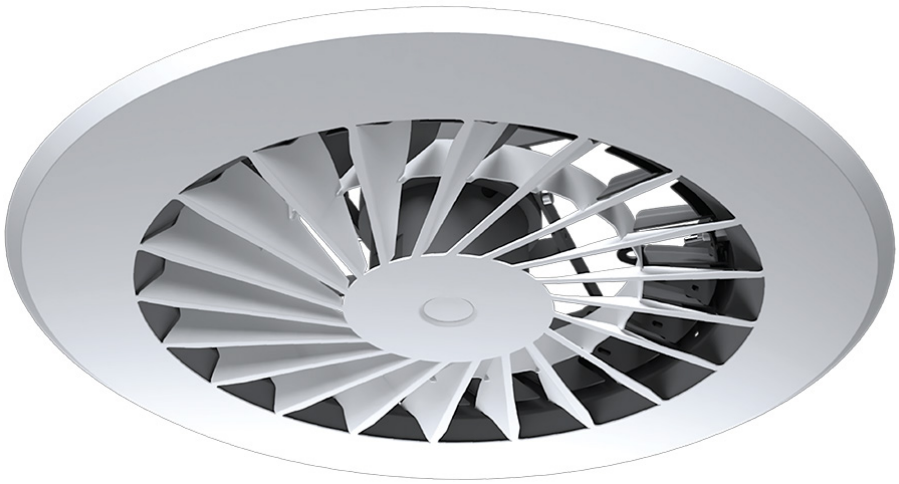
HSC-AD ADJUSTABLE SWIRL

ADJUSTABLE HELICAL SWIRL DIFFUSER



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HSC-AD ADJUSTABLE SWIRL

DESCRIPTION

The Adjustable Helical Swirl Diffuser, type HSC-AD, is a low profile diffuser that produces highly inductive swirl discharge of the supply air, diffusing the swirling air stream with adjustable horizontal-to-vertical discharge direction and strong mixing characteristics into the space. High levels of draught-free cooling and efficient heating from elevated discharge heights to floor level are achieved from the patent pending design.

The cambered leading edges of the twenty off-set radial vanes reduce both the sound power level and pressure drop, improving aural comfort and saving fan energy. Geometric twist of the helical vane tips provides increased downward penetration when heating and reduces the minimum permissible airflow rate of the diffuser when cooling. The pressure drop of the diffuser is substantially constant across the full range of airflow direction adjustment, ensuring stable HVAC system and fan operation regardless of discharge direction.

The HSC-AD diffuser may be flush mounted in a ceiling or freely suspended (ie no Coanda attachment to the ceiling required). The recommended discharge height is 2.5 to 15 m.

The maximum recommended differential between supply air and room air is -13 K when discharging horizontally in cooling mode, and up to +15 K when discharging downwards in heating mode, depending on airflow rate and discharge height. Discharge direction adjustment may be manual, electric or by thermal wax element (ie no controls or wiring required - refer to figure 3). The HSC-AD swirl vanes form a flush surface with the surrounding flat diffuser face, which may be square (available up to neck size DN500 only) or round (figures 1 & 2).

Figure 1

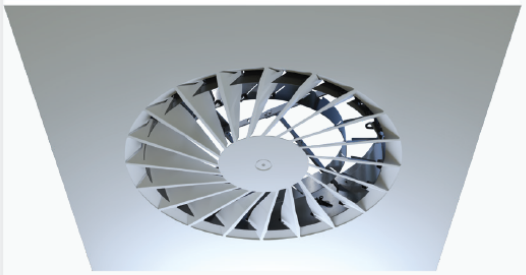

Figure 2

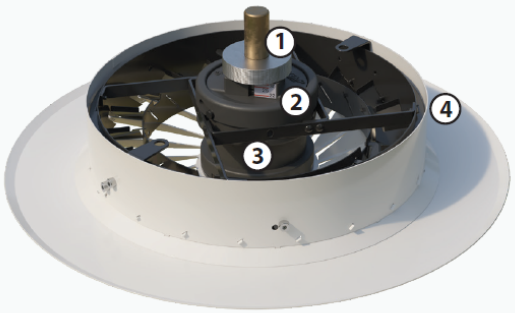

Figure 3

1 - Thermal element
2 - Temperature bias adjustment
3 - Control module
4 - Low profile height

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The diffuser is made of powder coated sheet-metal and is available with nominal neck diameters of 250 mm, 355 mm, 400 mm, 500 mm, 630 mm, 710 mm and 1000 mm.

For a given total pressure, the diffuser airflow rate approximately halves for each reduction in neck size. Excepting for sizes DN400 and DN630, each diffuser size is available with an optional reducer and reduced guide ring (refer to figure 1) to decrease the airflow rate by approximately 20% at a given pressure.

Mode of Operation

The highly inductive swirl discharge from the HSC-AD intensely entrains secondary air from the room into the supply air stream, thereby strongly increasing the supply air stream mass flow rate, producing rapid discharge velocity decay. As a result, at any given airflow rate, the HSC-AD swirl diffuser is suitable both for long throws (due to the high mass flow rate of the supply air stream) as well as short throws (due to the air stream's low velocity) making it an extremely adaptable diffuser. Strong dilution of the supply air stream provides rapid supply air stream temperature equalisation – and hence density equalisation – with room air, preventing cold air dumping. Low velocity air motion with uniform temperature distribution is achieved, producing high levels of thermal comfort (no cold and draughty or hot and stagnant spots).

The HSC-AD swirl diffuser's patent pending adjustable discharge direction design allows stepless discharge direction adjustment between horizontal and vertical, achieving high induction swirl discharge even in heating mode - at a substantially constant low pressure drop.

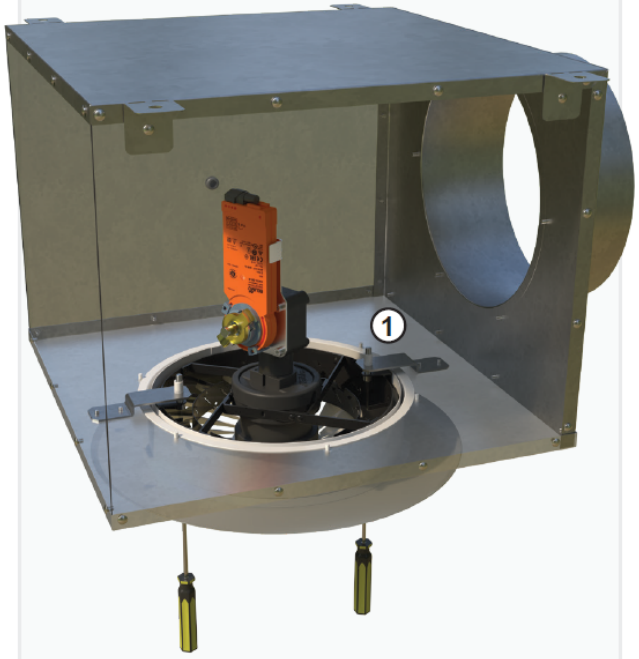


Figure 4 - Installation of an HSC-AD (shown with electric adjustment) into a plenum box using 2pcs M6 bolts (1) accessible through the diffuser face. Suitable for sizes DN250-DN500 with electric, thermal or manual adjustment.

Figure 5 - Installation of a manually adjustable HSC-AD into a plenum box using a central M6 threaded rod (2) with decorative cap. Suitable for sizes DN250-DN500 with manual adjustment only.

This ensures highly efficient low velocity and gust-free operation when heating, directing the strongly diluted, gently swirling supply air stream downwards over considerable discharge heights. Uniform temperature distribution of the warm, low velocity supply air is achieved. The constant pressure characteristics of the diffuser across the full range of discharge direction adjustment ensure not only that airflow rates, and hence system airflow balancing, remain constant but that fan surging is avoided regardless of discharge direction adjustment, contributing to precise thermostatic control and stable HVAC system operation year round.

Discharge direction may be adjusted manually, electrically or thermally. The latter is self-acting via a thermal element mechanism that includes maximum heating bias adjustment from 22°C to 30°C (figure 3). The electrical and thermal actuators (figure 4 & 6) are interchangable attachments to a common control module (figure 3). The diffuser without the control module offers manual adjustment only through the diffuser face, which may be realised through the diffuser face.

Installation of diffusers with manual, thermal or electrical adjustment:

Into plenum box: Diffusers may be mounted into a plenum box (figure 4) via two M6 bolts inserted through the diffuser face into two mounting brackets inside the diffuser neck. The bolts are then fastened to 2 plenum brackets (by others) located in accordance with dimension ***F*** (Dimensions table, page 4)

Into round duct: As described above, but the 2 bolts are to be fasted to a mounting bracket (available as an accessory for prior installation into the duct) instead of to 2 plenum brackets.

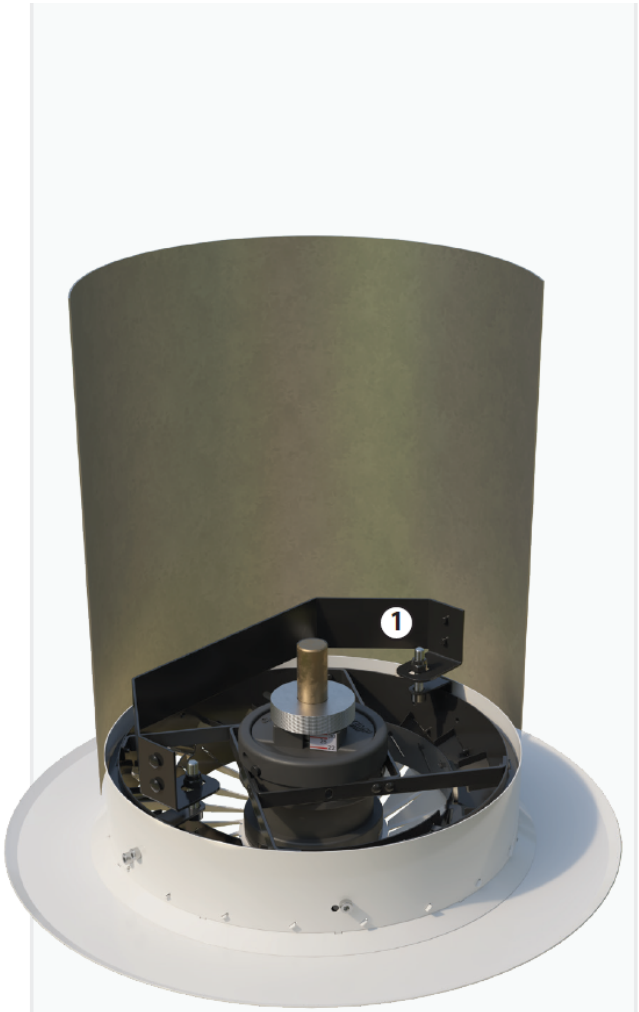


Figure 6 - Installation of an HSC-AD (shown with thermal element) into a round duct with mounting bracket (1) using 2pcs M6 bolts accessible through the diffuser face. Suitable for sizes DN250-DN500 with electric, thermal or manual adjustment.

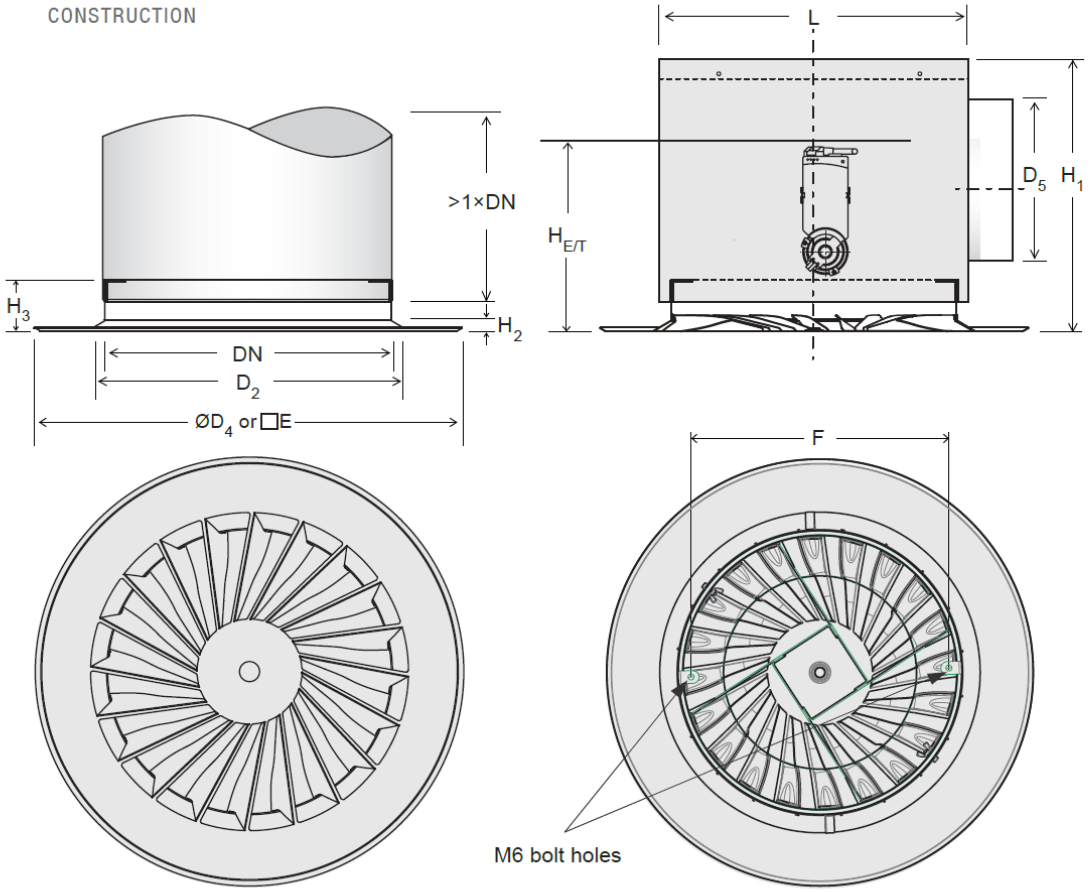
Installation of diffusers with manual adjustment:

Into plenum box or round duct: As an alternative to the method described in the previous paragraph, diffusers without a control module (i.e. manually adjustable diffusers - figure 5), may be installed via a central fixing bolt attached to a cross bar or traverse (both by others) located in the connection box or duct.

HSC-AD ADJUSTABLE SWIRL

TECHNICAL DATA

CONSTRUCTION



DIMENSIONS

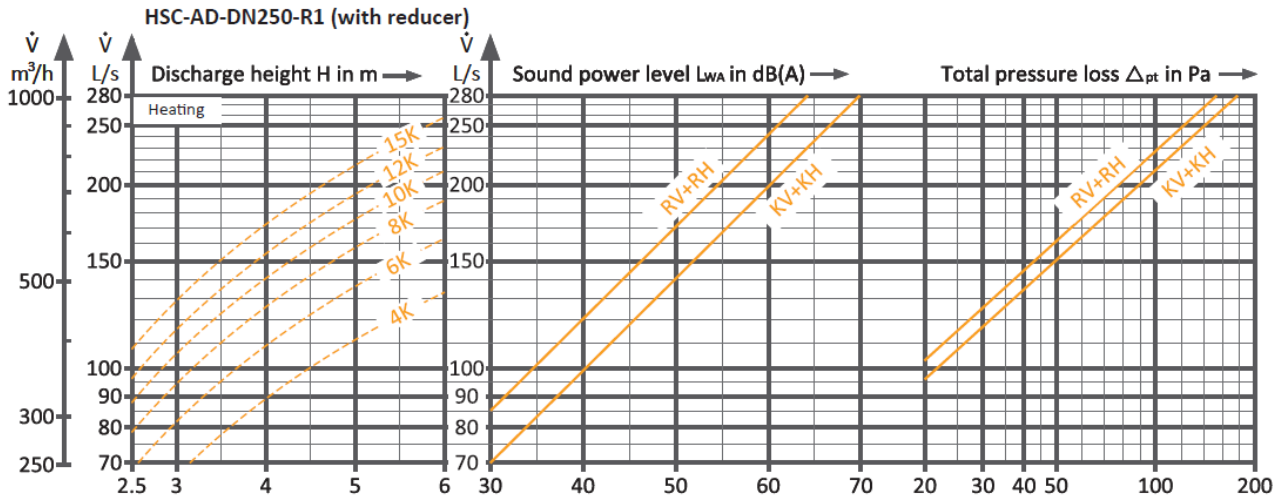
	D_2	D_4	E	D_5	L	H_1	H_2	H_3	H_E	H_T	F
DN250	270	375*	295,595	249	425	400	14	60	269	128	200
DN355	395	530*	445,595,603	354	495	550	20	80	269	128	320
DN400	447	600	595,603	399	595	590	19	84	269	128	365
DN500	560	750*	595,603	499	695	690	28	100	269	128	465
DN630	703	900	-	628	795	990	32	217	217	258	540
DN710	793	1000	-	708	850	1050	32	240	240	272	550
DN1000*	1110	1420	-	-	-	-	37	300	298	337	640

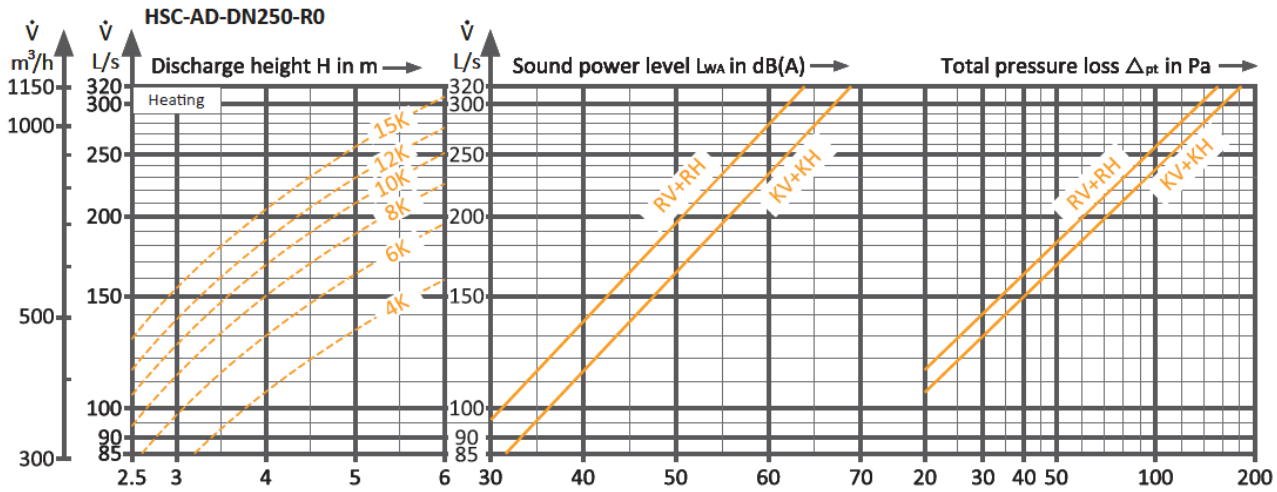
*Not available in Asia-Pacific

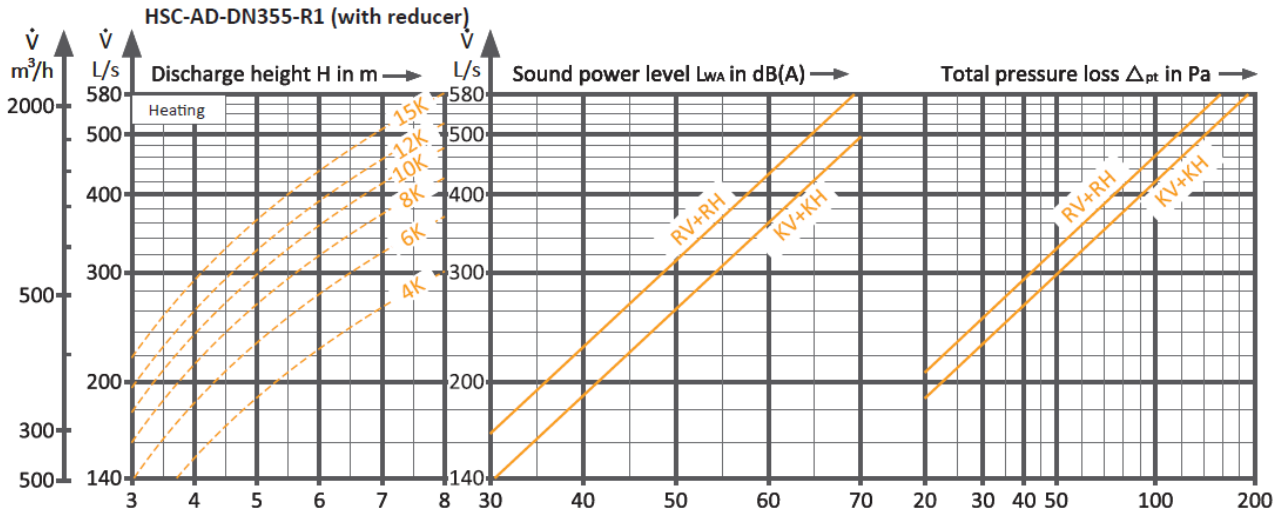
H_2 - Height of bellmouth
H_E - Height of diffuser including electric actutor (incl cable connection)
H_T - Height of diffuser including thermal actutor
F - Distance between holes of mounting bracket

HSC-AD ADJUSTABLE SWIRL

Quick selection guide. Refer to the online selection tool for detailed selections.







Notes:

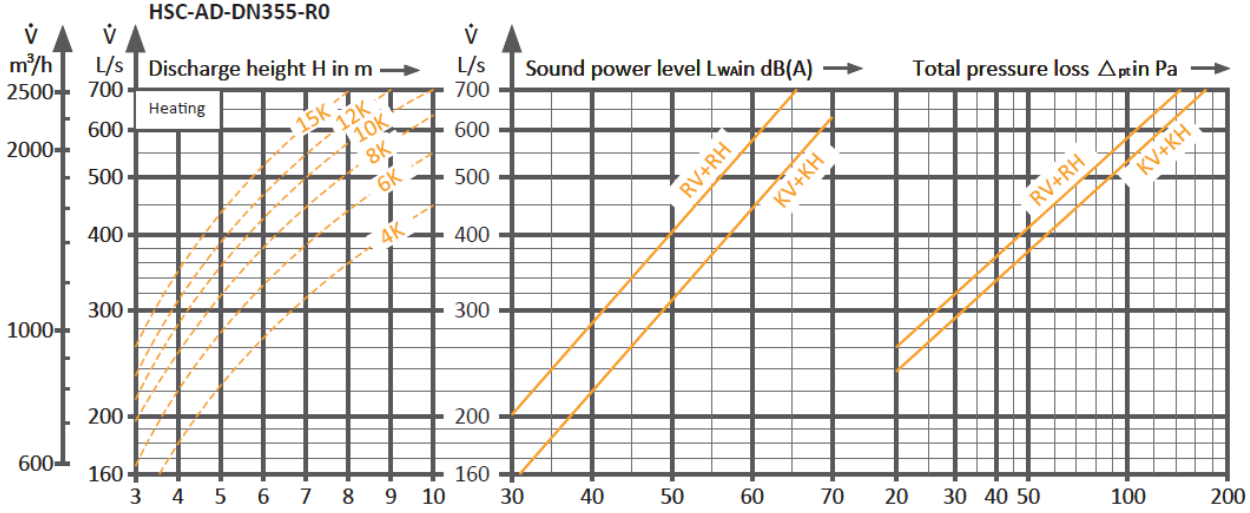
R = Round duct connection
K = Connection box
H = Horizontal discharge
V = Vertical discharge

For non-acoustically lined connection boxes, add 2 dB(A)

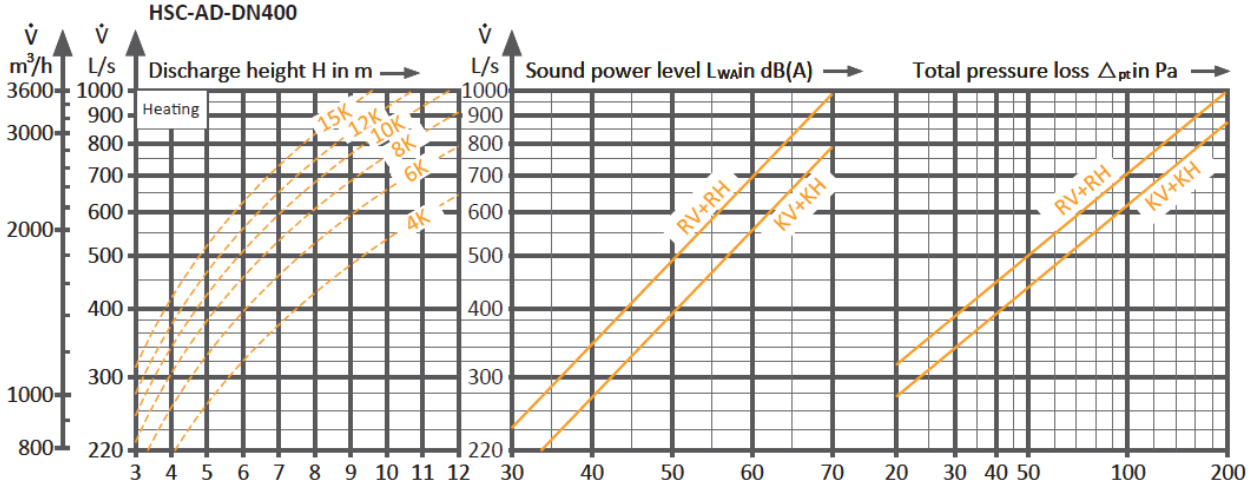
HSC-AD ADJUSTABLE SWIRL

Quick selection guide. Refer to the online selection tool for detailed selections.

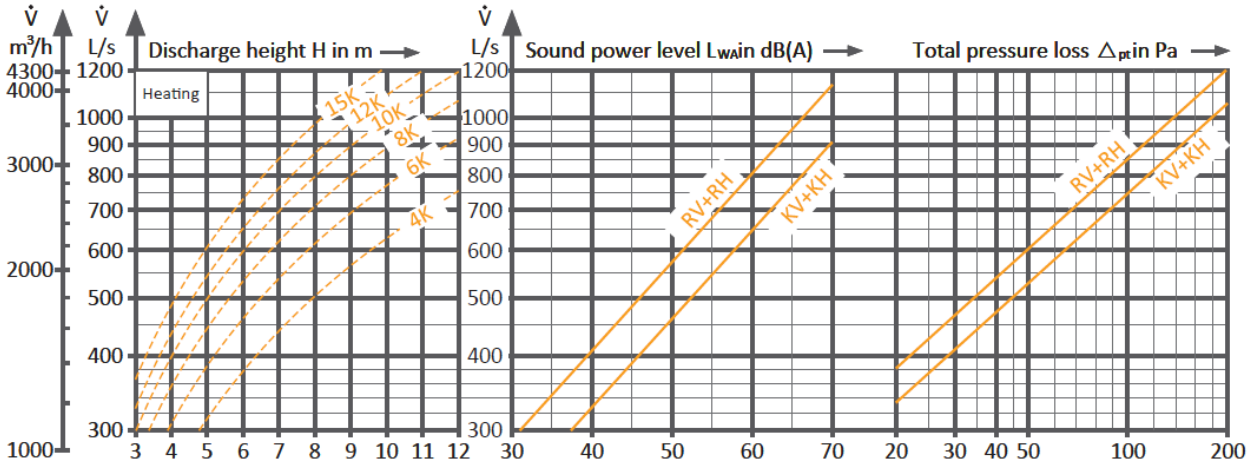
HSC-AD-DN355-R0



HSC-AD-DN400



HSC-AD-DN500-R1 (with reducer)



Notes:

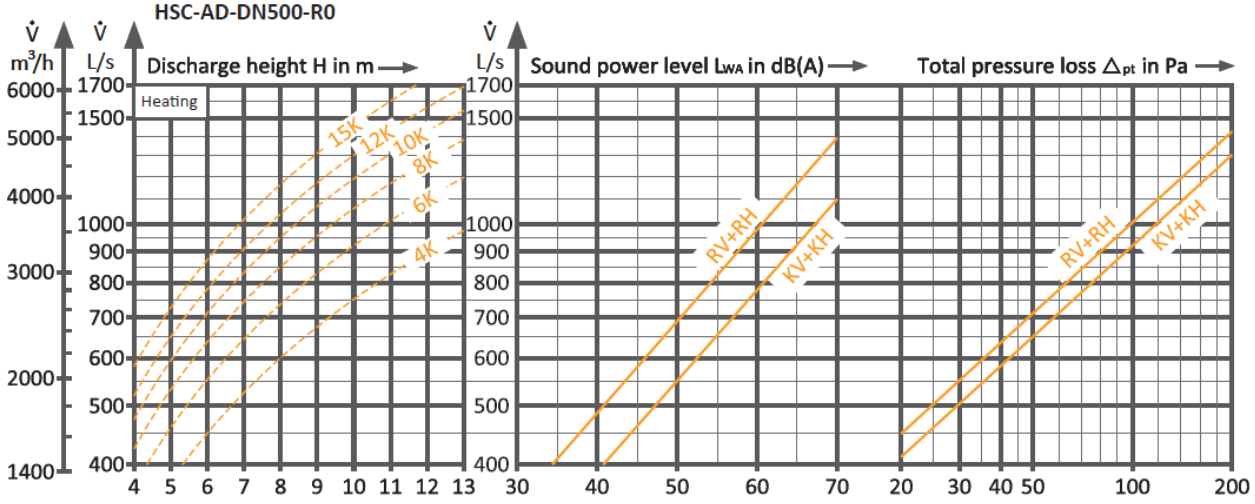
R = Round duct connection
K = Connection box
H = Horizontal discharge
V = Vertical discharge

For non acoustically lined connection boxes, add 2 dB(A)

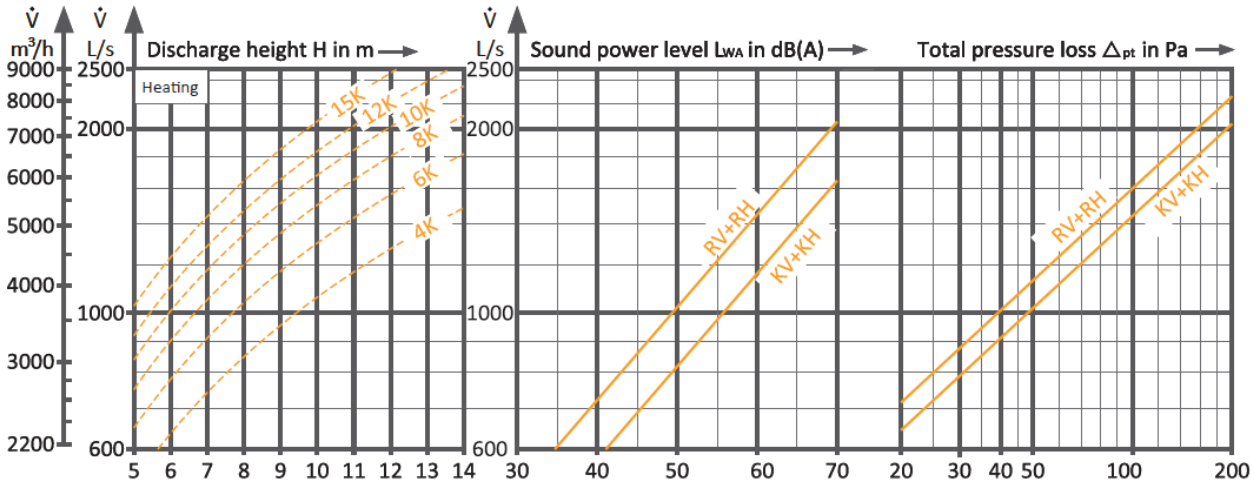
HSC-AD ADJUSTABLE SWIRL

Quick selection guide. Refer to the online selection tool for detailed selections.

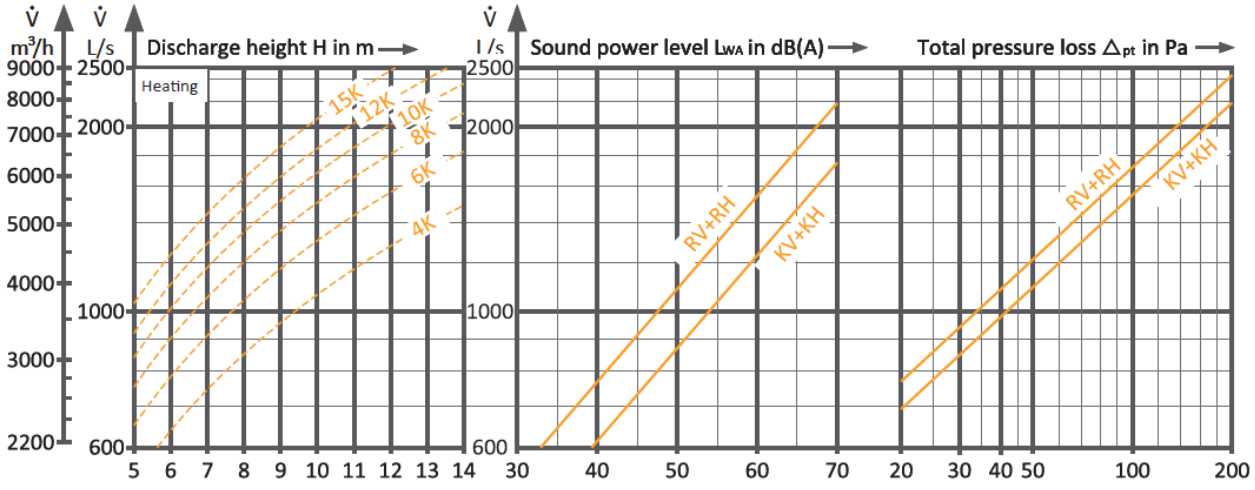
HSC-AD-DN500-R0



HSC-AD-DN630



HSC-AD-DN710-R1 (with reducer)

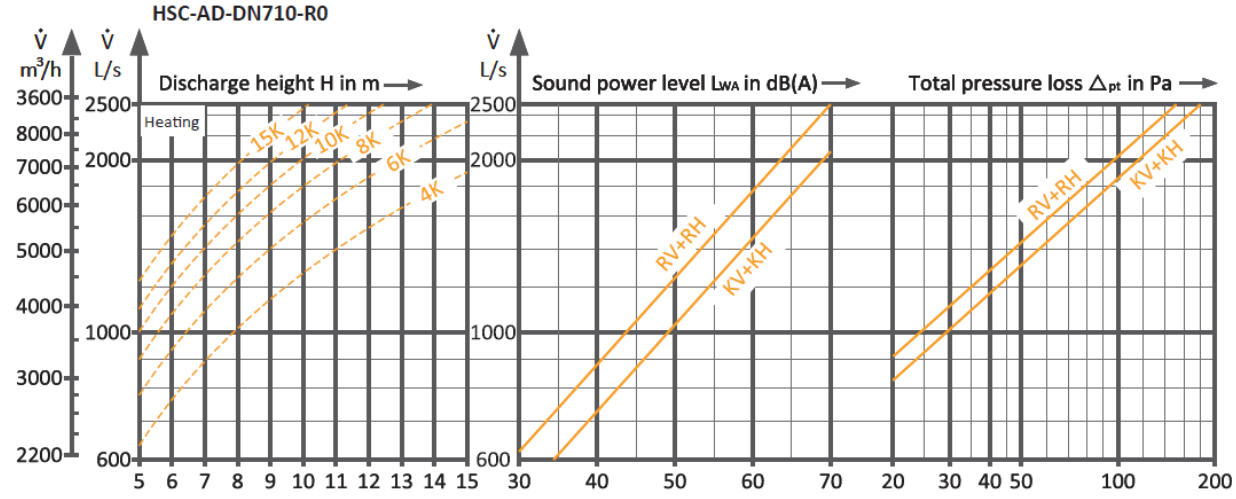


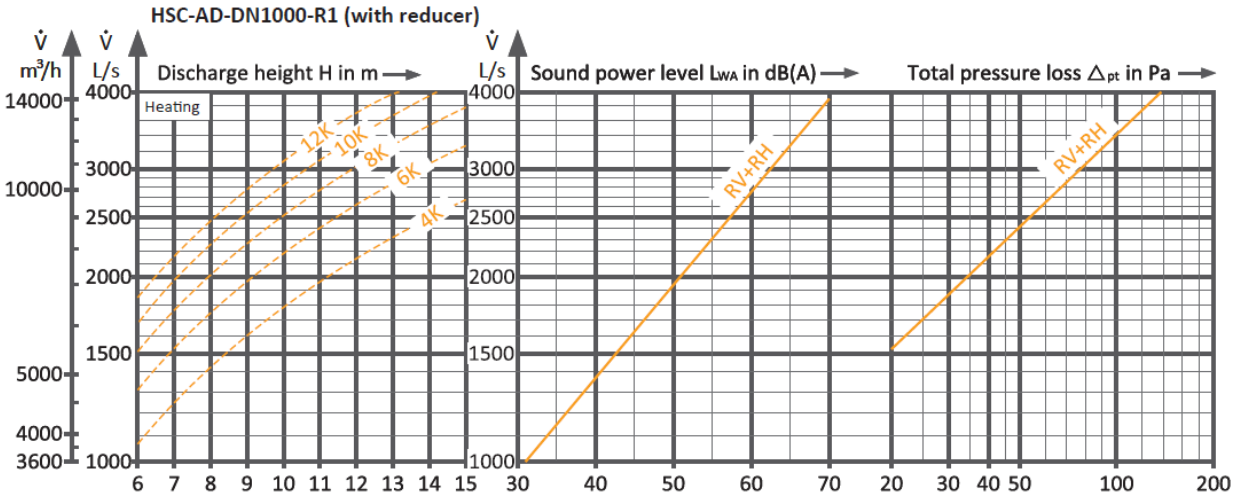
Notes:
R = Round duct connection
K = Connection box
H = Horizontal discharge
V = Vertical discharge

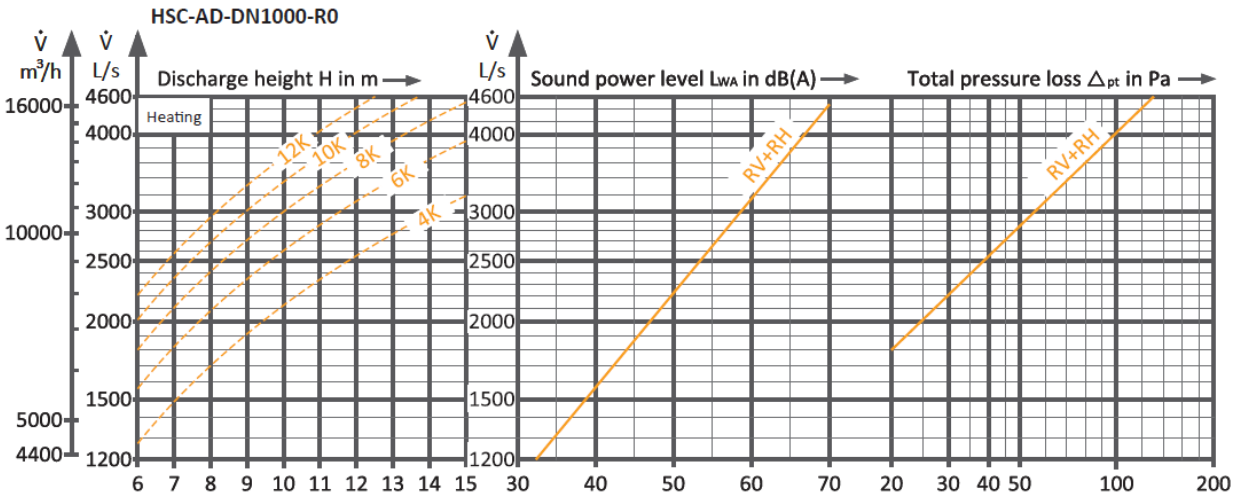
For non acoustically lined connection boxes, add 2 dB(A)

HSC-AD ADJUSTABLE SWIRL

Quick selection guide. Refer to the online selection tool for detailed selections.







Notes:
R = Round duct connection
H = Horizontal discharge
V = Vertical discharge

For non acoustically lined connection boxes, add 2 dB(A)

HSC-AD ADJUSTABLE SWIRL

Selection Tool

An HSC-AD selection tool is available at smartemp.com for detailed diffuser selections.

Air Diffusion Performance Index (ADPI)

The Air Diffusion Performance Index (ADPI) is a single number that rates the air diffusion performance of a system of diffusers operating in a space. ADPI is affected by such factors as diffuser type and location, airflow rates, heat loads and location, space geometry, etc. To determine ADPI, air velocity and air temperature measurements are made at four different heights at a multitude of locations throughout the occupied zone in accordance with ASHRAE Standard 113. For each measurement point, ADPI evaluates the combined effect of local velocity and temperature deviation from average room temperature to establish whether the threat of draught or stagnation exists at that point. The temperature deviation and air velocity effects are additive, so that an increased threat of draught exists at points where the air velocity is high and the local temperature is cooler than average; similarly, an increased threat of stagnation exists at points where the air velocity is low and the local temperature is higher than average. The percentage of points that pass the ADPI test (i.e. do not fail due to draught or stagnation) determines the ADPI percentage attained.

According to ASHRAE, for an office environment in cooling mode, the design goal should be an ADPI of 80%. The HSC-AD selection tool has a default ADPI setting of 90%. This is adjustable from 70% to 95%.

HSC-AD ADJUSTABLE SWIRL

FEATURES

- Diffuse airflow from swirl discharge with adjustable horizontal-to-vertical discharge direction for high thermal comfort from elevated discharge heights.
- Low profile height.
- 20 off-set radial vanes flush with horizontal diffuser face.
- Diffuser face may be square (up to neck size DN500 only) or circular.
- For installation substantially flush with suspended false ceiling or freely suspended.
- Vanes with cambered leading edges reduce noise and pressure drop.
- Geometrically twisted helical vane tips for increased downward discharge penetration and stable discharge patterns at reduced airflow rates.
- Internal adjustable guide ring with 20 geometrically twisted guide vanes for substantially constant low pressure discharge direction adjustment.
- Available in the following neck sizes: DN250; DN355; DN400; DN500; DN630; DN710; DN1000.
- Excepting for DN400 and DN630, each neck size is available with reducer and reducer guide ring to decrease airflow by approximately 20%.
- Discharge height: 2.5 m to 15 m.
- Minimum cooling (horizontal discharge): $\Delta T_{supply\text{-}room}$ = -13 K.
- Maximum heating (downward discharge): $\Delta T_{supply\text{-}room}$ = +15 K, dependent upon airflow rate and discharge height.
- Diffuser made of powder coated sheet-metal.
- Connection to duct or connection box via two threaded rod fasteners accessible through the diffuser face.
- Standard configuration without control module, to provide manual discharge direction adjustment only.
- Control module available with:
  - Electrical actuator kit (24 V or 230 V supply, with 3-point for 2-position control or 2-10 V for modulating control); or
  - Thermal element (with adjustable bias).

HSC-AD ADJUSTABLE SWIRL

ORDER DETAILS

HSC-AD-DN355-C-R0-M-RAL9003-0
(1) (2) (3) (4) (5) (6) (7)

(1) MODEL:
- Helical Swirl Ceiling - Adjustable Direction

(2) NOMINAL DIAMETER:
- DN250 = Nominal neck diameter 250 mm.
- DN355 = Nominal neck diameter 355 mm.
- DN400 = Nominal neck diameter 400 mm.
- DN500 = Nominal neck diameter 500 mm.
- DN630 = Nominal neck diameter 630 mm.
- DN710 = Nominal neck diameter 710 mm.
- DN1000** = Nominal neck diameter 1000 mm.

(3) FACE SHAPE:
- C* = Circular face with flush contact edge (4 mm / 30°) for closed false ceilings:
  - Ø 375 mm* for size DN250;
  - Ø 530 mm* for size DN355;
  - Ø 600 mm* for size DN400;
  - Ø 750 mm* for size DN500;
  - Ø 900 mm* for size DN630;
  - Ø 1000 mm* for size DN710;
  - Ø 1420 mm* for size DN1000.
- S = Square face with 90° turn-up for coffered ceilings (up to size DN500 only):
  - □295 mm* up to 595 mm for size DN250;
  - □595 mm* (□445 mm to □603 mm available) for size DN355;
  - □595 mm* to □603 mm for size DN500.

(4) REDUCER:
- 0* = No reducer for high airflows.
- 1 = Reducer for reduced airflows.

(5) ADJUSTMENT:
- M* = Manual adjustment only.
- E1 = With electric actuator 24V, 2-10V.
- E2 = With electric actuator 24V, 3-pt (2-position).
- E3 = With electric actuator 230V, 2-10V.
- E4 = With electric actuator 230V, 3-pt (2-position).
- T = With thermal actuator

(6) SURFACE FINISH:
- 9003* = Face powder coated to RAL9003 (Signal White).
- 9005 = Face powder coated to RAL9005 (Jet Black).
- 9006 = Face powder coated to RAL9006 (Aluminium).
- _____= Face powder coated to RAL ___ .

(7) ACCESSORIES:
- 0* - Diffuser only
- K - With uninsulated connection box
- B - With mounting bracket for round duct installation

Note:
* Standard, if no type code entered.
** Not available in Asia-Pacific

Products supplied may differ slightly from those described in this technical brochure due to on-going product development.

HSC-AD ADJUSTABLE SWIRL

TENDER TEXT

Furnish and install type HSC-AD Adjustable Helical Swirl Diffusers to provide diffuse airflow with adjustable horizontal-to-vertical discharge direction for high thermal comfort from elevated discharge heights. Each diffuser is to be made of powder coated steel and shall include 20 off-set radial vanes flush with the horizontal diffuser face. The diffuser face is to be square (up to neck size DN500 only) or circular, as specified. The diffuser is to be installed substantially flush with the suspended false ceiling or freely suspended, as specified.

Swirl vanes are to include cambered leading edges for reduced noise and pressure drop, and the helical swirl vane tips are each to incorporate a geometric twist for increased downward discharge penetration and reduced minimum airflow rates. An internal adjustable guide ring with 20 geometrically twisted guide vanes is to provide constant pressure discharge direction adjustment.

The guide ring is to be adjusted manually, electrically or thermally, as specified and in accordance with our guidelines. The latter two each attach as a kit to an included control module, which is optionally available for manual adjustment. Diffuser neck size is to be DN250, DN355, DN500 or DN710, as required. The diffuser is to incorporate the optional reducer and reduced guide ring, where appropriate. Diffuser discharge height of 2.5 to 15 m to be in accordance with our recommendations for the duty required.

Cooling with horizontal discharge direction to be at no less than $\Delta T_{supply\text{-}room}$ = -13 K. For heating applications, provide downward discharge and control maximum $\Delta T_{supply\text{-}room}$ not to exceed the maximum permissible heating temperature differential prescribed for the selected diffuser, airflow rate and discharge height.

Where specified, each diffuser is to be connected to a side-entry sheet-metal connections box, internally insulated where indicated, fabricated in accordance with our recommendations. Alternatively, each diffuser is to be connected to a vertical duct of internal diameter equal to the diffuser DN size and at least one duct diameter in length.