PRODUCT BROCHURE

SMARTEMP® IN COMFORT

Wall Swirl Diffuser

CSW-AD

Optional Feature:
Constant throw VAV

DESCRIPTION

The SMARTEMP® Wall Swirl Diffuser, type CSW-AD (figure 1), is a highly inductive sideblow swirl diffuser that supplies large volume flow rates of air over large horizontal throws in voluminous spaces – from sidewalls, bulkheads, columns or ducts in such applications as exhibition centres, convention halls, airports, shopping malls and factories.

Diffuser throw may be pre-set in the factory or is adjustable in steps via simple accessories. Discharge direction is adjustable in up to two planes: left-right adjustment to permit the air stream to be directed manually up to 30° left or right from the diffuser central access; and manual, thermal or electric up-down adjustment by up to 30° from the central access to allow draught-free cooling and efficient heating, and to suit fluctuating loads.

Substantial fan energy savings may be realised by an optional electrically operated variable air volume (VAV) damper accessory that allows diffuser airflow to be reduced, typically to about 40%, in times of low demand whilst maintaining largely constant horizontal throw length. This option is available for size DN630 only.

The central jet of the CSW-AD directs the discharged air stream over long throws, whilst the surrounding swirl pattern strongly decelerates the primary air stream velocity, reducing draught risk and improving comfort. This is because highly inductive swirl discharge induces large quantities of room air into the supply air stream, bringing about rapid discharge velocity decay, as well as rapidly equalising supply air stream temperature with room air temperature. This reduces air stream trajectory deviation due to temperature differences and achieves uniform temperature and velocity distribution in the space without creating draughts.

CSW diffusers equipped with the motorised VAV option (figure 1; available for size DN630 only) maintain largely constant horizontal throw over a wide range of airflow rates supplied to the diffusers at substantially constant pressure. This allows significant fan energy savings to be achieved during periods of low thermal load.

The motorised VAV option also allows system airflow to be reduced during pre-occupancy heating, thereby often allowing return air ducts and dampers to be sized for substantially less than 100% airflow and allowing energy savings to be achieved during the warm-up phase.

The VAV option without motor (ie manually adjustable when commissioning) allows a multitude of diffusers of differing duty to all be of the same size. This is due to the ability to set each diffuser' s airflow rate and throw. This often enables a uniform aesthetic to be achieved in the space.

The CSW diffuser may be largely flush mounted to the surface that it discharges from, as discharge direction adjustment is achieved by altering the direction of vanes within the diffuser central jet, not by altering or swivelling the direction of the entire diffuser assembly. The CSW diffuser's electrical actuators or thermal elements are hidden from view, thereby further ensuring a pleasant aesthetic.

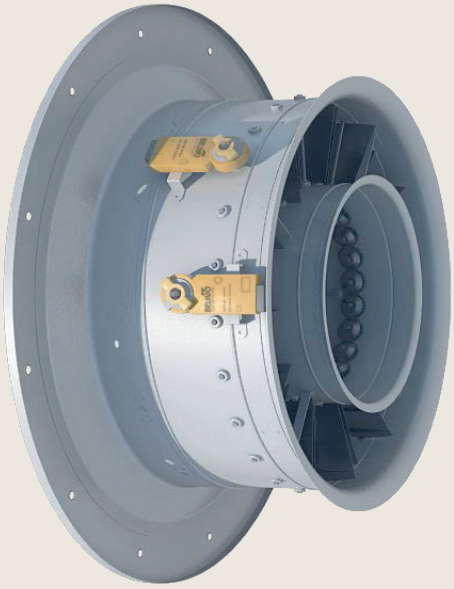


Figure 1

CONSTRUCTION

In its standard configuration (figure 2), the CSW diffuser comprises an outer cylinder (1), flared exit (2), guide ring (3), swirl vanes (4), core tube (5) and horizontal vanes (6). Diffuser sizes DN500 and DN630 are installed with twelve mounting bolts (7), each with a flat cap of the same colour as the diffuser, to the duct or plenum wall. Sizes DN355 and DN400 are mounted with brackets (8) into the duct.

An optional variable air volume (VAV) damper (size DN630 only) housed within the outer cylinder may be driven by an electric actuator (9). Additionally, an electric actuator or a self-acting thermal actuator (not shown) may adjust the horizontal vanes, and hence diffuser discharge direction, up (cooling) and down (heating) by up to 30º from the diffuser central axis. Optional vertical vanes (not shown) may manually adjust the diffuser discharge direction left or right by up to 30º from the diffuser central axis.

In its standard throw configuration "L" , the CSW is set to provide long throws; in this configuration, the optional VAV dampers (size DN630 only), when operating at constant total pressure, can turn the diffuser airflow rate down from 100% to approximately 40% whilst maintaining constant horizontal throw.

Two optional throw configurations are offered: "M" for medium throws, which, at the same airflow rate, equates to approximately 80% of the throws from the "L" configuration; and "S" for short throws, equating to approximately 60% of the throws from the "L" configuration.

In these two cases, the optional VAV dampers (size DN630 only), when operating at constant total pressure, can turn the diffuser airflow rate down from 100% to approximately 30% and 25%, respectively, whilst maintaining constant horizontal throw.

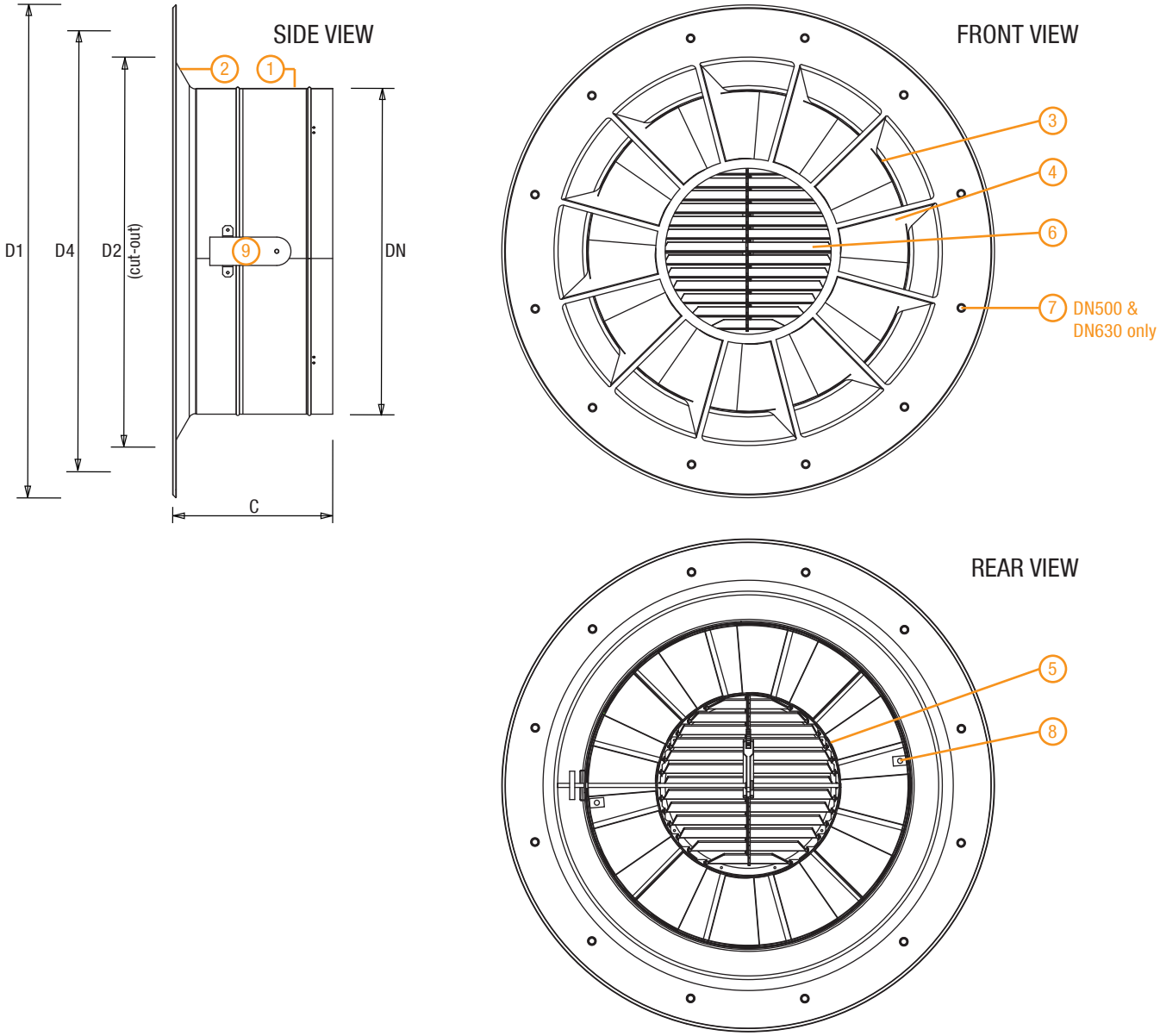


Figure 2

DIMENSIONS

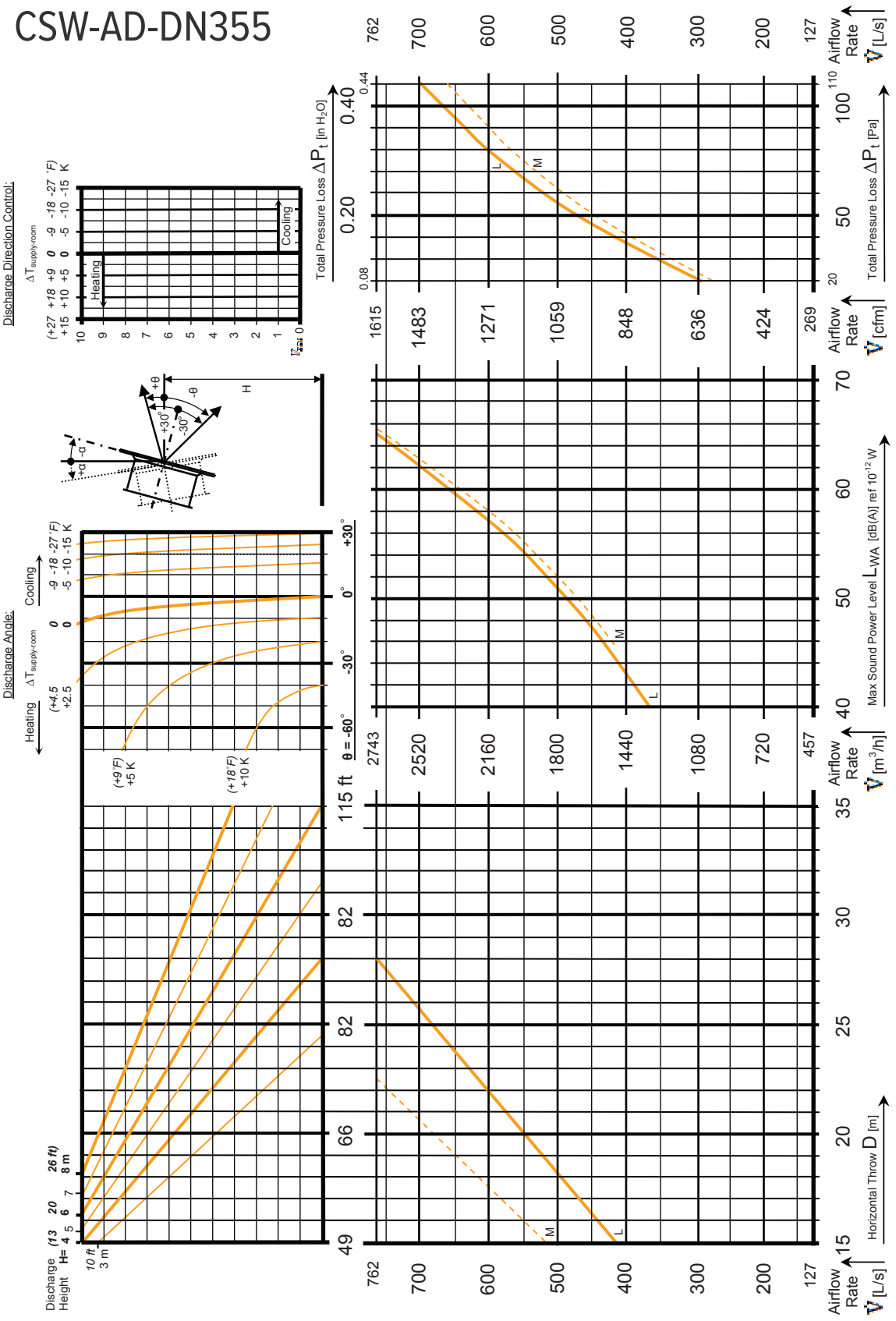
(mm)	C	D1	D4	D2
DN355	203	533	-	430
DN400	229	600	-	485
DN500	286	750	679	605
DN630	360	945	856	745

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

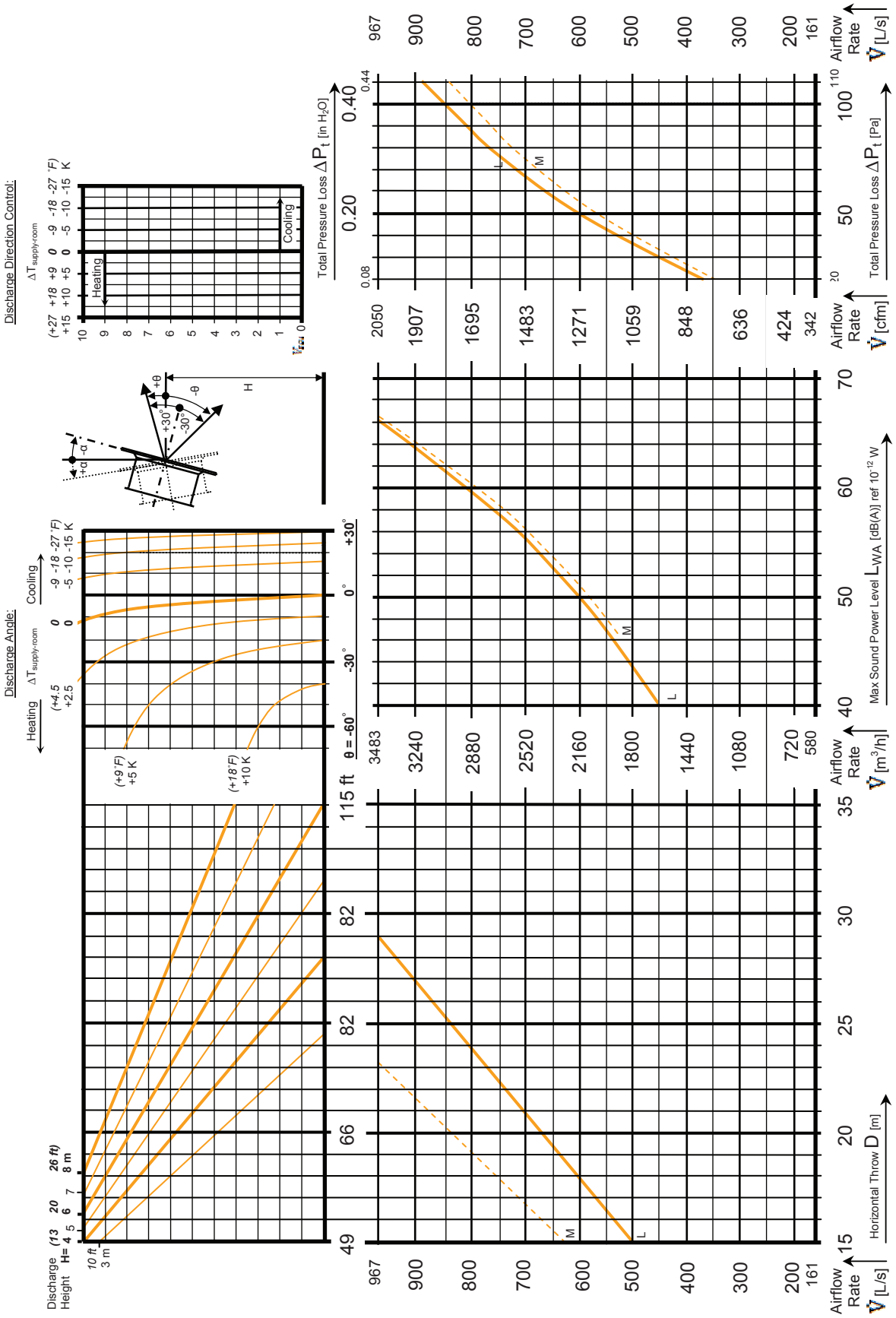
PERFORMANCE SUMMARY

Airflow Rate:	Size DN630: 400 L/s to 2400 L/s
Horizontal Throw:	Size DN630: 15 m to 35 m
Up/down Adjustment:	± 30° from diffuser central axis, manual adjustment standard (electric or thermal element optional)
Left/right Adjustment:	Optional ± 30° manual adjustment from diffuser central axis
VAV Adjustment:	Optional VAV dampers for turndown to less than 40%, optionally with electric actuator DN630 only
Discharge Height:	3 m to 8 m
Temperature Differential:	Cooling: ≤ -15 K Heating: ≤ +10 K
Spacing:	The minimum centre-line spacing between two diffusers is 3 • DN

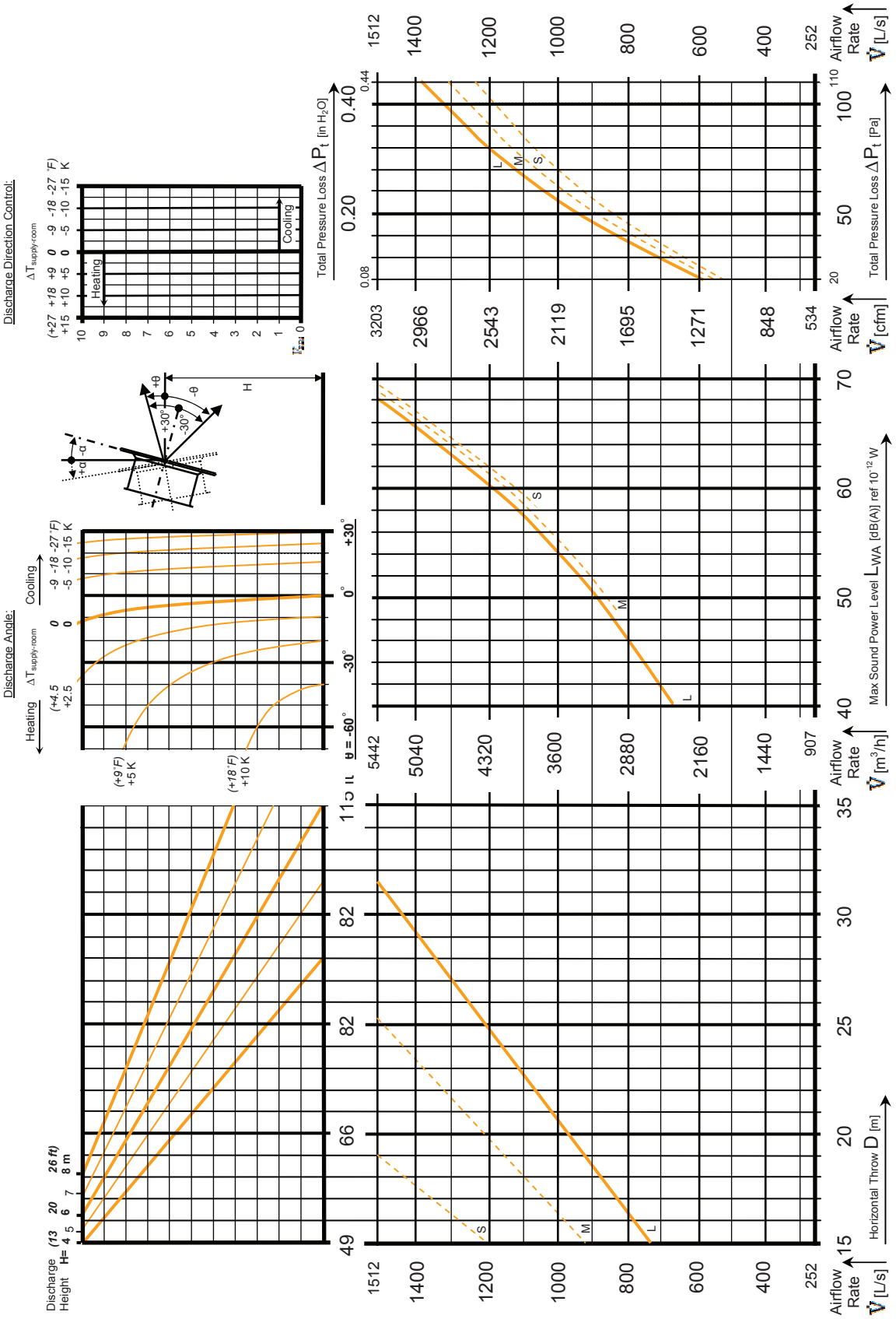
CSW-AD-DN355


Discharge Direction Control:
ΔT supply-room
Heating
Cooling
Discharge Angle:
Heating
Cooling
Discharge Height H=
Total Pressure Loss ΔPt [in H2O]
Total Pressure Loss ΔPt [Pa]
Airflow Rate V̇ [L/s]
Airflow Rate V̇ [cfm]
Airflow Rate V̇ [m3/h]
Max Sound Power Level LWA [dB(A)] ref 10-12 W
Horizontal Throw D [m]
115 ft
θ = -60°
-30°
0°
+30°
+θ
-θ
+α
-α
H

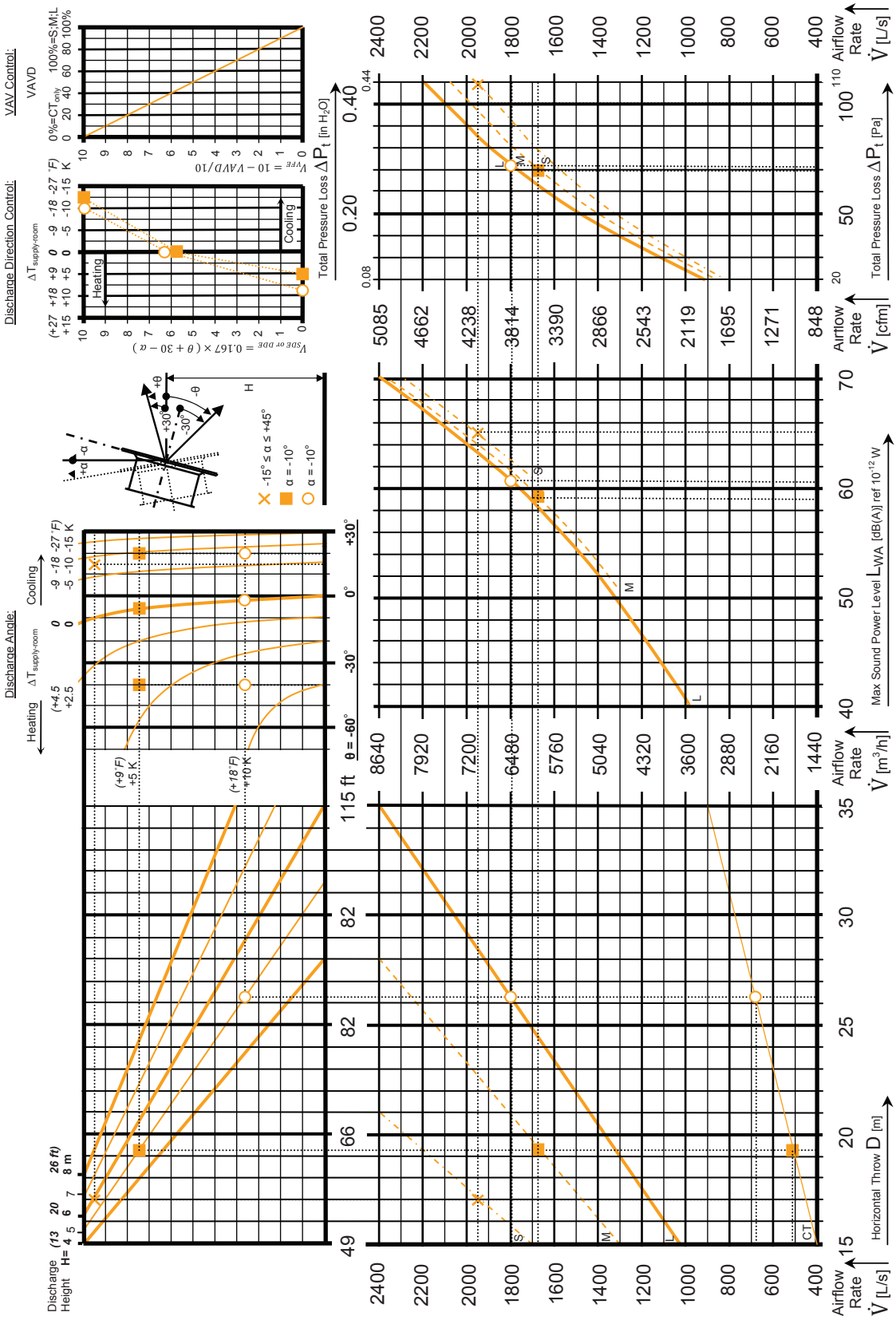
CSW-AD-DN400


Discharge Direction Control:
Heating
Cooling
Discharge Angle:
Heating
Cooling
Discharge Height
Horizontal Throw D [m]
Airflow Rate V̇ [L/s]
Airflow Rate V̇ [m³/h]
Airflow Rate V̇ [cfm]
Total Pressure Loss ΔPt [in H2O]
Total Pressure Loss ΔPt [Pa]
Max Sound Power Level LWA [dB(A)] ref 10⁻¹² W
115 ft
θ = -60°
-30°
0°
+30°
+α
-α
+θ
-θ
+30°
-30°
H

CSW-AD-DN500


Discharge Direction Control:
Heating
Cooling
Discharge Angle:
Heating
Cooling
Discharge Height H=
Horizontal Throw D [m]
Airflow Rate V̇ [L/s]
Airflow Rate V̇ [m³/h]
Airflow Rate V̇ [cfm]
Total Pressure Loss ΔPt [Pa]
Total Pressure Loss ΔPt [in H2O]
Max Sound Power Level LWA [dB(A)] ref 10⁻¹² W
S
M
L

CSW-AD-DN630


Discharge Angle:
Heating
Cooling
ΔT supply-room
Discharge Height
H= 4 5 6 7 8 m
(13 20 26 ft)
115 ft
θ = -60°
-30°
0°
+30°
(+9°F) +5 K
(+18°F) +10 K
Airflow Rate V̇ [L/s]
Horizontal Throw D [m]
Airflow Rate V̇ [m³/h]
Max Sound Power Level LWA [dB(A)] ref 10⁻¹² W
Airflow Rate V̇ [cfm]
Total Pressure Loss ΔPt [Pa]
Total Pressure Loss ΔPt [in H2O]
Discharge Direction Control:
VAV Control:
VAVD
0%=CTonly 100%=S:M:L
Heating
Cooling
-15° ≤ α ≤ +45°
α = -10°
α = -10°
CT
S
M
L

SELECTION EXAMPLE

NOTES

- Min Centre-line Distance between two diffusers: tmin = 3 x DN. Layout criteria based on ADPI ≥ 90%.
- Max Discharge Angle relative to diffuser central axis: +30˚ (up) @ 10V SDE or DDE; -30˚ (down) @ 0V SDE or DDE.
- θ Discharge Angle relative to horizontal axis: counter-clockwise (up) then θ positive; clockwise (down) then θ negative.
- α Mounting Angle relative to vertical axis: counter-clockwise (up) then α positive; clockwise (down) then α negative.
- Diffuser Acoustical Directivity: 4.
- If NO Volume Flow Damper (no VFM or VFE) then deduct 3 dB(A) from Sound Power Level L_{WA}.
- Recommendations based on ADPI ≥ 90% (for ADPI ≥ 80% increase maximum cooling $\Delta T_{supply\text{-}room}$ by 50%).

$\Delta_{supply\text{-}room}$ ≤ ± 15 K, dependent upon V, H and θ
VAV%D = VAV demand in % (VFE option)
L = Long horizontal throw (standard)
M = Medium horizontal throw (optional)
S = Short horizontal throw (optional)
CT = Core Tube (ie minimum turndown)

LRA% = Minimum % of total air drawn as low level return
$\Delta T_{maxheating}$ = (1 + (LRA%)/100) × Max Heat $\Delta T_{supply\text{-}room}$
VVFE = 10 - VAV%D/10
$V_{SDE\ or\ DDE}$ = 0.167×(θ + 30 - α)
$\Delta T_{heating\ VAVmin}$ = 2 x $\Delta T_{heating\ VAVmax}$

EXAMPLES

		1) ✕	2) ■	3) ●
PROJECT REQUIREMENTS				
$\Delta T_{supply\text{-}room}$	**≤**	-10 K (ie cooling only)	-10 K (ie cooling) and + 8 K (ie heating)	-10 K (ie cooling) and + 8 K (ie heating)
D	**≈**	17 m	19 m	26 m
H	**=**	6 m	6 m	-
Notes:		Constant diffuser airflow.	Constant diffuser airflow.	To be connected to the same supply air plenum, with the diffusers mounted at the same height and mounting angle, as in Example 2. Each diffuser's airflow rate is to be electrically adjustable for VAV operation.

PROJECT SELECTION				
Model		CSW-AD-DN630-S-SDM-O	CSW-AD-DN630-M-SDM-VFM	CSW-AD-DN630-L-SDM-VFE
Notes:		-	-	Select same Pt as for Example 2
V	**=**	1950 L/s	520 to 1680 L/s, manually adjustable	675 to 1800 L/s, electrically adjustable
LWA	**=**	65.5 dB(A) – 3 dB(A) no VFM or VFE= 62.5 dB(A)	59 dB(A)	60.5 dB(A)
Pt	**=**	108 Pa	70 Pa	71 Pa
θ max cooling	**=**	+15˚	+20˚	+20˚
θ max heating	**=**	n/a	-40˚ (ie +20˚ - 60˚ swivel arc)	-40˚ (ie +20˚ - 60˚ swivel arc)
α	**=**	-15˚ ≤ α ≤ +45˚ (ie from +15˚ - 30˚ to +15˚ + 30˚)	-10˚ (ie +20˚ - 30˚)	-10˚ (ie +20˚ - 30˚)
Max Cool $\Delta T_{supply\text{-}room}$	**=**	-10 K @ θ = +15˚	-12 K @ θ = +20˚	-10 K @ θ = +20˚
Max Heat $\Delta T_{supply\text{-}room}$	**=**	n/a	+5 K @ θ = -40˚	+8 K @ θ = -40˚
$\Delta T_{max\ heating}$	**=**	n/a	+8 K (required), therefore:	+8 K (required), therefore:
LRA%	**=**	n/a	[($\Delta T_{max\ heating}$/Max heat $\Delta T_{supply\text{-}room}$)-1]×100 = [8/5 – 1] x 100 =60%	0%
$V_{SDE\ or\ DDE}$	**=**	n/a	0 V @ +5 K; 5.5 V @ 0 K; 10 V @ -12 K	0V@+8K; 6.3V@0K; 10V@ -10K
V_{VFE}	**=**	n/a	n/a	10-(VAV%D)/10

ORDER DETAILS

CSW-AD-DN___-___-___-____

VOLUME FLOW DAMPER:
- 0 NO damper
- VFM* Volume Flow-Manual
- VFE* Volume Flow-Electic

DISCHARGE DIRECTION:
- SDM: Single Deflection-Manual up/down
- SDT: Single Deflection-Thermal up/down
- SDE: Single Deflection-Electric up/down
- DDM*: Double Deflection-Manual up/down & left/right
- DDT*: Double Deflection-Thermal up/down & left/right
- DDE*: Double Deflection-Electric up/down & left/right

HORIZONTAL THROW:
- L: Long
- M: Medium
- S: Short

NOMINAL DIAMETER:
- 355
- 400
- 500
- 630

MODEL:
- Circular Swirl Wall - Adjustable Direction

Notes:
* Only with size DN630.
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TENDER TEXT

Furnish and install, as specified, the SMARTEMP Wall Swirl Diffusers (type CSW-AD), with annular swirl discharge and a central jet providing long and substantially horizontal throws with both adjustable up/down adjustment (manually, thermally or electrically operated) and optional manual left/right adjustment (DN630 only) of the combined air stream via adjustable guide vanes in the central jet. Throw is to be factory set to long (L), medium (M) or short (S), as appropriate. Where specified, optional VAV guide vanes (manually or electrically operated), available for size DN630 only, are to provide largely constant throw VAV operation with turndown to approximately 40%, 30% and 25% for constant throw lengths L, M or S, respectively.

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