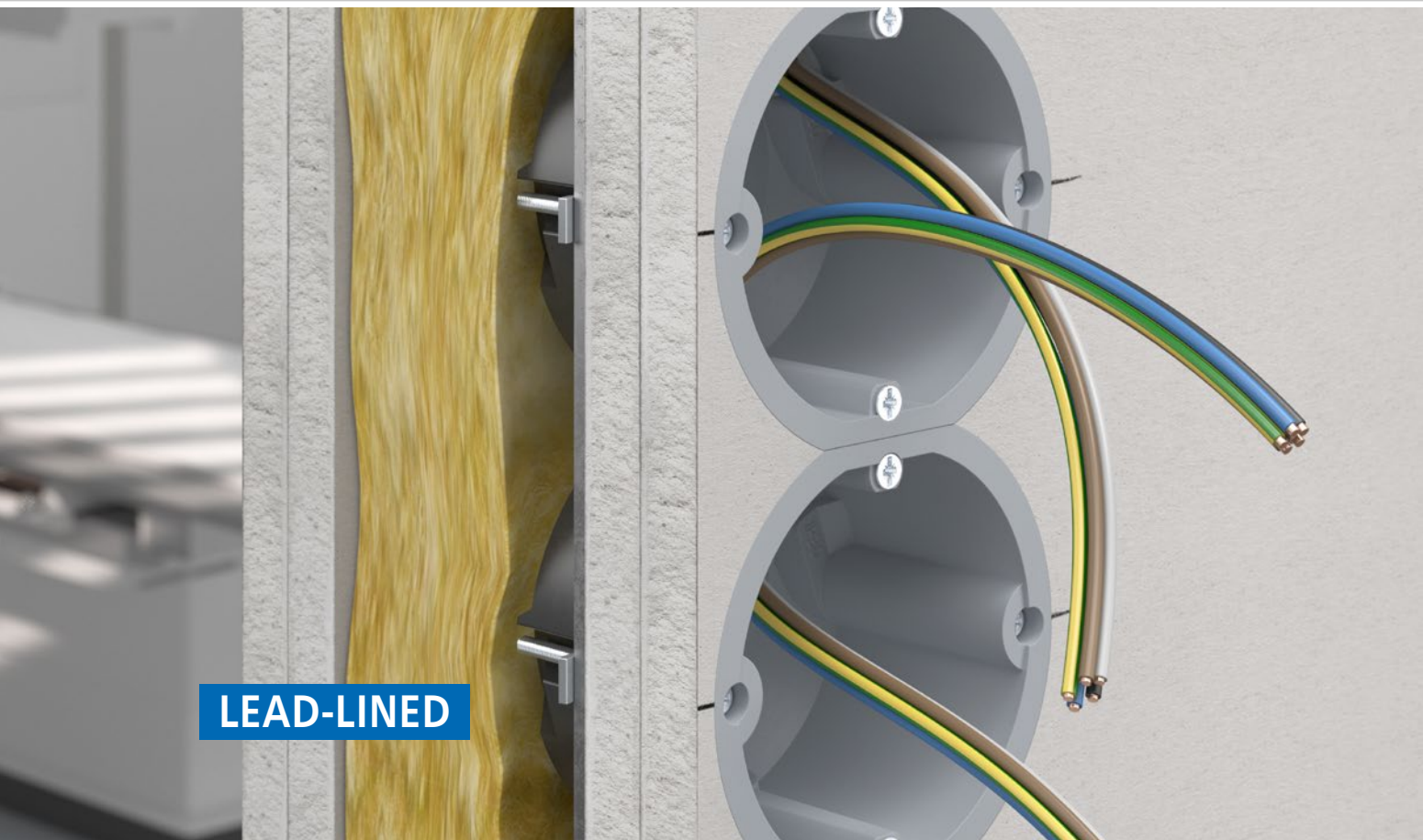
- 1 Multiple combinations possible without negative effects on radiation protection.
- 2 Create the installation opening using a cutter (e.g. PROFI cutter 1081-20).
- 3 Exact opening thanks to the universal opening cutter.



**Radiation-protection  
one-gang junction box**  
9074-01

**Straight coupling**  
9060-74





# Safety for X-ray rooms. One-gang junction box for radiation-protection walls.

The **KAISER radiation-protection one-gang box for use in lead-lined walls** protects against radiation used for medical purposes, e.g. in X-ray facilities. The radiation protection material with an integrated lead functional component absorbs the dangerous X-ray radiation with a lead equivalent value of 2.5 mm Pb just as efficiently as 2.5 mm thick lead. The radiation protection of the wall remains completely intact even when installation boxes are fitted.

- Protection against X-rays
- Suitable for lead-lined radiation-protection walls
- No health risks – no skin contact with lead function component
- Retrofitting possible
- Fast installation without additional screening measures

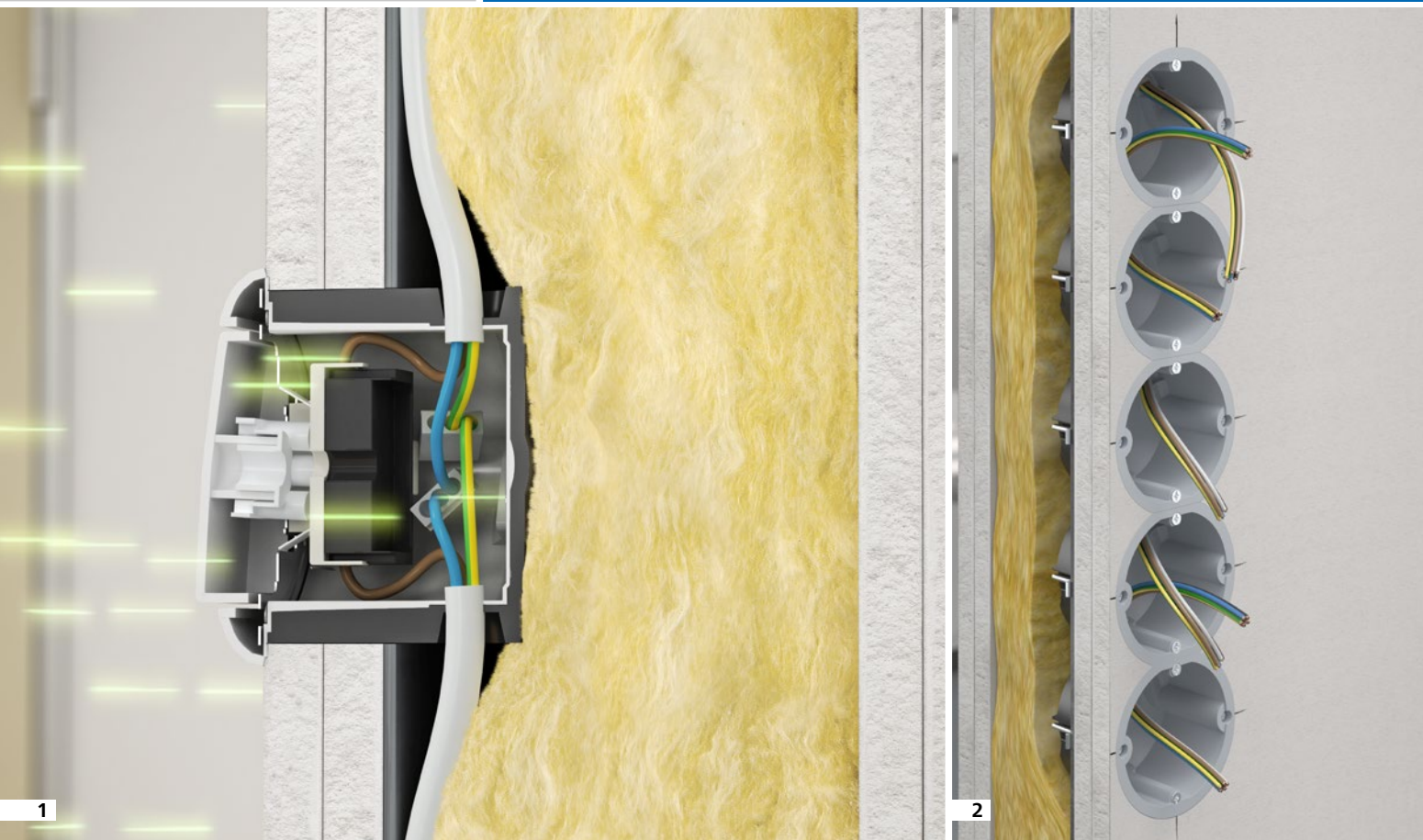
## Proof of radiation protection

The German TÜV-Nord Ensys demonstrated that within a range of tube voltages between 90 and 150 kV, KAISER's radiation-protection one-gang box with a lead-function component achieves a lead equivalent of 2.5 mm Pb.

This was confirmed by a series of comprehensive tests that preceded certification, and it was clearly demonstrated that the wall's radiation protection in this range of applications is completely maintained.

The certificate can be [downloaded](#) as a PDF file from our website.





- 1 The radiation protection of the wall remains completely intact even when installation boxes are fitted.
- 2 The fully-insulated through-wiring is carried out with the straight coupling. Up to a 5-unit combination of boxes is possible without any negative effects on radiation protection.

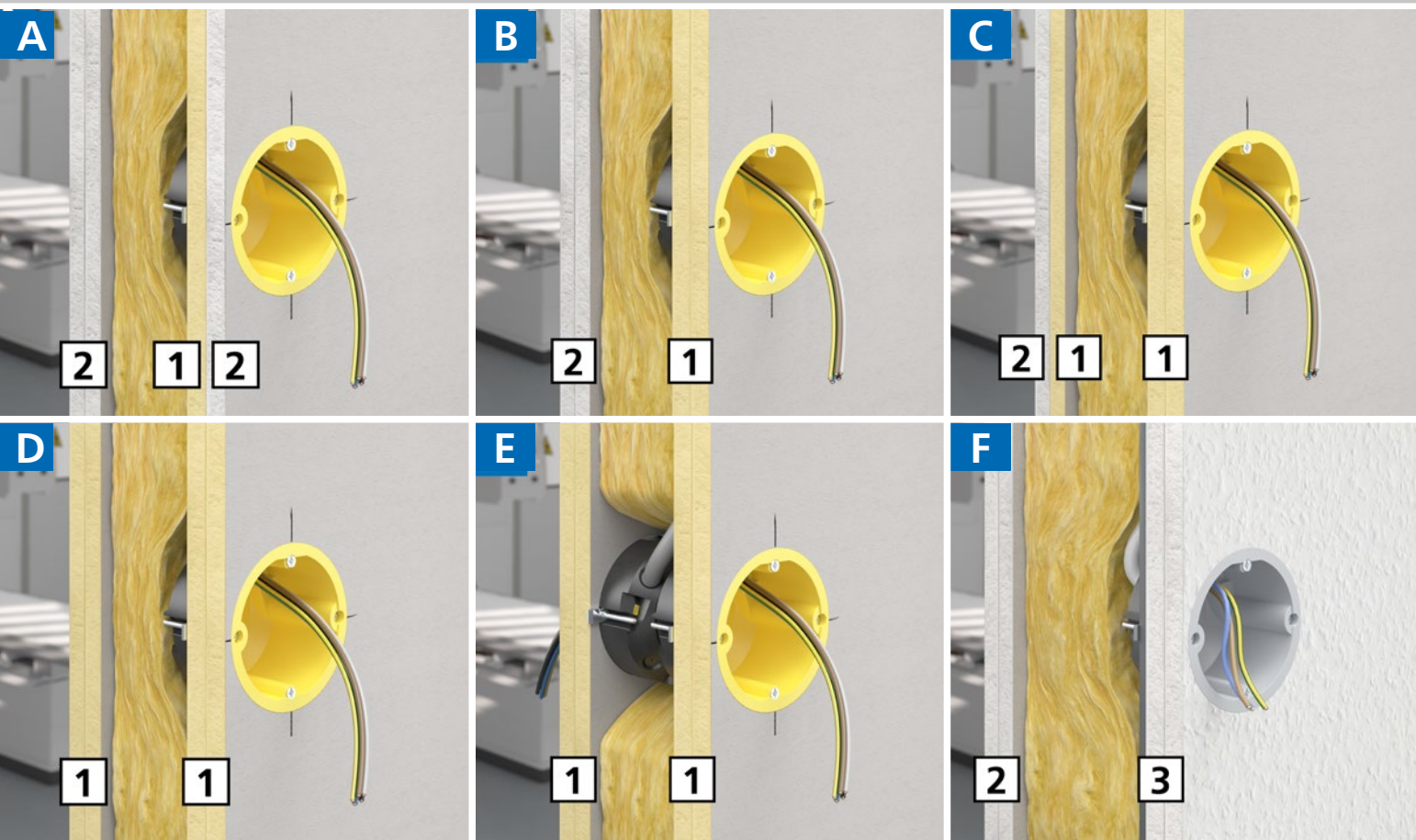


**Radiation-protection  
one-gang junction box  
Lead-lined  
9074-03**



**Straight coupling  
9060-88**





# For wall structures suitable for radiation-protection panels.

The following describes various wall structures in conjunction with the required number of lead-free and lead-lined radiation-protection panels as well as a plasterboard panel in accordance with the lead equivalent values required in DIN 6812. Please refer to the following table for the corresponding lead equivalent value with the corresponding figure.

Lead equivalent in mm Pb / Figure

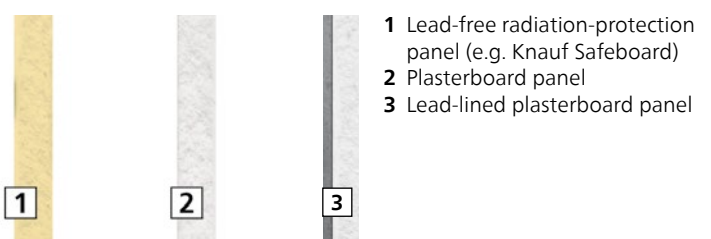
|           |   |
|-----------|---|
| 0.3 - 0.6 | A |
| 1.0 - 1.1 | B |
| ≤ 1.75    | C |
| ≤ 2.75    | D |
| ≤ 3.0     | E |
| ≤ 2.5     | F |

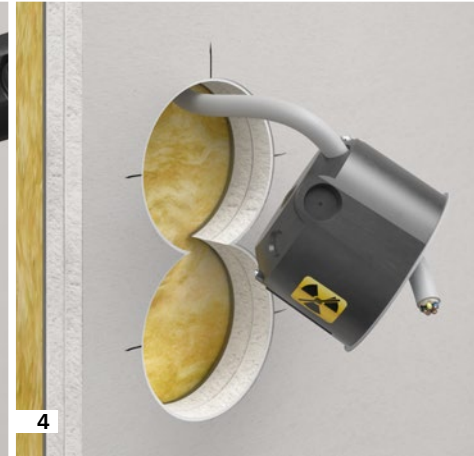
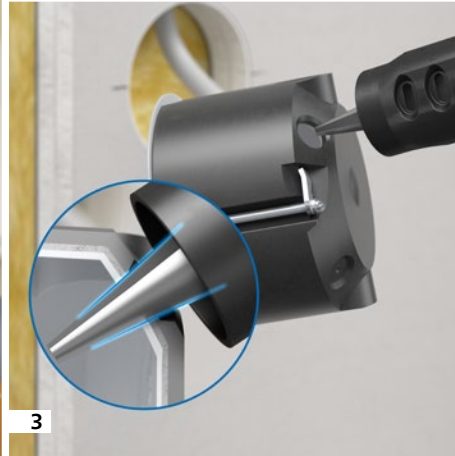
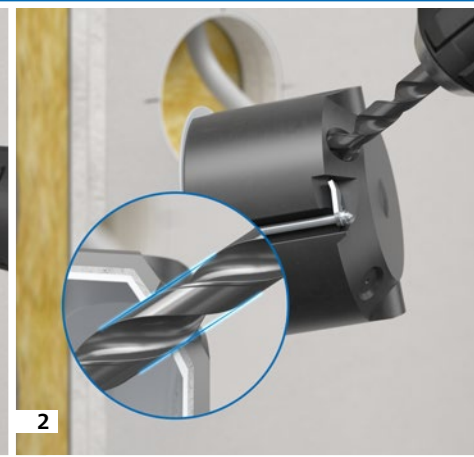
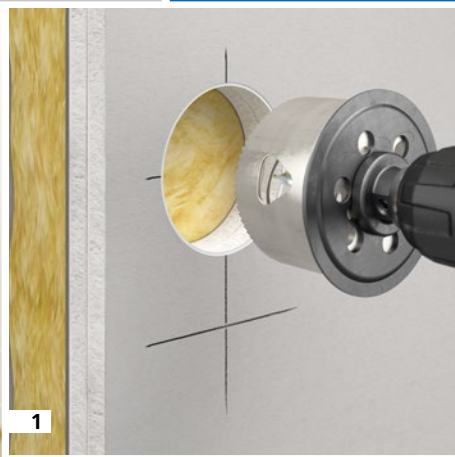
## Use in lead-free radiation-protection walls (e.g. Knauf Safeboard):

- A** Lead equivalent: up to 0.6 mm Pb  
Wall construction: 2 layers of boarding on both sides
- B** Lead equivalent: up to 1.1 mm Pb  
Wall construction: 2 layers of boarding on both sides
- C** Lead equivalent: up to 1.75 mm Pb  
Wall construction: 2 layers of boarding on both sides
- D** Lead equivalent: up to 2.75 mm Pb  
Wall construction: 2 layers of boarding on both sides
- E** Two opposing radiation-protection one-gang boxes achieve a lead equivalent of 3 mm Pb

## Use in lead-lined radiation-protection walls

- F** Up to 2.5 mm Pb on both sides, 2-layer boarding, lead-lining on one side





# Quick installation of the one-gang junction box for radiation-protection walls.

## Installation

1. Use a cutter (e.g. Multi 4000 or Multi 2000 HM) to create a  $\varnothing$  74 mm opening.
2. Use HSS drill bits to prepare the appropriate cable entry.
3. Use the universal opening cutter (Art. no. 1085-80) to create the cable entry with the prescribed cable retention.
4. Insert the electric cables, then fit the box into the installation opening.

**PROFI cutter**  
1081-20



**EXPERT cutter**  
1082-40

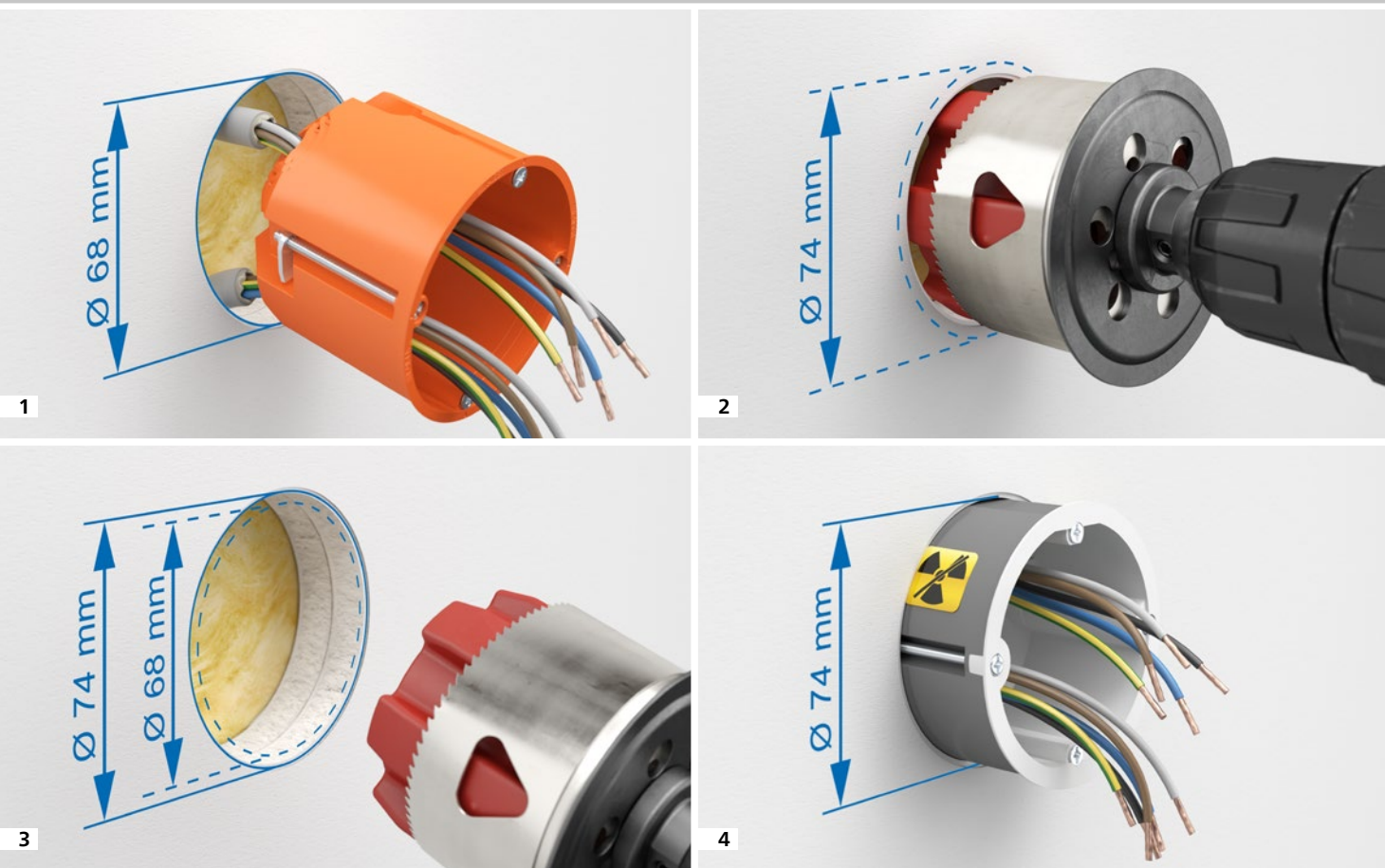


**Universal opening cutter**  
1085-80



**Centering insert 68/74**  
1083-99





## Refurbishing. Centering insert 68/74 for retrofitting.

The centering insert 68/74 enables existing installation openings to be easily expanded from  $\varnothing 68$  mm to  $\varnothing 74$  mm. These can be single or multi-layer boarded lightweight construction walls, consisting of lead-free radiation-protection panels (e.g. Knauf Safeboard) and lead-lined plasterboard panels. Retrofitting of existing conventional cavity wall boxes with radiation-protection one-gang boxes is therefore significantly simplified. The centering insert 68/74 mm is an uncomplicated tool aid for  $\varnothing 74$  mm cavity wall cutters (e.g. PROFI or EXPERT) and provides precise guidance for expanding the installation opening.

Assignment table for opening the  
radiation-protection one-gang junction box.

Universal opening cutter  
1085-80



HSS drill bit



| Cavity wall installation for radiation-protection one-gang boxes 9074-01 (lead-free) |                         | Universal opening cutter Ø                    |  |
|--------------------------------------------------------------------------------------|-------------------------|-----------------------------------------------|--|
| NYM cables                                                                           | 3 x 1.5 mm <sup>2</sup> | 9.5 mm                                        |  |
|                                                                                      | 5 x 1.5 mm <sup>2</sup> | 9.5 mm                                        |  |
|                                                                                      | 3 x 2.5 mm <sup>2</sup> | 10.5 mm                                       |  |
| Straight coupling                                                                    | 9060-74                 | Cut up to the marking of the connector entry. |  |

| Cavity wall installation for radiation-protection one-gang boxes 9074-03 (lead-lined) |                         | HSS drill bit Ø | Universal opening cutter Ø                    |
|---------------------------------------------------------------------------------------|-------------------------|-----------------|-----------------------------------------------|
| NYM cables                                                                            | 3 x 1.5 mm <sup>2</sup> | 8.0 mm          | 9.5 mm                                        |
|                                                                                       | 5 x 1.5 mm <sup>2</sup> | 9.5 mm          | 9.5 mm                                        |
|                                                                                       | 3 x 2.5 mm <sup>2</sup> | 9.5 mm          | 9.5 mm                                        |
|                                                                                       | 5 x 2.5 mm <sup>2</sup> | 9.5 mm          | Connector                                     |
| Straight coupling                                                                     | 9060-88                 | 12 mm           | Cut up to the marking of the connector entry. |

KAISER radiation protection system.  
At a glance.



[https://www.kaiser-elektro.de/en\\_DE/solutions/radiation-protection/](https://www.kaiser-elektro.de/en_DE/solutions/radiation-protection/)

Installation in walls. 

Radiation-protection one-gang boxes



Radiation-protection one-gang box  
9074-01



Radiation-protection one-gang box  
Lead-lined  
9074-03



Straight coupling  
9060-74



Straight coupling  
9060-88



Universal VDE cover  
1184-90

Tools



EXPERT cutter  
1081-20



PROFI cutter  
1082-40



Universal opening cutter  
1085-80



Centering insert  
1083-99

# Systems and solutions for professional electrical installation work.

KAISER has been developing and producing systems and products as the basis for professional installation work since 1904. Planners and fitters all over the world use our practice-oriented solutions for their daily work in all installation areas.



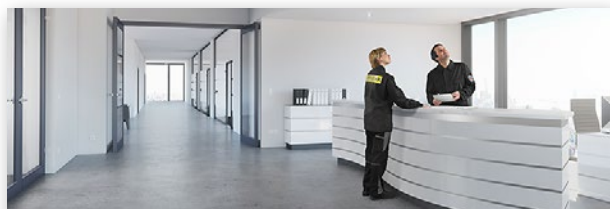
## Energy efficiency.

Innovative KAISER products help you to ensure compliance with the requirements of EU Directives and national regulations, such as the German Energy Act for Buildings (GEG, formerly EnEV).



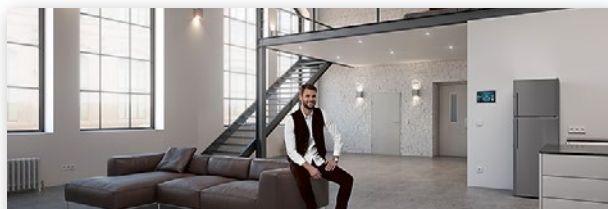
## Radiation protection.

Use of the new radiation-protection one-gang boxes allows the radiation protection of the wall to be maintained without additional shielding measures.



## Fire protection.

KAISER fire protection systems provide reliable solutions for electrical installations in fire protection walls and ceilings.



## Construction.

KAISER has corresponding product system solutions for safe, durable and practical use in redevelopment, renovation and modernisation projects.



## Sound insulation.

KAISER's innovative sound insulation boxes ensure compliance with the construction requirements for sound insulation walls, as well as for built-in installations.



## Concrete construction.

Complete systems for on-site mixed and precast concrete. Fully optimised to professional electrical installation work.

### Technical information and advice

All current further information on products, system solutions and communication media can be found on our website at [www.kaiser-elektro.de](http://www.kaiser-elektro.de)

For additional questions or information, our team of technical consultants will be happy to assist you and look forward to talking to you: **+49 (0) 23 55 809 61** · [technik@kaiser-elektro.de](mailto:technik@kaiser-elektro.de)

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