HDA
®Lightstrips

Ceiling system for heating and cooling

LIGHTSTRIPS

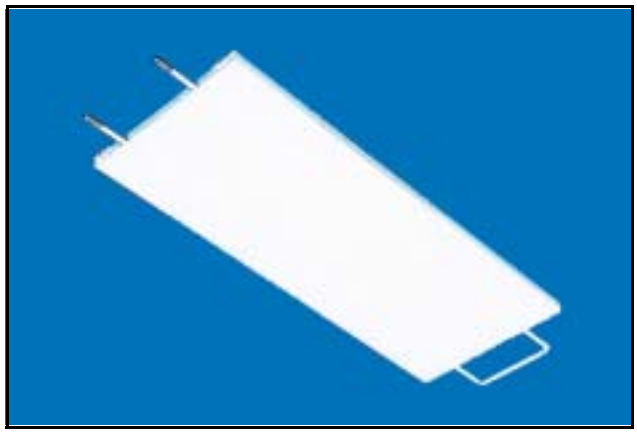
- LIGHTSTRIPS ultra light weight prefabricated ceiling panel for cooling and heating.
- LIGHTSTRIPS can be suspended or integrated in a suspended ceiling.
- Several widths that can be connected in series in lengths up to 25 metres..
- Hygienic– enclosed insulation.

FUNCTIONS

- Heating (by radiation)
- Cooling (by radiation)

APPLICATION

- Halls
- Industries
- Schools
- Shops
- Offices



KEY FIGURES

Heating capacity:	Up to 250 W/m^2 (Δt_{mv} = 30ºC).
Cooling capacity:	Up to 87 W/m^2 (Δt_{mk}= 10ºC).
Lengths:	Lengths up to 6000 mm. Connected in series up to 25 m.
Width:	Widths 400 mm, 800 mm and 1200 mm.
Colour:	Swegon standard white finish RAL 9010. On delivery surfaces are protected by plastic film.
Control:	Per room or centrally. Swegon Control system, see separate brochure.

ADVANTAGES OF LIGHTSTRIPS HDA

LIGHTSTRIPS – serves several functions:

- heating and/or cooling to the required temperature.
- can be individually suspended or integrated in a suspended ceiling.
- installed in long lengths to minimise connection pipes.

LIGHTSTRIPS are supplied as complete units with heating/cooling capacity adapted to the customer's requirements.

Low installation costs:

- light design.
- prefabricated units.

Inset depth is minimal – only 30 mm when surface mounted on the ceiling.

Low maintenance costs due to:

- no moving parts.
- smooth surfaces on the top and bottom that are easy to clean.

Hygienic due to:

- enclosed insulation.
- easy to wipe clean.

As temperature control is designed using a system with water as the heat transfer medium the ventilation system can be fully adapted to the activities carried out in the building.

FUNCTION

Hot or cold water circulates through copper pipes that have homogenous contact with a profiled aluminium plate. The panel absorbs or gives off heat through radiant heat exchange between the panel and the room. The exchange of heat takes place primarily through radiation.

DESIGN

The panels are manufactured of flat aluminium plate with profiled seatings for the copper pipe. The panels are 400mm wide and can be supplied interconnected using two or three panels for widths of 800 or 1200 mm. Piping is designed in copper, Ø 12 mm and is applied so that maximum contact between the pipe and panel is achieved.
Suspension fittings are made up of surface treated steel components.

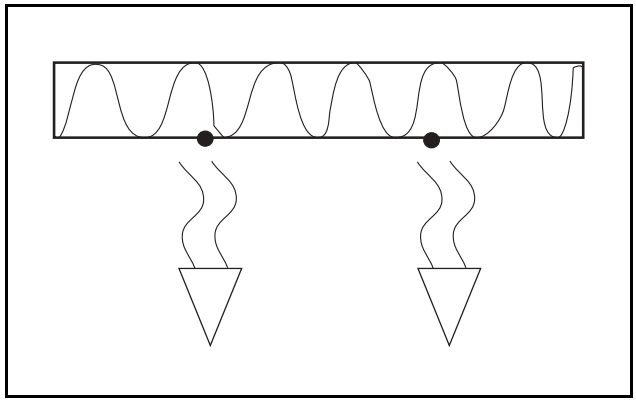


Figure 1. *Heating.*

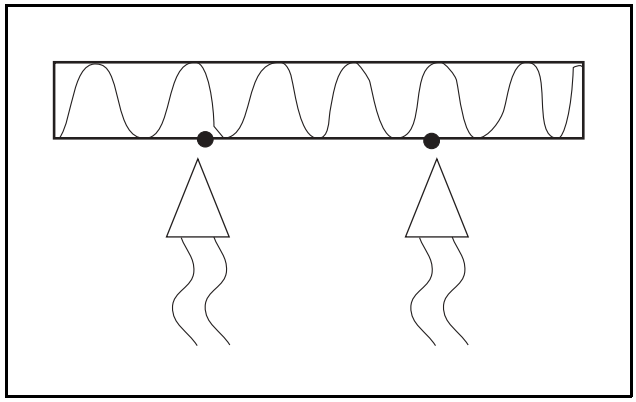


Figure 2. *Cooling.*

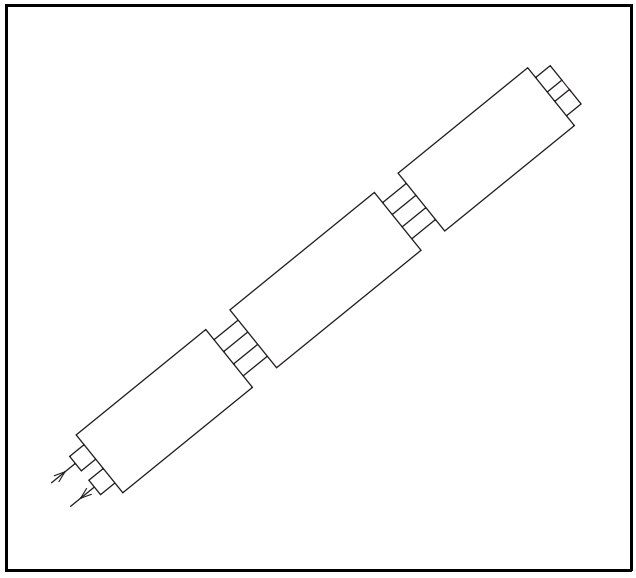


Figure 3. *Series connection.*

Lightstrips are manufactured in ready made sections in lengths up to 6 metres. The required length is obtained by combining different lengths in increments of 500 mm up to an overall length of 25 metres.

RANGE AVAILABLE ON ORDER

HDA:	Ceiling system for heating and cooling.
Colour:	RAL 9010 gloss value 30 ± 6%.
Height:	30 mm.
Width:	400, 800 och 1200 mm.
Lengths:	Optional lengths in increments of 500 mm. Panels are supplied in sections for on-site installation with overall lengths greater than 6000 mm.

CONNECTION VARIANTS

		Plain pipe ends Cu Ø
HDA	400-S	∅12 mm
HDA	400-P	∅15 mm
HDA	800-S	∅15 mm
HDA	800-P	∅15 mm
HDA	1200-S	∅15 mm
HDA	1200-P	∅22 mm

SPECIAL TYPES

Colour: Can be supplied in optional colour on request.

Connection variants: If other connection options are required please state HDAa size-X and supply a drawing.

ACCESSORIES

Assembly set G3

Each panel is supplied with 4 suspension fittings for the first 3000 mm..
Add 2 suspension fittings for each additional increment of 3000 mm.
Drop rod M6 threaded bar L = 1000 mm.

Assembly set G3S

For greater installation heights than 1000 mm.
State: G3-S + the required drop rod length.

Assembly set G4

For surface mounting 4 brackets per 3000 mm.

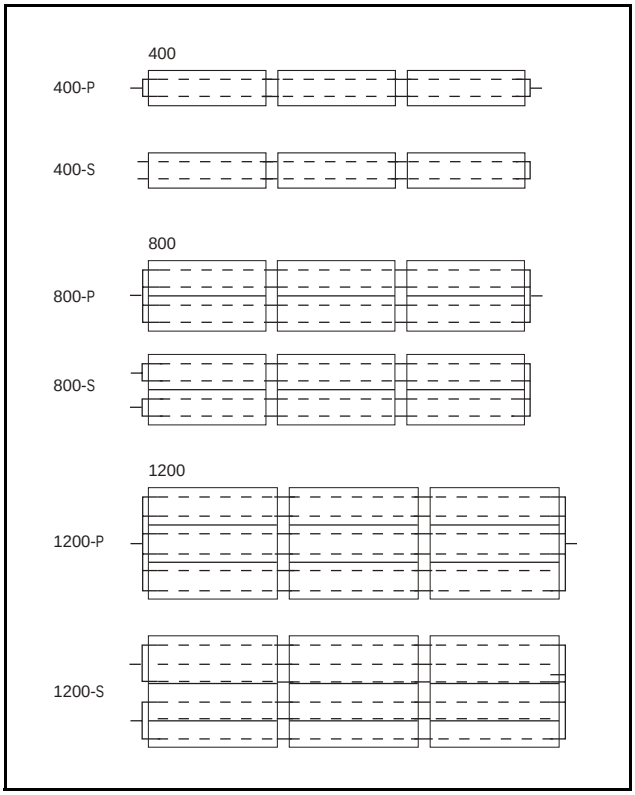


Figure 4. *Connection variants.*

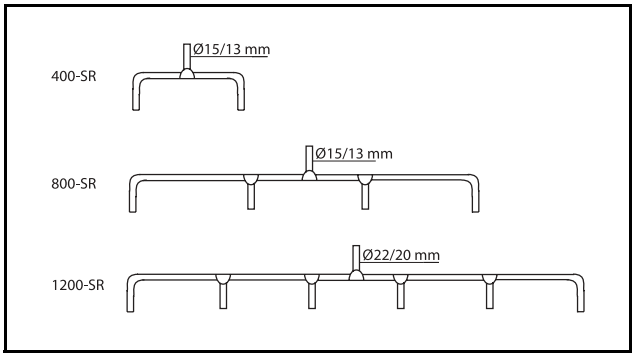


Figure 5. *Connection pipes.*

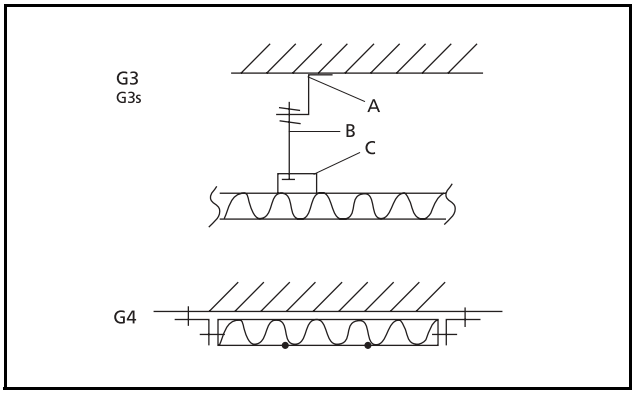


Figure 6. *Suspension.*
A = Ceiling bracket
B = Threaded drop rod
C = Suspension bracket

PLANNING

Selection HEATING

Select LIGHTSTRIPS SURFACES so that they cover the transmission requirement and infiltration losses.

The room's air temperature can be lower without reducing the operative temperature. The lower air temperature is compensated by the higher surface temperature provided by LIGHTSTRIPS.

Positioning LIGHTSTRIPS UNITS

General rule: Position the heat surfaces within a 2 metre zone of the perimeter wall.

In deeper buildings and where skylights are fitted position the LIGHTSTRIPS units proportional to the transmission requirement.

Correct positioning of the heaters allows the directed operative temperature to be kept within close limits.

LIGHTSTRIPS should be positioned so that they directly compensate for the radiation from colder surfaces. In a normal hall building, without skylights, 75–80% of transmission losses are through the outer walls.

LIGHTSTRIPS' surface temperature with fixed work place

The diagram in **figure 9** shows the max. recommended Δt_{mv} (mean water temperature – rooms temperature) in relation to the type of heater and the installation height. A too high Δt_{mv} value can give too intense heat radiation causing discomfort. Always check this when Lightstrips is installed above fixed work places.

Example

A work place is to be positioned directly under two 1200 mm Lightstrips installed at a height of 4 m. The diagram at the bottom right Δt_{mv} = 45°C, i.e. at a room temperature of 20°C the highest mean water temperature will be 65°C.

RECOMMENDED LIMIT VALUES

Max. recommended operating pressure:	600 kPa
Max. recommended test pressure for testing completed installations:	900 kPa
Minimum heating water flow:	0,016 l/s
Highest supply temperature:	+80°C
Minimum cooling water flow:	0,04 l/s
Temperature increase cooling water:	2-4°C
Temperature lowering heating water:	5-20°C
Minimum supply temperature:	Should always be selected so that the system works without condensation.

Attempt to lay supply pipes higher than the panels. This will ensure that any air can be expelled at the minimum recommended water flow per panel.

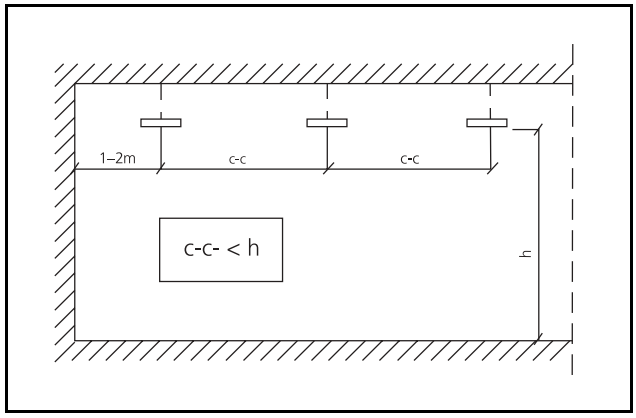


Figure 7. *Recommended maximum spacing between panels for an even operative temperature. Can be surface mounted.*

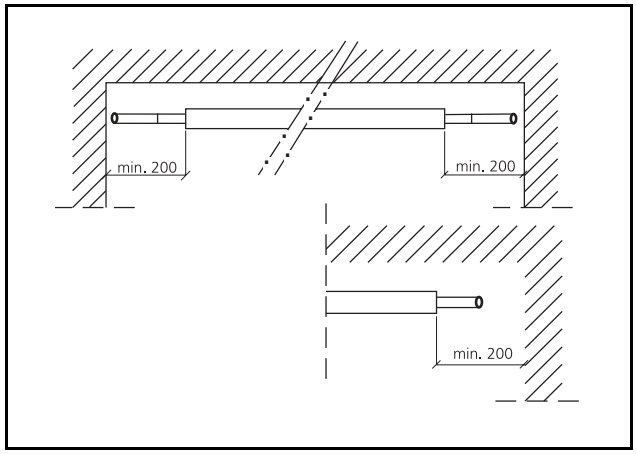


Figure 8. *Recommended minimum distance from walls.*

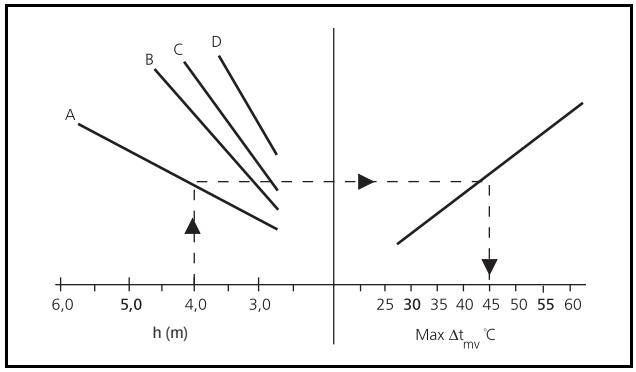


Figure 9. *Recommended outdoor temperature as a function of the installation height.*

Installation height m/Max. Δt_{mv} °C

A = Two or more adjacent mounted LIGHTSTRIPS
B = LIGHTSTRIPS b = 1200
C = LIGHTSTRIPS b = 800
D = LIGHTSTRIPS b = 400

Comparison between radiant and air heating

Two identical buildings with mechanical ventilation have the following temperature values:

	Air heating	**LIGHTSTRIPS**
	Building A	**Building B**
Room air temp.	+20°C	+16°C
Mean surface temp.	+16°C	+20°C
Operative temp.	+18°C	+18°C

An operative temperature of +18°C is obtained for both buildings. However, in building B the supply air is provided at 4°C lower than in building A. **This gives an energy saving of 15–20% for building B.**

Installation example – minimal pipe routing
Figure 10 shows 2 examples using a minimum of pipe routing.

Miscellaneous
When LIGHTSTRIPS are used for heating the supply air temperature should be kept at a constant, lower level than the room's set point-value. In this way internal heat sources can be used for additional heating and total energy consumption can be reduced.

Installation example – minimal pipe routing

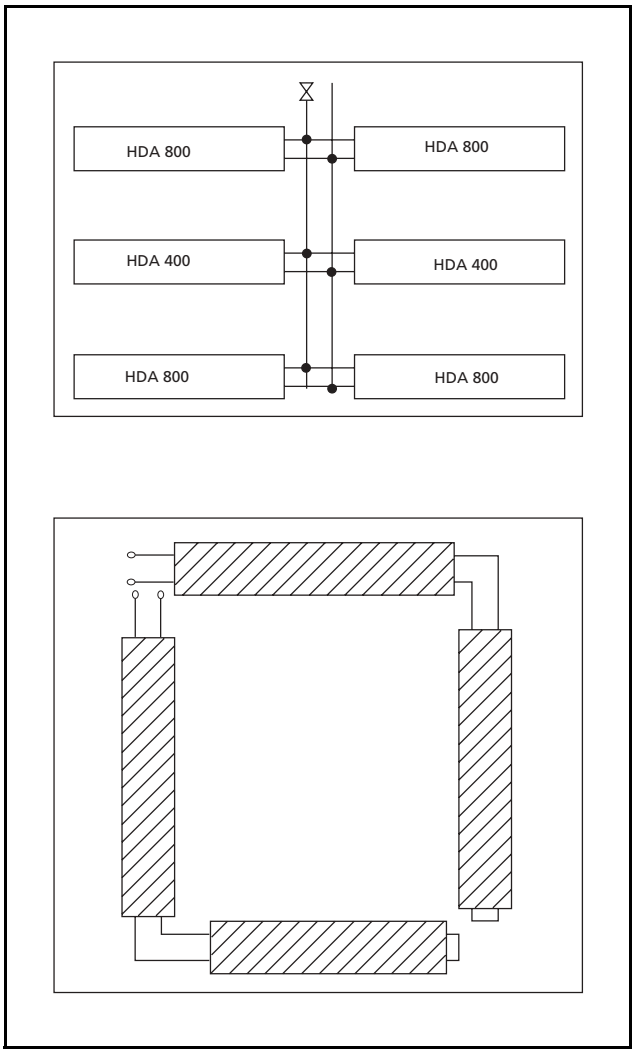


Figure 10. *Installation example with minimal pipe routing.*

TECHNICAL SPECIFICATION

Heating

Step by step selection

1. Calculate the room's total heating requirement.
2. Make a preliminary layout showing suitable orientation and panel positions.
3. Choose a suitable panel and the number of metres required using table 1.
4. Determine the connection variant based on the required panel length, pressure drop and pipe routing.
5. Determine the water flow and pressure drop per loop.

Table 1. Heating effect P_v (W/m).

HDA	Δt_{mv} °C							
	25	30	35	40	45	50	55	60
400	86	100	119	139	161	182	198	220
800	172	200	237	278	322	364	396	440
1200	258	300	336	417	483	546	594	660

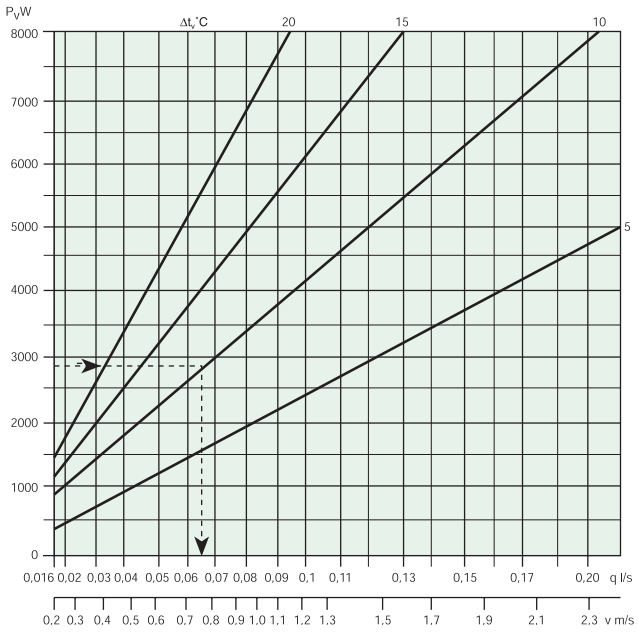
Table 2. Heating effect with air flow P_v (W/m).

HDA	Δt_{mv} °C							
	25	30	35	40	45	50	55	60
400	101	122	138	159	179	207	223	245
800	202	244	276	318	352	414	446	490
1200	303	366	414	477	528	621	669	735

Table 3. Heating effect P_v (W/m) vertical wall installation.

HDA	Δt_{mv} °C							
	25	30	35	40	45	50	55	60
400	90	105	130	145	165	190	210	235
800	180	210	260	290	330	380	420	470
1200	270	315	390	435	495	570	630	705

Diagram 1. Heating effect/flow per loop.



Units of measure

P: Output W, kW
t_r: Room temperature °C
t_m: Mean water temperature °C
v: Velocity m/s
q: Flow l/s
p: Pressure Pa, kPa
Δp: Pressure drop Pa, kPa
Δt_m: Temperature difference [t_r - t_m] °C
Δt: Temperature difference between supply - return °C

Supplemental index: v = heating, k = Cooling

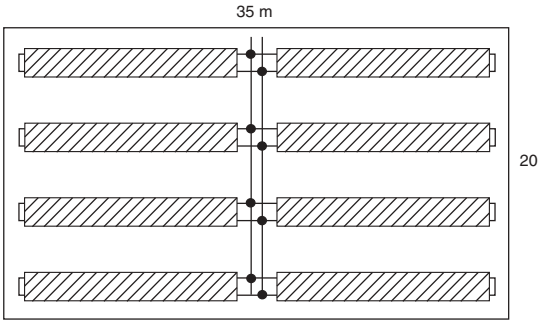
EXAMPLE

A sports hall has a heating requirement of 22 kW including infiltration losses at t r 20°C. The size of the building is 35 x 20 m, ceiling height 6 m. Windows and doors are located on the long sides.
t_m 50°C (55–45) Δt_v 10°C
Δt_{mv} 30°C
Supply air system: Swegon low velocity unit

SOLUTION

Pipe connection point: Centre of one long side.

Table 1. Heating effect P_V (W/m).
At Δt 30°C gives HDA 800 200 W/m.
Required overall length at 22 kW: 22.000/200 = 110 m
As the pipe connection is in the centre of the building a suitable solution is 8 x HDAa 800-S 14000 mm distributed in the building.



8 x HDA 800-S 14000 mm.

Diagram 1. Effect/flow per unit.
Each panel of 14 m emits 2800 W.
Look for the intersection 2800 W and Δt_v10°C
go to the base line and read off q = 0.065 l/s.

Diagram 3. Pressure per loop.
Look for the intersection 0.065 l/s and 14 m go to the pressure drop line 800-S and read off 12 kPa.

Cooling
Step by step selection:

1. **Table 4.** Cooling effect P_kW/m. Determine the width and length of the panels based on the building's size and cooling requirements where any cooling capacity from ventilation air has been removed.
   Table 5. Extra cooling effect PkW/m Airflow on the panel surfaces and thereby a higher cooling effect use table 5.
2. **Diagram 2.** Effect/flow per loop. Determine the water flow per loop based on the cooling effect and temperature increase of the cold water.
3. **Diagram 3.** Pressure per loop Δp Pa. Read off the pressure drop Δp above the loop.

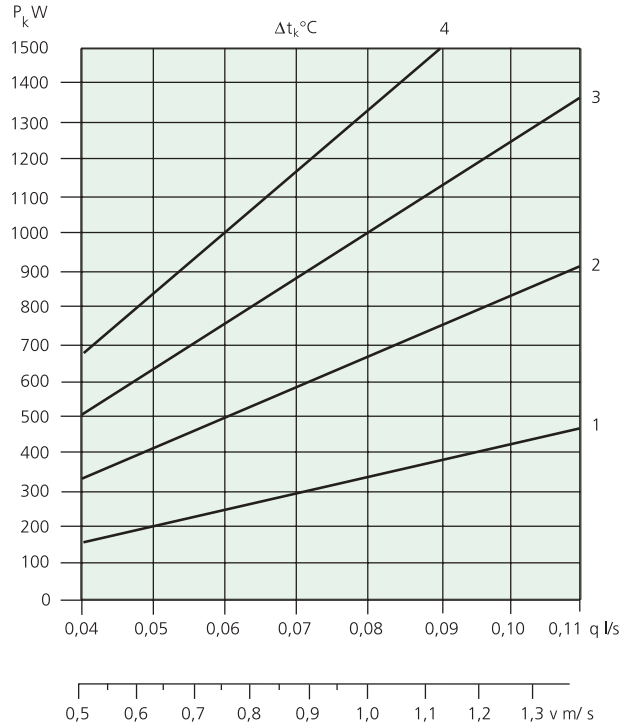
Table 4. Cooling effect P_k (W/m).

HDA	Δt_{mk} °C							
	5	6	7	8	9	10	11	12
400	16	19	23	27	30	35	38	41
800	32	38	46	54	60	70	76	82
1200	48	57	69	81	90	105	114	123

Table 5. Cooling effect with air flow P_k (W/m).

HDA	Δt_{mk} °C							
	5	6	7	8	9	10	11	12
400	19	21	26	31	34	38	42	45
800	38	42	52	62	68	76	84	90
1200	57	63	78	93	102	114	126	135

Diagram 2. Cooling effect/flow per loop.



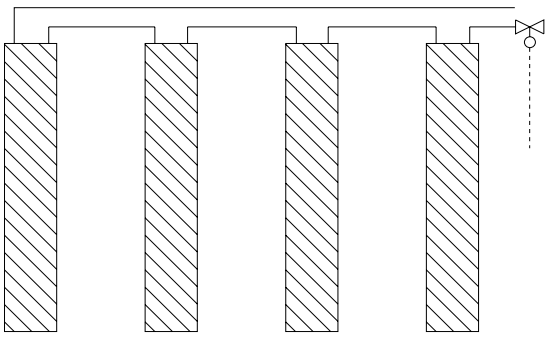
EXAMPLE
A conference room of w x d x h = 6 x 4.5 x 2.7 is to be comfort controlled.

Selection conditions:

room temperature	24.5°C
supply temperature	16°C
cooling water temp	14–17°C
cooling requirement	1500 W
air flow	40 l/s
supply air system	ceiling units Swegon TDYc
suspended ceiling	ceiling in T-profiles 600 x 1200
ceiling depth	100 mm

SOLUTION
Cooling
Supply air's cooling effect 40 x 1.2 x 8.5 = 408 W
The LIGHTSTRIPS shall meet 1500 –408 = 1092 W

Table 5. Cooling capacity with airflow
Gives with 14/17°C and tr 24.5°C Δt_{mk} = 9°C for HDA-800, 68 W/m
Requisite length 16 m
Select 4 x HDA 800-S-4000.

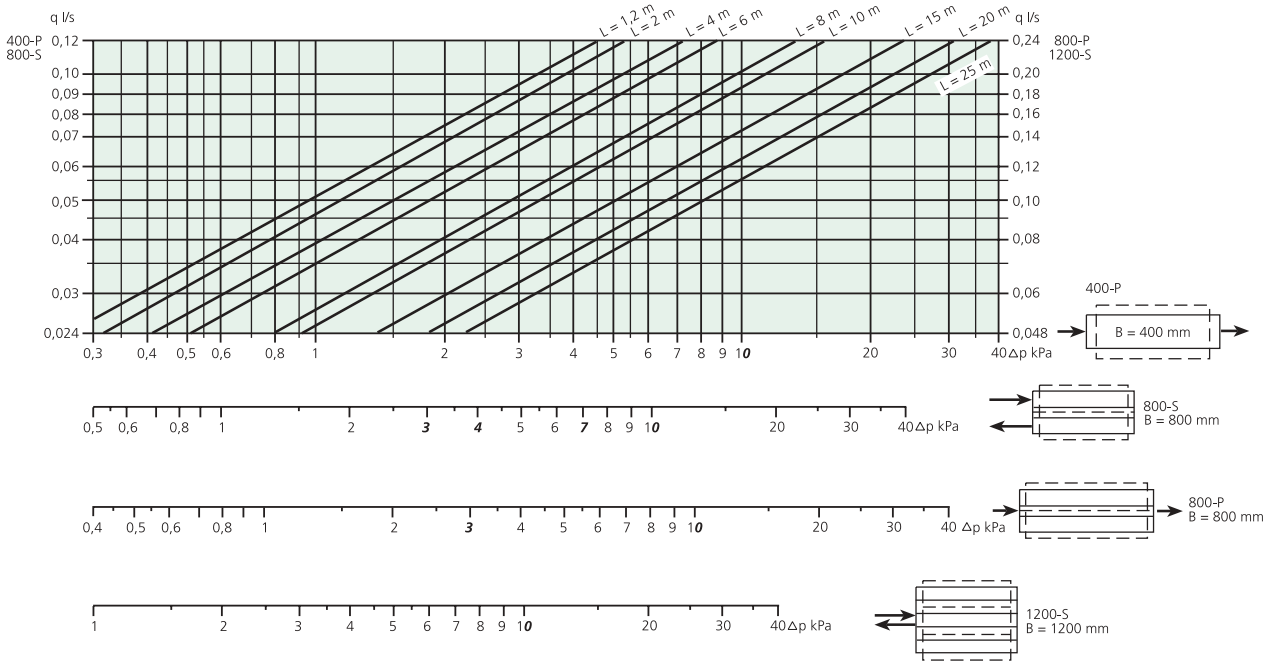


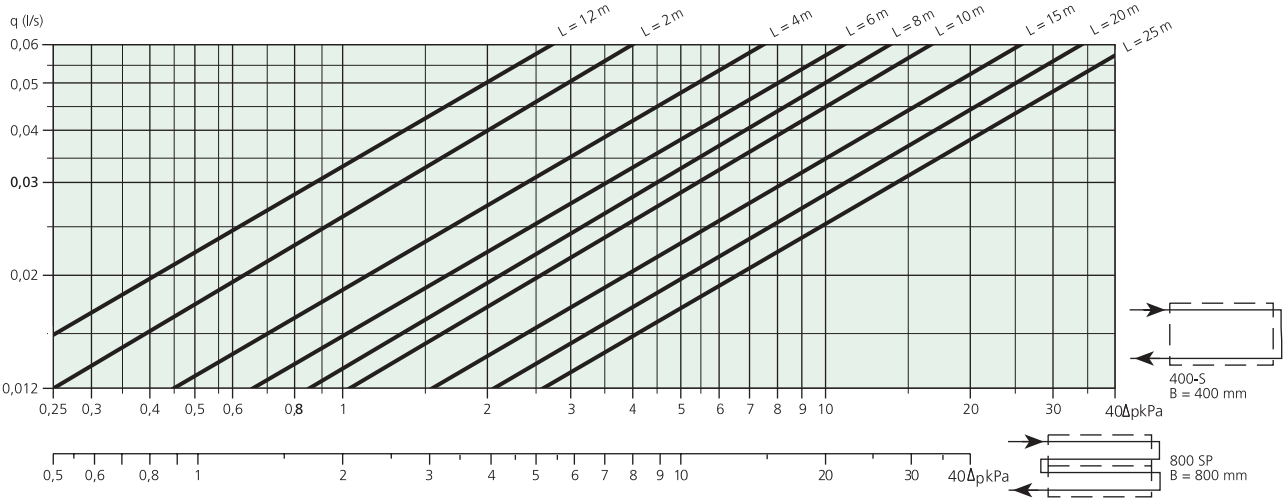
4 x HDA 800-S-4000
Connected in series with control valve

Diagram 2. Cooling capacity/waterflow for the loop.
Each panel L = 4000 mm gives 272 W.
The panels are connected in series with an overall length of 16 m and a capacity of 1088 W.
Find the intersection for 1088 W and Δt_k = 3°C, go down to the base line and read off 0.085 l/s.

Diagram 3. Pressure drop for the loop.
Find the intersection for 0.085 l/s and 16.0 m go to the pressure drop line for 800-S and read off 23 kPa.

Diagram 3. Pressure drop per panel.





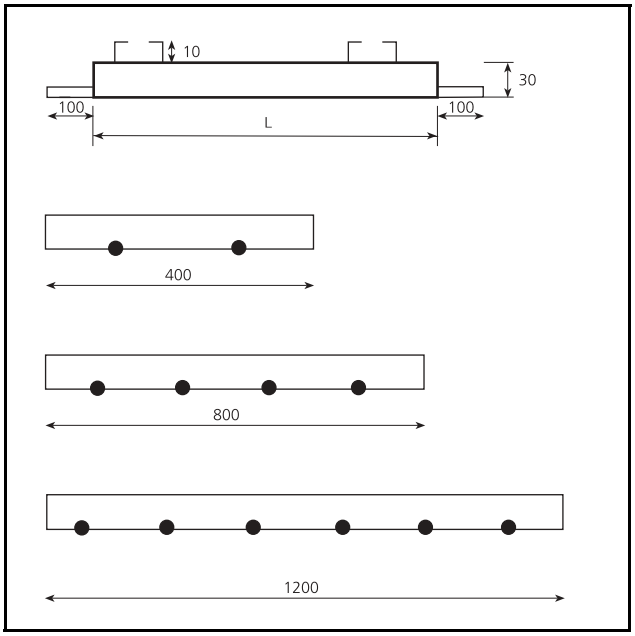


Figure 11. *Dimensions.*

WEIGHT

Weight per meter HDA	kg/m incl. water
400	2.5
800	5
1200	7.5

Assembly area

Min. installation height: Can be surface mounted.

SPECIFICATION

Swegon LIGHTSTRIPS HDA for cooling and heating.
Supplied in prefabricated lengths up to 6000 mm, enamelled in Swegon white standard finish RAL 9010 gloss value 30 ± 6%.

Limits of contract

Swegon's limits of contract are at the connection points for water. At these connection points the plumbing contractor connects to plain pipe ends, fills the system, vents and performs pressure testing.
The units are supplied with assembly fittings for suspension (excluding screws for securing to joists).

Product

Cooling/heating panel HDA	a-	bbbb-	c-	dddd
Model:				
Width 400, 800, 1200				
Connection options:				
S = loops in series P = loops in parallel				
Lengths				
500-6000 (increments 500 mm)				

Accessories

Assembly set Installation height 1000 mm	HDAT G3	
Assembly set Installation height ... (greater than 1000 mm)	HDAT G3S	aa
Assembly set for surface mounting	HDAT G4	

EXPLANATORY TEXT

Example of the explanatory text.
Swegon ceiling system LIGHTSTRIPS for heating/cooling type HDA, with the following functions:

- Hygienic– enclosed insulation
- Low build-in height
- Visible parts enamelled in white standard finish RAL 9010. (optional)
- Complete delivery including requisite fittings for suspension excluding screws for securing to joists.
- Limit of contract at connection points for water according to principal drawing. (optional)
- At connection points the plumbing contractor connects to plain pipe ends 12, 15, or 20 mm, depending on the size. (optional)
- The plumbing contractor fills, vents and pressure tests and bears responsibility that the planned waterflow reaches every system branch and panel. (optional)

Accessories:

- Assembly set HDAT G3 xx
- Assembly set HDAT G3 + drop rod length xx
- Assembly set HDAT G4 xx
- Number specified separately or given with reference to the drawing.
- Size: VP XX-1 HDA -aaaa-b-ccccc xx
- VP XX-2 HDA -aaaa-b-ccccc xx
  etc.
- Control equipment.