

TECHNICAL INFORMATION AND INSTALLATION INSTRUCTIONS

FLOOR AIR DIFFUSER



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INDULFLOOR



THREE FUNCTIONS COMBINED INTO A SINGLE FLOOR AIR DIFFUSER



INDULFLOOR is a floor air diffuser with integrated duct sound absorber and innovative mechanism for air flow rate and discharge setting. INDULFLOOR is perfect for integration into raised floors and can be installed along façades to save space. The simultaneous adjustment of the air volume and of the velocity of air leaving, together with a tried-and-tested highly inductive air discharge profile, ensure high thermal comfort in a range of application areas in modern architecture, especially in office spaces.



Ventilation diagram of commercially available floor air diffuser

- 1. Butterfly damper, air flow rate limiter or controller
- 2. Duct sound absorber
- 3. Plenum box with outlet



INDULFLOOR ventilation concept

- 1. Air flow rate limiter
- 2. Duct sound absorber
- Plenum box with integrated mechanism for air flow rate and discharge setting

INDULFLOOR



OVERVIEW OF COMPONENTS

INDULFLOOR comprises a housing with an integrated duct sound absorber and mechanism to generate an almost constant flow pattern independently of the air flow rate. The air flow rate can be adjusted from the room on a scale. The air diffuser has an asymmetrically positioned air connection socket and an accessible linear grille with support frame.

The floor air diffuser has 4 height-adjustable feet with accompanying locknuts for adjustment to installation tolerances. To improve structure-borne sound decoupling, the elastic thermoplastic (TPE) anti-slip pads (supplied) can be placed under the adjustable feet. There are two impact-noise decoupling fixing tabs on the feet facing the room side, so that the floor air diffuser can be secured against moving. The floor air diffuser is supplied with an access panel to allow for a defined and simple interface to the raised floor. The floor covering can be attached to the access panel. The height of the access panel is adjusted to suit the project and to the thickness of the floor covering during manufacturing.

A room-side pressure measurement nipple allows for pressure and air flow rate recording on site. A supply air rate can be read off from the performance curve with the measured pressure signal and the scale on the air diffuser (see page 11). A pressure controller, to be supplied by the customer, must be fitted in the main line to ensure a constant pressure signal at the floor air diffuser.

		3	5
1	Accessible linear grille with support frame	_	
2	Inductive air diffuser profile	_	
3	Air guide profiles with scale for air flow rate setting from the room	_	
4	Air flow rate determination via pressure measurement nipple		
6	Height-adjustable feet with plastic underlay and additional anti-slip pads for impact-noise decoupling	_	
6	Fixing tab for impact-noise decoupled fixing	_	
7	Air connection socket	_	
8	Throttle elements for air flow rate setting	_	
9	Accessible panel (interface to raised floor)	_	
0	Integrated duct sound absorber	_	

INDULFLOOR



SPECIAL FEATURES

All benefits at a glance

Installation	Low box height of 133 mm for problem-free installation in raised floors, without clearance to the façade.
Components	Compact, ready-to-use solution: air diffuser, air flow rate and discharge setting, duct sound absorber.
Assembly/installation	Single-piece for ease and speed of installation.
Commissioning	No adjustment needed, factory preset.
Air flow rate control	No access hatch needed, as the air flow rate is easy to set from the room and pressure measurement nipple is used to measure the set air flow rate.
Ambient air flow + thermal comfort	Inductive air diffuser profile for optimal mixing/source flow according to set air flow rate. Air flow rate can be subsequently increased or decreased without impacting comfort.
Acoustics	Duct sound absorber integrated into air diffuser.
Cleaning	Floor trough of linear diffuser can be cleaned according to VDI 6022 by removing the floor grille and air diffuser profile.

INDULFLOOR DESIGNS AND RANGES OF APPLICATION





Single element

INDULFLOOR floor air diffuser with integrated, sound absorbing air flow rate controller as single element.



Band arrangement

INDULFLOOR floor air diffuser with integrated, sound absorbing air flow rate controller as band arrangement, with optional connection plate.

Dimensions

Length	1100 mm
Visible width of linear grille	113 mm
Height of box (without access panel)	133 mm
Height of box incl. neck	193 mm
Total height incl. adjustable feet (without anti-slip pad)	193 to 243 mm
Air connection	98 mm
Air connection side	Right (left on request)
Maximum floor covering thickness	35 mm
Minimum clearance height of raised floor	133 mm

Colours

Linear grille	Natural anodised aluminium
Frame	Black
Air diffuser profile	Black

Recommended ranges of application

Function	Cooling. Heating is also possible as an addition.
Air flow rate range per outlet	30 to 160 m³/h
Sound power level at 133 m³/h and 30 Pa	L _{wa} < 32 dB(A)
Recommended line pressure range	Between 30 and 60 Pa
Temperature differential $\Delta T (T_{SUP} - T_{IDA})$	Down to –6 K



Single element



Pressure measurement nipple for measuring the static pressure in the plenum box Detail "Y" Utility of the static Detail "Y"

Optional anti-slip pads for attachment

Detail "X"

Total height incl. adjustable feet without anti-slip pads 193-243 mm Total height incl. adjustable feet with anti-slip pads 196.5-246.5 mm





DESIGN VERSIONS

Single element



Kiefer Klimatechnik

TECHNICAL DATA

DESIGN TABLES

		Pre-charge pr	essure dP 30 Pa	Pre-charge pr	essure dP 40 Pa	Pre-charge pressure dP 50 Pa	
	Scale	V [m³/h]	LWA [dB(A)]	V [m³/h]	LWA [dB(A)]	V [m³/h]	LWA [dB(A)]
1	3	34	12	40	17	45	20
	4	50	12	58	17	66	20
	5	65	16	75	21	85	25
	6	86	22	99	27	111	30
	7	100	26	116	30	130	34
	8	114	29	132	33	147	37
	9	125	30	145	35	162	38
	10	133	32	154	37	172	40
	11	141	33	163	37	183	41
	12	150	34	174	38	196	42

Selected pre-charge pressure and sound power level according to supply air flow rate and scale setting per air diffuser.





CHARACTERISTIC DIAGRAM OF FLOOR AIR DIFFUSER FOR TECHNICAL DESIGN AND ADJUSTMENT



Sound power level and pre-charge pressure according to supply air flow rate and scale setting per air diffuser.



DESIGN EXAMPLE





DESIGN EXAMPLE

Example design:

3 Determine the intersection of the 45 Pa curve with the set flow rate ($\dot{V}_{example} = 60 \text{ m}^3/\text{h}$)



4 Read off values

- Sound power level < 20 dB(A)

- Scale approx. 4





INPUT ATTENUATION

Practical questions relating to input attenuation

- **Case 1:** To what extent does the INDULFLOOR as a sound absorber reduce the flow-generated noise (e.g. from fans, moulded parts, pressure regulators, butterfly dampers, etc.) remaining in the air ducts?
- Case 2: To what extent can sound transmission, especially of conversations between adjacent rooms, be reduced?

The INDULFLOOR integrates a sound absorber or cross-talk sound absorber, which helps to reduce transmitted cross-talk sound by several orders of magnitude.

At the same time, the sound absorber integrated into the floor air diffuser is highly effective when it comes to reducing the system noise that remains in the duct network.

The effective sound level reduction by the floor air diffuser can be evaluated, inter alia, by specifying the input attenuation value of the air diffuser D_{LD} . By knowing the input attenuation, the planning office can, for instance, calculate the design of the sound absorption value of the air path or standard edge sound level difference in accordance with VDI 2081.

Case 1: Reduction of flow-generated noise in the air ducts



Example comparison of the input attenuation (INDULFLOOR) with the input attenuation of a traditional duct sound absorber

	Hz	63	125	250	500	1000	2000	4000
INDULFLOOR Input attenuation D _{LD,ER (scale 4)}	dB	14	17	16	30	34	37	38
Traditional duct sound absorber (L1000, DN100, packing thickness 25) Input attenuation	dB	1	5	9	17	30	42	38



INPUT ATTENUATION

Case 2: Reduction of sound transmission between two adjacent rooms

The input attenuation of the components for two sound directions (VDI 2081-Sheet 1:2022) must be used to calculate sound transmission or to calculate the total attenuation between two rooms (cross-talk sound transmission):

- Input attenuation from the air duct into the room $(\mathsf{D}_{_{\mathrm{LD,ER}}})$
- Input attenuation from the room into the air diffuser and air duct $(D_{_{LD,R}})$



A transmission path between two diffusers with air duct connected between two rooms.

Use of the INDULFLOOR floor air diffuser, with its high input attenuation, means that additional cross-talk sound absorption measures for the air path between rooms can usually be omitted.



INPUT ATTENUATION

Determining the input attenuation of the INDULFLOOR in a laboratory

International standard DIN EN ISO 7235:2010 specifies a method for determining the input attenuation value of air diffusers in frequency bands.

This is determined using a room-to-room method (substitution method) and the sound pressure level radiated into the room for a freestanding pipe end. A second measurement is then performed to determine the sound pressure level radiated into the room with the air diffuser, with unchanged source excitation. The duct sound pressure level is determined using the sound pressure level determined from the room for the freestanding pipe end, taking into consideration the reflection losses calculated in accordance with DIN EN ISO 5135. The input attenuation for the INDULFLOOR floor air diffuser is based on the difference between the two sound pressure level measurements in the room, adjusted for reflection losses at the pipe opening.

Schematic measurement configuration for determination of D_{LD.ER}





$$\mathbf{D}_{\mathsf{LD},\mathsf{ER}} = \mathbf{L}_{\mathsf{1}} + \Delta \mathbf{L}_{\mathsf{r}} - \mathbf{L}_{\mathsf{2}}$$

Where:

- D_{LD,ER} = Input attenuation, air diffuser in receiving room (duct-to-room transmission)
- L1 = Sound pressure level, receiving room (without air diffuser)
- L2 = Sound pressure level, receiving room (with air diffuser in receiving room)
- ΔLr = End reflection or end attenuation, pipe

$$\Delta \mathbf{L}_{r} = 10 \log \left(1 + \left(\frac{\mathbf{C}}{4\pi \mathbf{f}} \right) \frac{\Omega}{\mathbf{S}_{\kappa}} \right) \mathbf{dB}$$

Where:

- $\boldsymbol{S}_{\!\scriptscriptstyle \mathrm{K}}$ = Opening area of pipe end
- c = Sound velocity
- f = Third-octave-band centre frequency
- Ω = According to the installation situation in the reverberation chamber (4π if the air diffuser is positioned in the centre of the room, 4π centre of the wall, π edge and π/2)

Schematic measurement configuration for determination of D_{LD SR}





$$\begin{split} \mathbf{D}_{\mathrm{LD,SR}} &= (\mathbf{L}_{1} + \Delta \mathbf{L}_{r}) - (\mathbf{L}_{2} + \Delta \mathbf{L}_{r}) \\ \mathbf{D}_{\mathrm{LD,SR}} &= \mathbf{L}_{1} - \mathbf{L}_{2} \end{split}$$

Where:

- D_{LD,SR} = Input attenuation, air diffuser in transmitting room (duct-to-room transmission)
- L1 = Sound pressure level, receiving room (without air diffuser)
- L2 = Sound pressure level, receiving room (with air diffuser in transmitting room)
- ΔLr = End reflection or end attenuation, pipe



INPUT ATTENUATION



f [Hz] D_{LD,ER} [dB] Scale 1 Scale 4 Scale 7 Scale 12 18.1 17.3 50 17.9 18.8 14.9 63 14.3 13.9 15.2 80 12.8 11.8 11.7 13.0 100 13.1 12.9 11.4 13.3 125 25.7 23.6 22.1 24.1 34.4 160 31.1 31.1 32.0 200 17.2 13.0 13.9 16.7 250 19.4 16.7 16.4 14.2 315 28.7 26.7 24.7 20.5 400 28.7 27.5 28.3 22.8 500 34.0 33.2 30.2 22.8 630 32.2 29.7 29.3 28.5 800 35.2 32.6 30.4 33.4 1000 36.9 35.0 35.3 33.4 1250 32.9 36.5 36.6 30.1 1600 39.4 37.7 36.1 34.9 2000 38.3 37.8 35.6 35.1 2500 36.9 36.2 35.6 32.6 3150 37.9 36.9 36.3 32.3 4000 39.9 38.6 36.6 33.1 5000 39.4 37.8 36.0 32.8



INPUT ATTENUATION



Input attenuation air diffuser transmitting room

f [Hz]	D _{LD,SR} [dB]					
	Scale 1	Scale 4	Scale 7	Scale 12		
50	0.3	-1.7	-0.4	2.2		
63	-1.8	-1.9	-2.4	-3.1		
80	-2.4	-1.5	-1.3	-2.1		
100	-0.5	0.9	0.3	-0.5		
125	13.6	13.7	12.3	11.6		
160	29.4	29.5	29.4	27.7		
200	9.0	6.3	7.7	7.1		
250	14.7	12.9	11.9	11.8		
315	26.9	23.4	21.4	18.1		
400	24.3	21.1	21.6	19.2		
500	33.5	29.5	27.5	21.3		
630	33.2	30.1	28.8	27.5		
800	31.9	30.4	30.4	30.5		
1000	35.4	34.8	35.1	32.7		
1250	37.0	36.2	32.5	31.7		
1600	39.7	38.3	37.2	35.7		
2000	37.8	38.0	35.9	37.0		
2500	34.6	34.6	34.1	34.0		
3150	36.7	36.3	35.7	34.1		
4000	40.1	39.3	37.8	35.6		
5000	40.8	39.3	37.5	34.8		





Application area

Operation in dry, interior rooms at ambient temperatures of 5 to 40 °C (non-condensing). The floor air diffuser has been developed for use in locations where the prevailing air quality is typical of offices in terms of dust levels and corrosive/oily constituents.



Kiefer Klimatechnik GmbH accepts no liability for damage resulting from incorrect use. Deviating operating conditions require written approval from the manufacturer.

INDULFLOOR installation with access panel

The floor air diffuser is supplied with an accessible panel to allow for a defined and simple interface to the raised floor. The floor covering can be attached to the panel. The height of the panel is adjusted to the project and to the thickness of the floor covering during manufacturing.

The floor air diffuser has 4 height-adjustable feet with accompanying locknuts for adjustment to installation tolerances. The precise setting can be found on page 21.

There are two impact-noise decoupled fixing tabs on the feet facing the room side, so that the floor air diffuser can be secured against moving.

The innovative mechanism for air flow rate and discharge setting is locked for transport with a screw on the air diffuser profile. This is done in the factory. This screw must be removed at the time of commissioning or after adjusting the feet so that the air flow rate of the floor air diffuser can be set.





Installation example, INDULFLOOR with access panel



Installing and connecting the floor air diffuser

The floor air diffuser may only be installed once the unit has been properly stabilised and/or all feet on the unit supported.

Aligning and connecting the air diffuser

- Level the floor air diffuser using the adjustable feet and tighten the locknut.
- Fix the mounting tabs to the floor with screws to prevent slipping. The screws and dowels for floor attachment are not included in the standard delivery!
- Do not remove the protective film from the air connection socket until just before connection of the air duct, so as to prevent soiling of the unit.



Note! The air diffuser must be connected via a straight air duct with a length of at least 335 mm!

Connect the connection pipe to the air connection socket and seal, e.g. with cold-shrink tape.



Note!

Material damage due to external soiling! The wooden board (on the grid frame) and the dust protection film may only be removed when:

- It has been ensured that all dust-generating work in the room has been completed.
- > The floor around the air diffuser has been cleaned.
- ▶ The air discharge grille has been inserted.



Caution! Risk of injury due to sharp sheet metal edges. Wear protective gloves.



Setting the height-adjustable feet of the floor air diffuser

1. The height-adjustable feet can be set in a range from 0 to 50 mm. Start by undoing the locknut (SW 13).



2. The height can then be adjusted using an Allen key (SW 6). Afterwards, tighten the locknut again.



3. Finally, secure the fixing tabs to the floor.





Band mounting

With the optionally available connecting elements and screws, the floor air diffusers can be connected flush to form a continuous band. This allows for a continuous grille effect.

Installation in bands can be accomplished via two or more floor air diffusers. The optional linear grille spacer will also be supplied in that case. To mount the connection plate, the end bracket must be removed via two screws. The connection plate can then be screwed on.

1. Remove the frontal end bracket.



2. Screw on the connection plate using the previously removed screws.



3. Position the linear grille spacer on the connection plate.





Checking the design pressure and subsequent air flow rate and discharge setting

A room-side pressure measurement nipple allows for pressure and air flow rate recording on site. A supply air rate can be read off from the graph with the measured pressure signal and the scale on the air diffuser.

Checking the design pressure

On the side of the linear grille there is a pressure measurement nipple accessible from the room, which allows the precharge pressure in the plenum box to be measured or checked.



Measurement of the static design pressure at the pressure measurement nipple



Procedure for subsequent air flow rate and discharge setting based on characteristic diagram

The air flow rate and discharge are adjusted using a slide damper that can be accessed from the room. The slider can be set manually to the required air flow rate with the aid of a screwdriver. The scale runs from 1 to 12 (air flow rate from small to large). As the scale increases, the free cross-section and air flow rate increase. A kinematic system is integrated into the air diffuser, with which the air flow rate is simultaneously adjusted by means of an acoustically effective throttle element when the slide valve is adjusted at the air diffuser. The discharge setting changes automatically.

If the air flow rate per diffuser and the pressure drop in the line are known, the scale setting can be read off from the characteristic diagram.

The position of the slider can then be set to the required scale (in this example: 4) from the room with the aid of a flatpoint screwdriver, to achieve the required air flow of 60 m³/h per diffuser, at a line pressure of 45 Pa. Please see the images of scale setting on the following page.





Example of correct slider setting



 \checkmark

The cut-out with which the slider is moved with the aid of a screwdriver is also a setting reference for the air flow rate. For the correct air flow rate setting – in this case scale 4 – the left-hand edge of the cut-out (from the viewing direction of the number scale) must be moved flush with the required scale position.



X

This figure shows an <u>incorrectly</u> positioned slider on scale 4 - the left cut-out edge and scale position 4 are not flush.



Warning! Risk of injury due to sharp sheet metal edges. Wear protective gloves.

MAINTENANCE, CLEANING AND HYGIENE





Note!

A distinction is made between different qualification levels in the cleaning work specified below. Cleaning work may be carried out by trained cleaning personnel if all safety measures and precautions are assured by technical personnel with appropriate qualifications. Local and company safety regulations must be observed, together with the specifications in this operating manual, when carrying out any work on the unit and in its vicinity.

INDULFLOOR type floor air diffusers comply with VDI 6022 (2022) and are largely maintenance-free. As part of cleaning, air conducting elements should be checked for soiling or deposits at regular intervals and cleaned with commercially available cleaning agents.

The floor trough of the air diffuser can be cleaned by simply removing the linear grille, the perforated metal plate and the air diffuser profile.

Installing the discharge profile







Note!

When reinserting the air diffuser profile, make sure to thread the adjustment lever (3) into the designated tab (5).

SAFETY



General Information

This manual is intended to ensure the safe use of the floor air diffuser. Before commencing work, personnel must have read and understood this manual. Compliance with all the specified safety instructions and handling guidelines in this manual is required to ensure that work on the floor air diffuser can be carried out safely.

In addition, the local occupational health and safety regulations and general safety provisions for the area of application of the floor air diffuser apply. The figures provided in this manual may differ from the actual design if useful to illustrate operation and ensure basic understanding of the floor air diffuser. There may be minor differences between the floor air diffuser supplied and this manual as constant further developments or project-specific adjustments are reserved.

Assembly, installation, maintenance and dismounting may only be carried out by trained personnel. It must be ensured that all such work is performed reliably and safely. The local safety regulations must be observed.

Explanation of symbols and notes



This symbol can be found in all occupational safety instructions in this operating manual where there is a danger to life and limb. These instructions must be observed and require that work be performed with utmost caution. Occupational safety instructions must be passed on to users. Apart from the instructions in this operating manual, the generally applicable safety and accident prevention regulations must also be observed.



Topics in the operating manual which are particularly relevant and require special attention for reasons of safety and service life of the unit. Directives, regulations and instructions must be complied with here. Examples of such topics include damage to the unit or building services.



Risk of cuts!

Here you will find special information, instructions and prohibitions designed to prevent personal injury due to the risk of cuts from sheet metal. Indicator of a danger due to sharp edges.



General mandatory action sign for occupational safety and accident prevention. Compliance is compulsory due to various residual risks. Examples include wearing protective gloves, protective goggles and safety helmets.



General mandatory action sign indicating that a certain behaviour is required.

TRANSPORT INSTRUCTIONS, DELIVERY



AND STORAGE

Transport instructions and delivery

The floor air diffuser is delivered in sturdy transport packaging or on one-way pallets, shrink-wrapped and secured with plastic or metal bands.

Storage/inbound delivery

The recipient must check the floor air diffuser for damage immediately upon inbound delivery and this must be recorded on the delivery note if necessary. The haulier and the relevant contractual partner must be notified immediately if any damage is discovered or any parts on the delivery note are missing. Subsequent complaints cannot be considered.

Packaged products must be transported and stored as follows:

- Fully protected from weather conditions and humidity/moisture, i.e. do not keep or store products outdoors
- ► Transport and store products in dry, dust-free ambient conditions
- > Do not expose products to corrosive or aggressive media
- Protect products from direct sunlight

In order to prevent contamination of and damage to the unit, the packaging and protective film (if present) must not be removed until immediately before commissioning and/or connection.

Note:

Moisture and temperature effects can cause the dimensions of the material to change. We recommend storing the cardboard boxes for 2 to 3 days in the room where they will be used.



The cardboard packaging and protective films serve to protect the unit from dirt and damage and must not be removed during the construction phase! The manufacturer accepts no liability for soiling of or damage to the unit.

Disposal, environmental protection and recycling

All products are packaged carefully in environmentally friendly materials. The packaging material must be disposed of in accordance with local regulations.



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