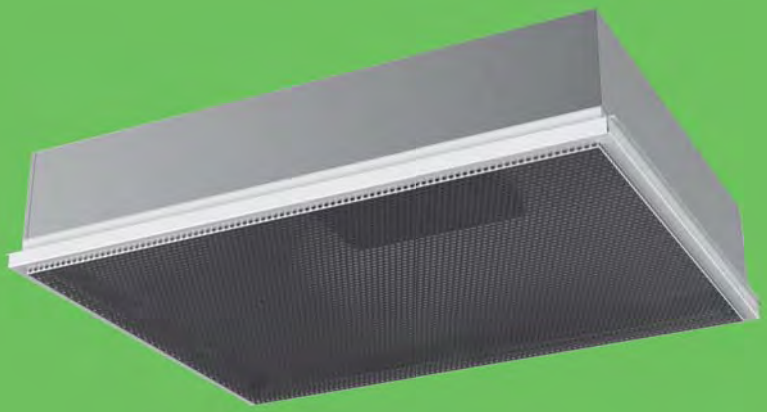
WATERLOO
A Swegon Group Company

Laminar Flow Diffusers

LFF Laminar flow panel with flanged frame

LFM Laminar flow panel with flangeless frame



Laminar Flow Diffusers

LFF / LFM

Introduction

LF diffusers have been designed for use in clean rooms, laboratories, operating theatres, or other applications where critical control of room air movement is necessary. They are also suitable for less critical applications such as animal rooms or kitchens where a vertical flow pattern may be required.

The laminar air pattern is achieved by use of a primary baffle within the plenum chamber and a low free-area perforated discharge plate at the face of the diffuser. The diffusers are available with either a flanged frame style (type LFF) to suit conventional exposed or concealed 'T' ceilings, or, with a flangeless frame (type LFM) suitable for modular panel constructions.

The LFM units can be supplied with a perimeter trim strip to suit the overall dimensions of the panel assembly. Support brackets and mounting plates can also be manufactured to fit suspended light bases used in operating theatres.

The units are available in three standard sizes with options for top, side, or end entry inlet spigots and screw operated louvre dampers.

Description

LF laminar flow diffusers are constructed from aluminium extruded frames and assembled using welding and soldering techniques to form a robust construction.

The perforated aluminium face plate can be easily removed for cleaning using the hook tool provided. Plenum chambers are manufactured from galvanised sheet steel, with all exposed edges and spot welds protected.

Product Description

LFF Laminar flow panel with flanged frame

LFM Laminar flow panel with modular flangeless frame

LD Louvre damper

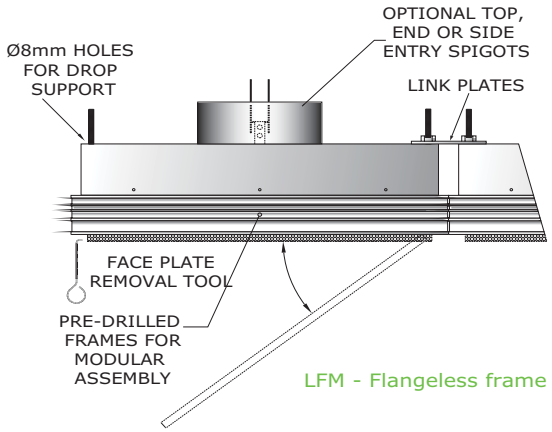
Features

- Two frame styles and sizes to suit 600mm and 1200mm 'T' ceilings or modular panel assemblies.
- Side, top, or end entry spigot connections with optional spigot mounted louvre damper.
- Pivoting, removable face plate for easy maintenance.
- Easy clean aluminium face plate and frame with durable polyester powder coating.

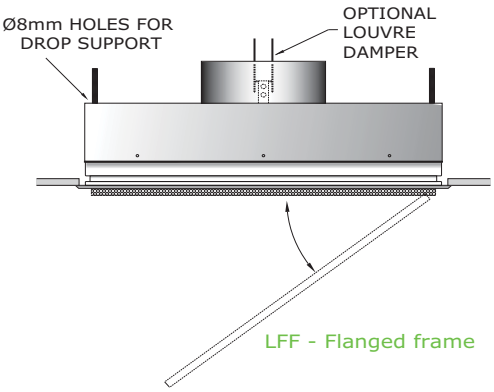
Finishes

PPG9010 (RAL 9010 Gloss - 80% Gloss White)
PPM9010 (RAL 9010 Matt - 20% Gloss White)
PPM9006 (RAL 9006 Matt - 30% Gloss Silver)
Other colours available on request

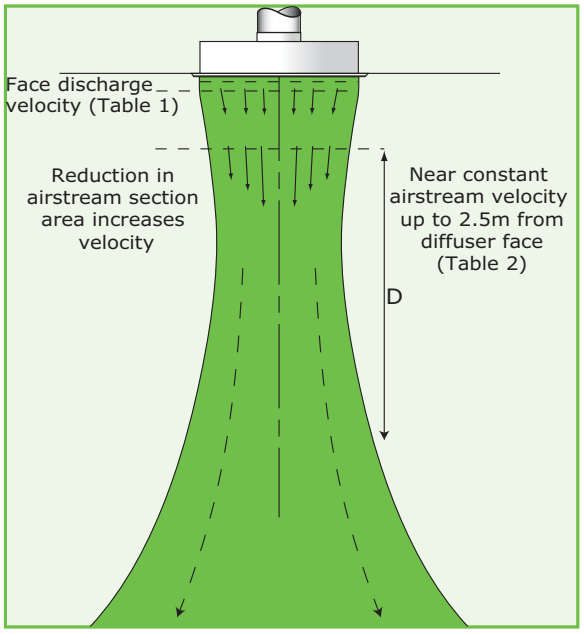
Free Area
23%



LFM - Flangeless frame



LFF - Flanged frame



Order Example

LFM/900/600/TE/PPM9010/LD

- Type
- Nominal Width
- Nominal Height
- Spigot Location
- Finish
- Damper (if required)

Type	Unit size	W x H	ØD	A
LFM	600 x 600	600 x 600	197	120
LFM	900 x 600	900 x 600	197	120
LFM	1200 x 600	1200 X 600	312	165
LFF	600 x 600	598 x 598	197	120
LFF	1200 x 600	1198 x 598	312	165

Laminar Flow Diffusers

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Selection Criteria

Laminar flow diffuser airstreams are characterised by the tendency to reduce in sectional area from the point of discharge, particularly with high cooling differentials.

Although this produces a slight initial increase in the core velocity, friction between the airstream boundary and the static room air offsets this, the nett result being to maintain a near constant air velocity at distances up to 2.5m from the face.

This characteristic is reflected in the data presentation of Tables 1 and 2 which give information on the face discharge velocity and the average airstream velocity over this distance.

The discharge velocity is based on an average number of vane anemometer readings at the face plate, whilst the airstream velocity is derived from time averaged readings with a 15 probe array at distances of 1m and 2m from the face.

In the case of the latter, data is given for cooling differentials of 3°C, 5°C and 10°C.

The temperature diffusion data presented in Table 3 can be used to determine the approximate airstream temperature by adding the indicated temperature rise to the discharge air temperature.

The acoustic data shown in Table 5 is presented in terms of sound power based dBA levels.

To obtain the resulting dBA level in the occupied zone, room absorption factors should be applied as appropriate to the installation conditions.

Diffuser selection criteria will be dependent on the application, but as a general guide most sedentary occupants would be tolerant of airstream velocities up to 0.25m/s if the air temperature is 1-2°C below that in the room.

In applications where there are concentrated heat sources or where the occupants are mostly transitory, this can generally be increased to 0.35 - 0.5m/s. As an example, consider the use of a 1200 x 600 diffuser in an operating theatre where the cooling differential is to be 5 °C with a supply air temperature of 17°C.

Reference to Table 2 shows that the maximum air flow rate to achieve an average airstream velocity of 0.25m/s would be 140 l/s.

Airstream temperatures at distances of 1m and 2m from the diffuser face can be found from Table 3; in this case, at 140 l/s, the supply air temperature will rise by 3.5°C and 4.5°C respectively, giving moving air temperatures of 20.5°C and 21.5°C at the two heights.

The diffuser noise level can be found from Table 5, which assuming a fully open damper, would be less than 25dBA at 140 l/s.

Selection Example LFM 600 x 600

Air flow 60 l/s

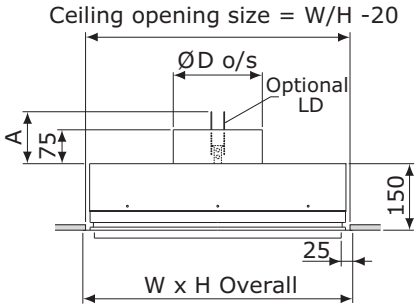
Cooling differential 5°C

Average face velocity 0.21 m/s

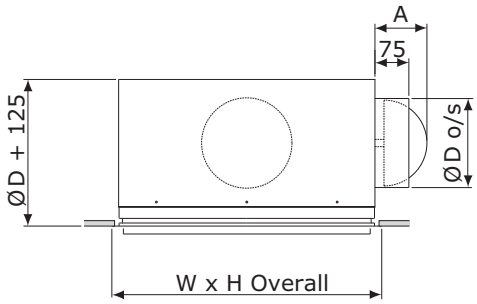
Average airstream velocity 0.25 m/s

Static pressure loos 2 Pa

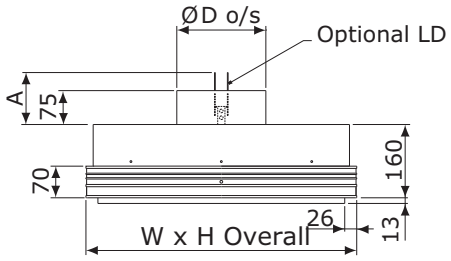
Noise level 25 dBA



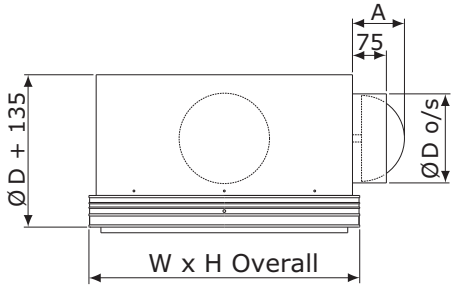
LFF-TE = Top Entry



LFF-SE = Side Entry
LFF-EE = End Entry



LFM-TE = Top Entry



LFM-SE = Side Entry
LFM-EE = End Entry

Laminar Flow Diffusers

LFF / LFM

Performance Table

Table 1. Average Face Air Velocity													
LFM / LFF		Air Flow Rate											
Unit size	m³/h	72	108	144	180	216	288	360	432	504	576	648	720
	l/s	20	30	40	50	60	80	100	120	140	160	180	200
600x600		0.05	0.10	0.13	0.17	0.21	0.30	0.37					
900x600			0.05	0.07	0.10	0.13	0.18	0.24	0.30				
1200x600					0.05	0.06	0.11	0.15	0.19	0.24	0.28	0.32	0.37

Table 2. Average Airstream Velocity													
LFM / LFF		Air Flow Rate											
Unit size	m³/h	72	108	144	180	216	288	360	432	504	576	648	720
	l/s	20	30	40	50	60	80	100	120	140	160	180	200
	DT												
600 x 600	-3 °C	0.09	0.11	0.13	0.16	0.20	0.26	0.33					
	-5 °C	0.09	0.12	0.15	0.20	0.25	0.31	0.36					
	-10 °C	0.10	0.13	0.15	0.25	0.32	0.41	0.45					
900 x 600	-3 °C	0.07	0.09	0.11	0.12	0.14	0.16	0.22	0.25				
	-5 °C	0.07	0.10	0.13	0.17	0.20	0.25	0.29	0.32				
	-10 °C	0.08	0.11	0.15	0.20	0.24	0.31	0.36	0.40				
1200 x 600	-3 °C				0.05	0.07	0.09	0.10	0.14	0.22	0.26	0.29	0.31
	-5 °C				0.05	0.07	0.10	0.12	0.16	0.25	0.30	0.35	0.39
	-10 °C				0.05	0.10	0.14	0.23	0.30	0.38	0.42	0.45	0.47

Table 3. Airstream Temperature Rise (°C)														
LFM / LFF			Air Flow Rate											
Unit size	DT	m³/h	72	108	144	180	216	288	360	432	504	576	648	720
		l/s	20	30	40	50	60	80	100	120	140	160	180	200
		D												
600 x 600	-3°C	1m	2.5	2.5	2.5	2.5	2.0	2.0	1.0					
		2m	3.0	3.0	3.0	3.0	2.5	2.5	2.0					
	-5°C	1m	4.5	4.5	4.5	4.0	3.5	3.0	2.5					
		2m	5.0	5.0	5.0	4.5	4.0	3.5	3.0					
	-10°C	1m	8.5	8.0	8.0	8.0	7.5	6.5	6.0					
		2m	9.5	9.5	9.5	9.0	8.5	8.0	7.0					
900 x 600	-3°C	1m	3.0	3.0	3.0	3.0	2.5	2.5	2.0	1.5				
		2m	3.0	3.0	3.0	3.0	3.0	2.5	2.5	2.0				
	-5°C	1m	5.0	4.5	4.5	4.5	4.0	3.5	3.0	2.5				
		2m	5.0	5.0	5.0	5.0	4.5	4.5	4.0	3.5				
	-10°C	1m	10.0	9.5	9.5	9.0	8.5	8.0	7.0	5.5				
		2m	10.0	10.0	9.5	9.5	9.0	8.5	8.0	7.0				
1200 x 600	-3°C	1m				3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.0
		2m				3.0	3.0	2.5	2.5	2.5	2.5	2.5	2.0	1.5
	-5°C	1m				4.5	4.5	4.5	4.0	4.0	3.5	3.0	2.5	2.0
		2m				5.0	5.0	5.0	5.0	4.5	4.5	4.0	3.0	2.5
	-10°C	1m				10.0	10.0	10.0	9.5	9.0	8.0	7.5	6.5	5.5
		2m				10.0	10.0	10.0	9.5	9.5	9.0	8.5	8.0	7.0

Table 4. Diffuser Static Pressure Loss (Pa) (open damper)													
LFM / LFF		Air Flow Rate											
Unit size	m³/h	72	108	144	180	216	288	360	432	504	576	648	720
	l/s	20	30	40	50	60	80	100	120	140	160	180	200
600 x 600		1	1	1	2	2	4	5					
900 x 600		1	1	1	2	2	4	5	7				
1200 x 600					1	1	1	2	2	3	3	4	4

Laminar Flow Diffusers

LFF / LFM

Performance Table

Table 5. Acoustic Data (Noise Level) dBA (open damper)													
LFM / LFF		Air Flow Rate											
Unit size	m³/h	72	108	144	180	216	288	360	432	504	576	648	720
	l/s	20	30	40	50	60	80	100	120	140	160	180	200
600 x 600					<20	25	29	33					
900 x 600						<20	28	32	35				
1200 x 600												<20	<20

LD Butterfly-style Louvre Damper

Introduction

Designed to adjust the airflow in our Format Circular Diffusers MC, WR and Perforated faced diffusers LF, CPD, KRCP the LD butterfly dampers allow for the air to be regulated prior to distribution through the terminals.

They are adjustable from the front of the Diffuser with a screwdriver and are made in aluminium.

They allow for the airflow to be left fully open, or restricted to closed low-leakage configuration when the damper is in the shut-off position.

Product Description

LD Butterfly-style Louvre Damper, Screwdriver operated

Features

- Screwdriver operated from terminal face

Finish

LD Aluminium blades

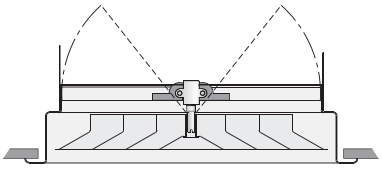
Dimensions

MCØ 150 / 200 / 300 / 450mm

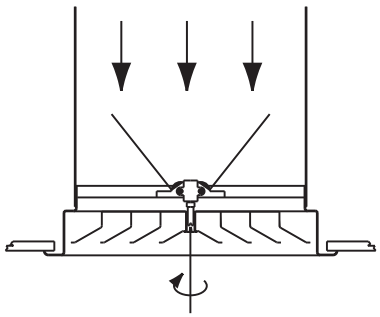
WRØ 150 / 200 / 250 / 300 / 375 / 450 / 525 / 600mm

Also sizes to suit standard circular spigots.

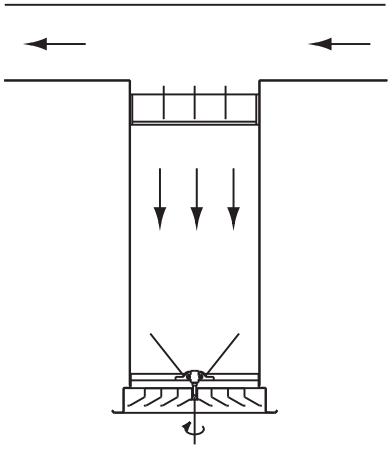
Note – the LD can only be selected with the MC or WR Circular Diffusers and the KRCP, CPD, LF perforated diffusers



MC / LD



LD - Standard arrangement for supply ducts. Adjustable through diffuser face.



ED & LD - Equalisation at stub duct take off with volume control at diffuser face.

Order Example

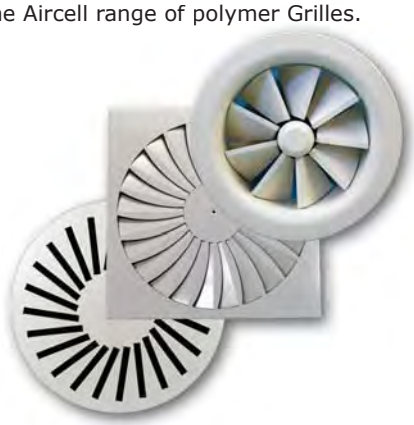
MC/300 DIA/BLINDFIX/PPM9010/LD

- Diffuser type
- Diffuser diameter
- Fixing
- Finish
- Butterfly damper

Waterloo Product Range

GRILLES

A complete range of products suitable for all wall, ceiling and floor applications. Most grilles are made from aluminium and have a range of fixed or moveable blades designed to give performance whilst remaining aesthetically pleasing to the eye. Grilles are made to customer specified sizes and colours (PPM/G); standard colour PPM9010 (20% Gloss White). The range is complemented by the Aircell range of polymer Grilles.



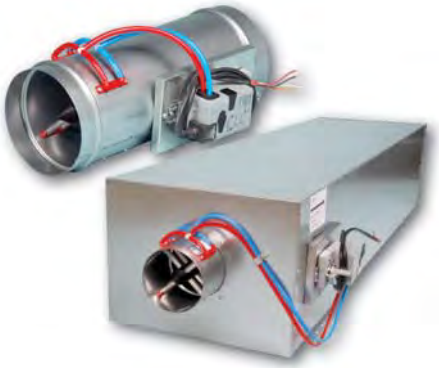
DIFFUSERS

Designed to be installed in various ceiling systems, we have a complete range to suit both performance and aesthetical requirements. Most diffusers are made from aluminium and can be ordered with or without plenum boxes for easy duct work. Diffusers can be ordered in customer specified colours (PPM/G); standard colour is PPM 9010 (20% Gloss White). This range is complemented by the Aircell range of polymer Diffusers.

ACTIVE AND PASSIVE CHILLED BEAMS

The finest quality range of high output active beams, used for ventilated heating and cooling applications. These units have 4 pipe coils to allow heating and cooling circuits to run simultaneously, giving constant and responsive control. The design allows a large optimum capacity and also allows the customer to specify the nozzle type and pitch for individual circumstances.

Active beams are made from steel to a large range of customer specified sizes and as such are suitable for various different ceiling systems. Standard finish is PPM 9010, however other (PPM/G) colours are available on request.



AIR VOLUME CONTROL DAMPERS

Pressure independent Variable Air Volume and Constant Air Volume dampers made from zintec plate. Most volume dampers are regulated with an electronic motor and sensors and are calibrated to customer specifications before delivery.

The Constant Air Volume damper requires no power source as it is controlled via a mechanical device and calibrated before delivery. All volume dampers can be ordered with a single or double (insulation) skin.

EXTERNAL LOUVRES

A quality range of products for external wall applications. Made from aluminium, with birdscreen or insect screen options. All louvres are made to customer specified sizes and (PPM/G) colours; standard colour is PPM 9006.

DISPLACEMENT

A full range of recessed, semi-recessed, floor, wall and corner units providing high ventilation efficiency and excellent comfort. The very low pressure involved also offer quiet installations. Displacement units are available as wall or floor mounted, or indeed integrated within the architectural design.

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FM 27823

EMS 590755

Waterloo declare that, at the time of print, all products are in accordance with relevant directives, as identified by HEVAC and other European Organisations and will display the CE Marking where required.

August 2019