BOEGGER

DEMISTER PADS
BROCHURE

We can supply full ranges of demister pads and packing materials for liquid and gas separation. We can supply drawings and installation guide for your projects.

Demister Pads
Liquid & Gas Separation

Boegger Industrial Limited
sales@demisterpads.com

www.demisterpads.com

COMPANY **PROFILES**

Boegger Industrial Limited, established in 2000, we have almost 20 years experience in producing and exporting demister pads, knitted wire mesh and other packing materials.

We have strict quality control system by both ISO 9001 certification and enterprise QC department. We claim that all demister pads our customers receive are qualified and in perfect performance. We have wide ranges of specifications for our customers' choice. The filtration fineness can achieve 3 μm to 5 μm. Except for standard and popular sizes, we can also customize for specific applications according to customers' requirements.

With perfect quality, considerate service, our demister pads and packing materials are well received in Australia, America, Canada, New Zealand, UK, and some Europe countries

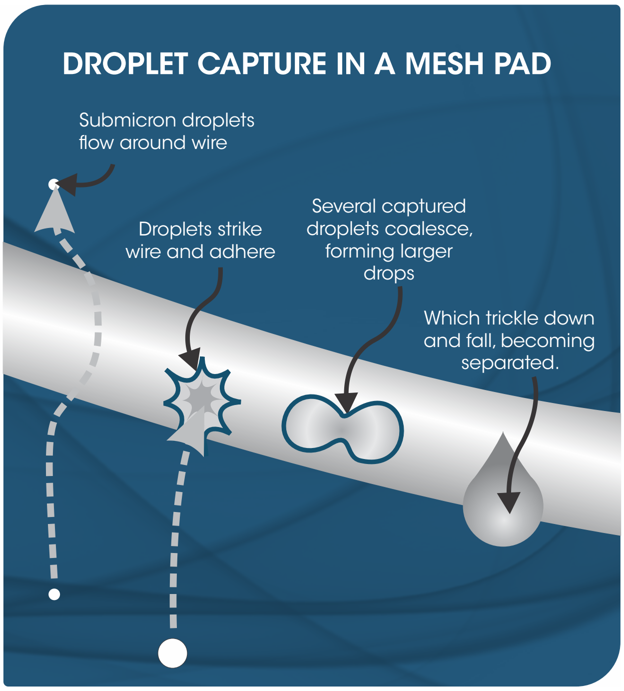
We aim to supply the best quality products, the most considerate service and the most professional guidance for you.

CONTENTS

Why We need Demister Pads?

In the chemical processing industry, there are many processes in which gases and liquids come into contact with each other, and whenever this occurs, the gas will entrain some amount of liquid particles. The liquid that is carried into the gas may cause many problems, such as product loss, equipment damage, low efficiency, etc., so it needs to be eliminated.

Mist eliminator can be defined to mechanically separate the gas and liquid. The equipment in the mist eliminator is called demister pads. Demister pads can help to improve the purity and extend equipment service life.



Droplets Formation

There are many factors in a process that can cause liquid entrainment. Here are some common reasons:

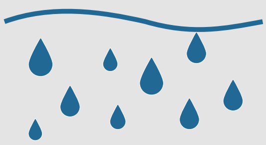
Contact of gas and liquid phases in the mass transfer process or condensation process.

For example, the liquid may results from bubbles bursting or jetting at gas/liquid interface. This is commonly seen in evaporators, bubble columns and distillation columns.

Thermodynamic changes in the system.

For example, when the saturated gas in the condenser and the heat exchanger is cooled, the steam condenses. The gas may become supersaturated, resulting in droplet formation.

Furthermore, if the gas travels too fast and does not allow the droplets to settle under gravity, they will be entrained in gas or steam.



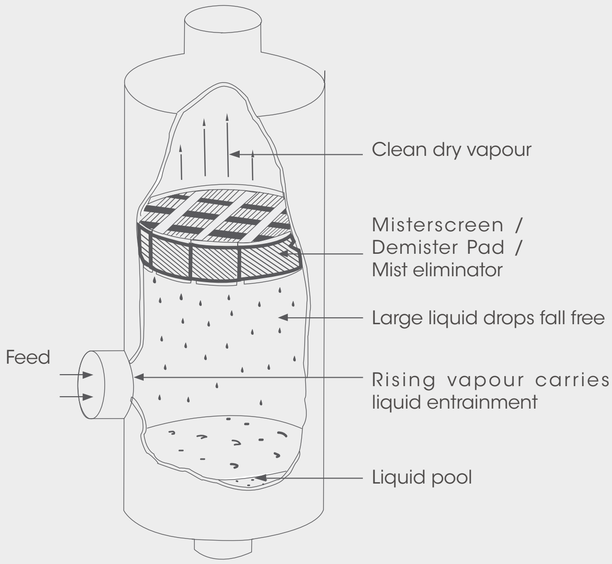
In most cases, the entrainment must be removed to purify the gas and prevent equipment damage or environmental contamination.

Working Principle

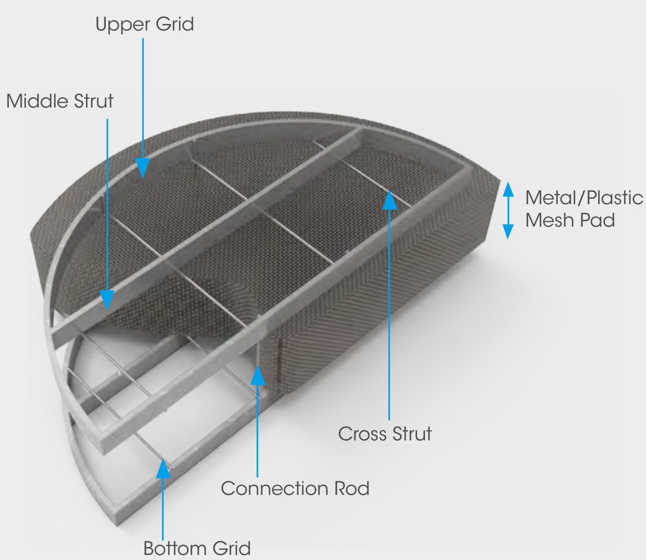
As the gas rises through the demister pad at a constant velocity, the gas collides with the knitted mesh and adheres to the surface of the filament due to the inertia of the rising gas.

The diffusion of gas over the surface of the filament and the gravitational sedimentation of the gas cause larger droplets formed along the filament to the junction of the two filaments.

The wettability of filaments, the surface tension of the liquid and the capillary action of the filaments make the droplets larger and larger. when the droplets are too large, which the self gravity exceeds the gas lifting force, the resultant force of the liquid and surface tension, the droplets will fall off the filaments.



Structures



As the gas rises through the demister pad at a constant velocity, the gas collides with the knitted mesh and adheres to the surface of the filament due to the inertia of the rising gas.

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Knitted Mesh

Knitted wire mesh is made by knitting machine similar to jumpers and scarves machine. The final knitted mesh is in the structure of inter-connecting loops, and it similar to a long knit sock. We can produce multi-filament, co-knit and multi-strand knitted wire meshes. Our knit wire diameter is commonly range from 0.11 mm to 0.35 mm. But for special applications, knit wire as small as 0.03 mm or as large as 0.8 mm in diameter is available.

Material

Steel & Alloy

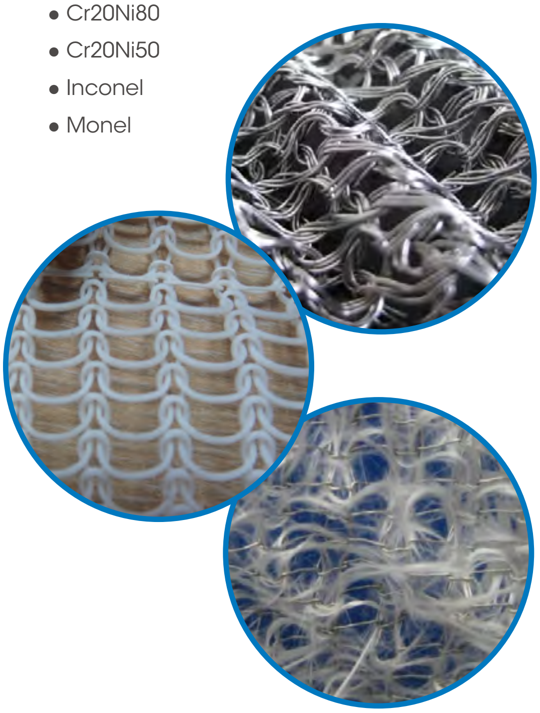
- Carbon steel
- SUS 304
- SUS 321
- SUS 316
- SUS 316L
- SUS 310S
- SUS 304M
- Nickel
- Titanium
- Brass
- Copper
- Cr20Ni80
- Cr20Ni50
- Inconel
- Monel

Nonmetal

- PP
- PTFE

Steel & Fiber

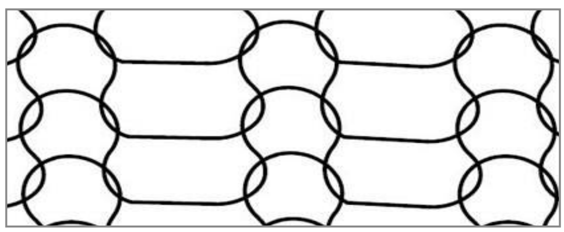
- SUS & Fiberglass
- SUS & PP
- SUS & PVC
- SUS & F46



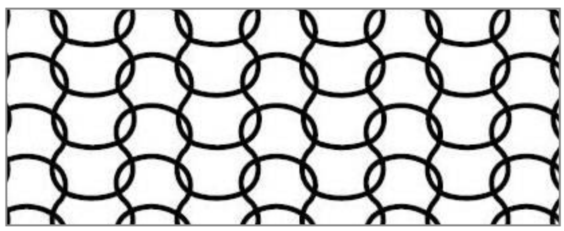
Specification

Type		Wire diameter (mm)	Bulk Density (kg/m³)	Specific Surface Area (m²/m³)	Voidage
SP	Flat Wire	0.1× 0.4	168	475	0.9788
	Round Wire	0.23		320	
DP	Flat Wire	0.1 × 0.3	186	626	0.9765
	Round Wire	0.19		484	
HR	Flat Wire	0.1 × 0.4	134	313	0.9875
	Round Wire	0.23		217	
HP	Round Wire	0.08–0.22	128	403	0.9839

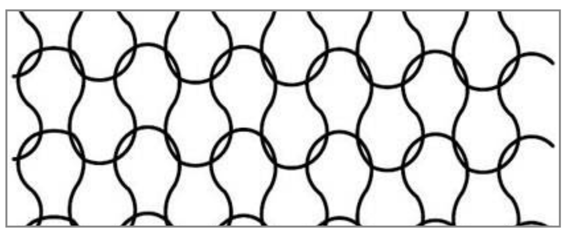
Density



SP



HP/HR



DP

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Order Information

Material: ____________________ (see page05)

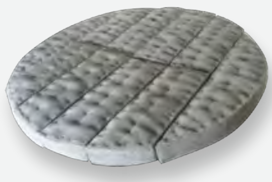
Density: ____________________

Diameter:

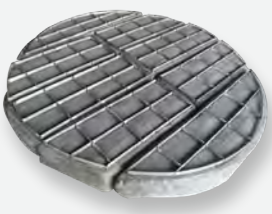
Pad Thickness:	☐ 100 mm	☐ 150 mm
Mesh surface:	☐ Flat	☐ Crimped
Grid type:	☐ With Grid	☐ Without Grid

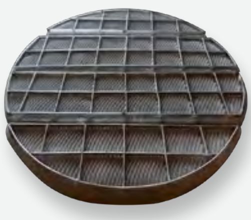
If the diameter is larger than 500 mm. It will be split into sections in the range of 300 mm to 400 mm

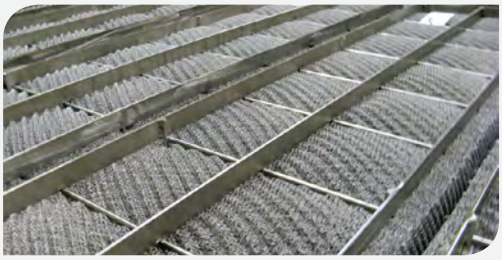

Integral


Without Grid


Plain Mesh


Sectional

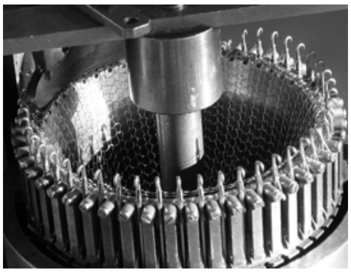

With Grid


Crimped Mesh

Item	Density (kg/m^3)	Free volume (%)	Surface area (m^2/m^3)	Domestic model	Other companies model							
					Metex	York	Becoil	Knitmesh	Vico-tex	Uop	Koch	Acs
[1]BD-1	80	99.0	158	H	Hi-Thruput	931	954	4536	160	B	511	7CA
BD-2	120	98.5	210	L		422						
BD-3	144	98.2	280	N	Nu-Standard	431		9030	280	A	911	4CA
BD-4	128	98.4	460	SN		326			415		706	
BD-5	193	97.5	375	SL	Xtra-Dense	421	890	9033	380	C	1211	4BA
BD-6	300	96.2	575	SM								
BD-7	390	95.0	750	SH								
BD-8	220	97.2	905	T								
BD-9	432	94.5	1780	R	Multi-Strand	333			800			
BD-10	220	97.2	428	W	Wound							
BD-11	160	96.7	5000	GS		371						

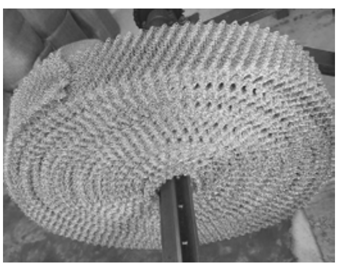
[1] density 80 is suitable for both metal materials and plastic materials.
Other models is only suitable for metal materials.

Production Line



Knitting mesh

1



2

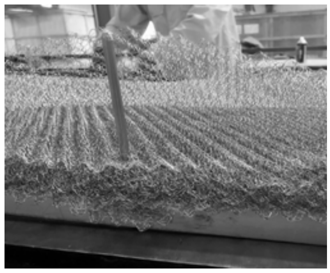
Crimped (optional)

Cut into pieces

3

4

Install the bottom grid

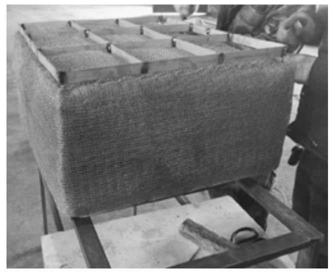


Laying mesh

5

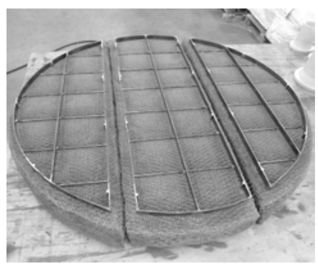
6

Install the top grid



Wrap around

7



8

Finished

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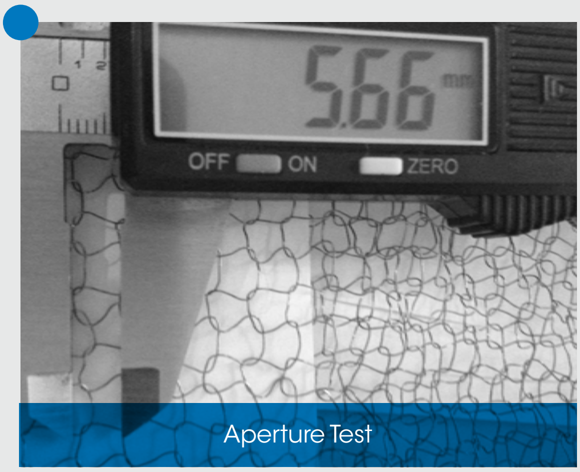
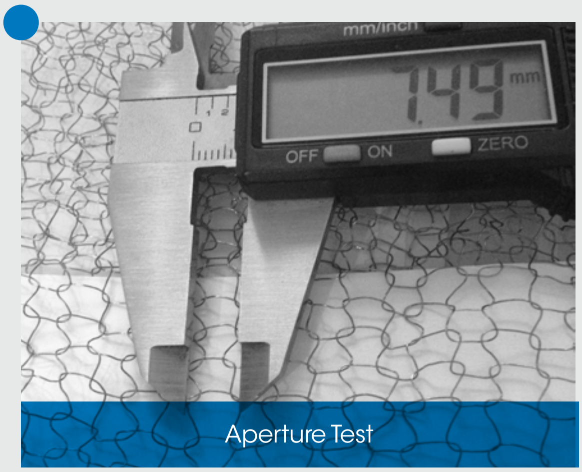
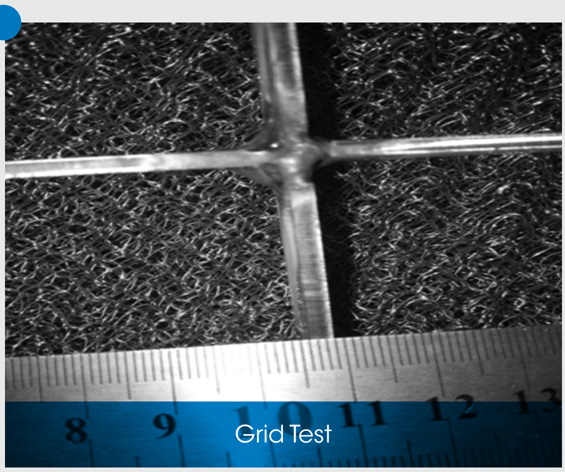
QC System

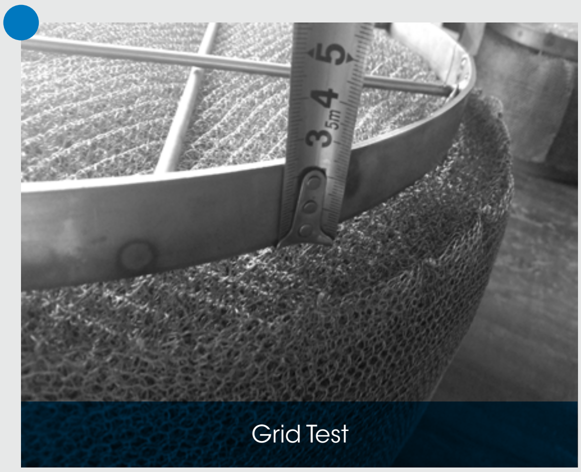


Aperture Test



Aperture Test


Grid Test


Grid Test


Thickness Test


Diameter Test

Mesh pad demister installation fixing options

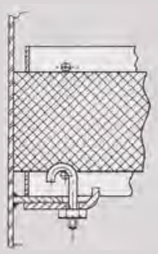


Fig. 1
Horizontal demister
Fixed from below
Using Hookbolts & clmps

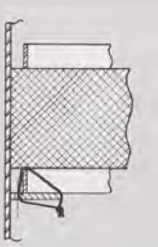


Fig. 2
Horizontal demister
Fixed from below
Using tie wire

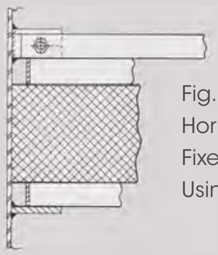


Fig. 3
Horizontal demister
Fixed from above
Using hold-down bars / angles

Fig. 4
Horizontal demister
Fixed from below in box housing
Using threaded rods

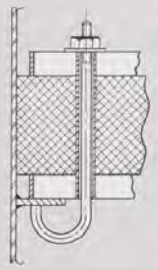


Fig. 5
Horizontal demister
Fixed from above
Using rotating J-Bolts

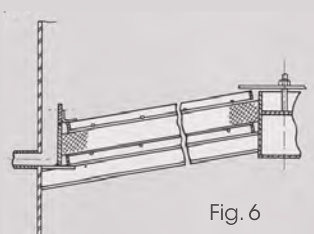


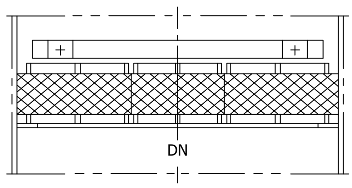
Fig. 6
Conical demister 10° upwards
Fixed from above
Using spider beams & clamps

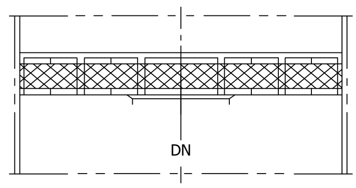
Installation

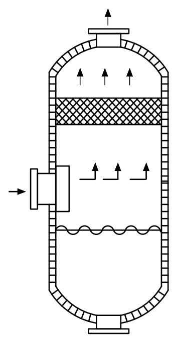
According to different using condition, it can be divided into upload type and download type.s

- Upload type. When the opening is located in the above of the demister pad or when there's flange above the demister pad, you should choose the upload demister pad. Diameter of upload type is ranges from 300 mm to 5200 mm.

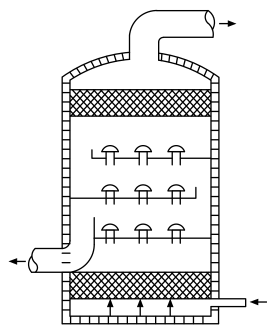
- Download type. When the opening is in the below of the demister pad, you should choose the download type demister pad. Diameter of upload type is ranges from 700 mm to 4600 mm.



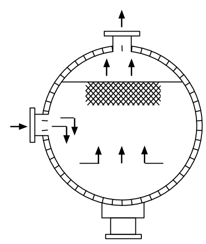




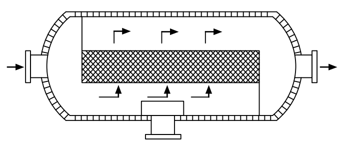
Vertical separation column



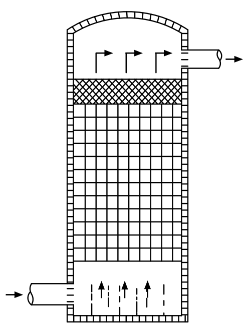
Distillation column



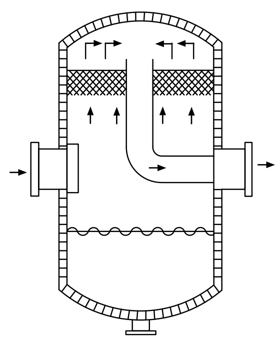
Horizontal separation tower



Spherical separation tower



Packed tower



Scrubber

Applications

Mesh demister pads are used to separate the droplet entrained in the gas to ensure the mass transfer efficiency, reduce valued material loss and improve the operation of the post-column compressor.

Generally, the mesh demister pads are arranged at the top of tower to effectively remove 3–5 μm mist droplets. The mesh demister pads can be arranged in the middle of tower trays to increase the mass transfer efficiency and reduce the board spacing.

Demister pads can not only be used for gas and liquid filtration in towers, they can also be used for gas separation in air filters. In addition, the demister pads can be used as a buffer for various types of instruments in the instrument operation to prevent electronic interference caused by radio waves.

OIL AND GAS PRODUCTION

- Three Phase Separators
- Inlet Scrubbers
- Compressor System
- Cold Separators
- Glycol Dehydration
- Amine Absorption Column

POWER GENERATION

- Steam Drums
- Seawater Desalination Plant
- Flue Gas Desulphurisation
- Compressor System

CHEMICAL INDUSTRY

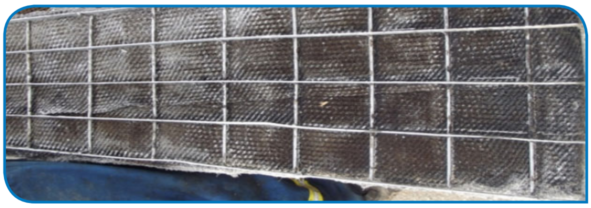
- Distillation
- Gas Absorption and Stripping
- Condensation
- Gas Compression
- Dehumidification and Drying
- Spray Removal and Desalination

PETROLEUM REFINERIES

- Crude Oil Distillation
- Catalytic Cracking
- Alkylation
- Stripping Operation in Desulphurization
- And Hydro Fining Process
- Compression Operations in
- Natural Gas Processing
- Sulphur Condensers

Maintenance

After being used for a period of time, the wire mesh demister pad is easy to be blocked by the particles entrained by mists. The pressure drop will increase and the liquid flooding will occur easily, so it need to be maintained regularly.
Besides, during the use of wire mesh demister pads, air enters the tower and the moisture in the air is easily neutralized with the acid foam in the demister pad to form sweet acid, which may corrode the demister pad, it need to be cleaned regularly.
The maintenance of demister pad is easy. Just wash the demister pads with cleaning water. But the drying process can not be ignored, otherwise the residual dilute acid will decrease the service life of demister pads.

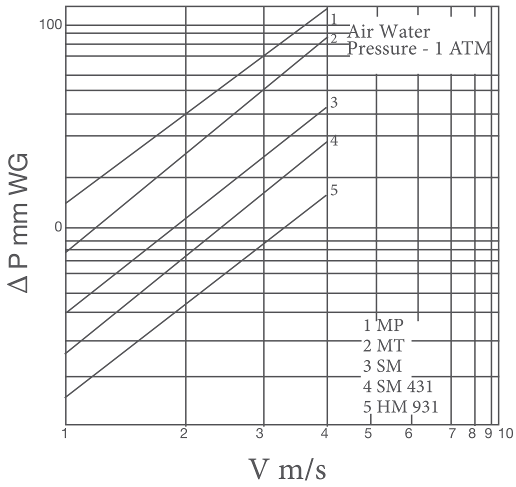


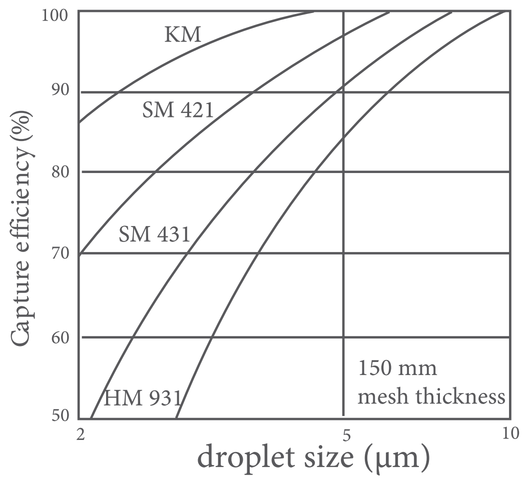
Package

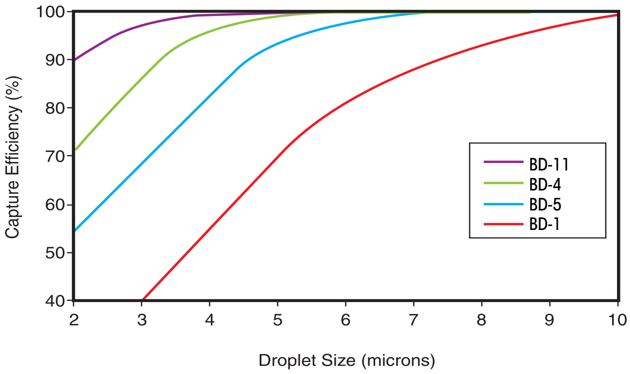
The standard package of demister pad is wooden case, other packages can be customized according to customers' requirements.

Pressure Drop

The separating action of senator largely depends upon the contact surface area necessary for impingement, which must be very distributed. Generally speaking, a higher free volume leads to lower pressure drop. In critical cases, it may be necessary to decide whether pressure drop or efficiency should be sacrificed. Our demister pads allows the greatest possible efficiency at the lowest possible pressure drop.







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Wire Mesh Demister Pad Size Calculation

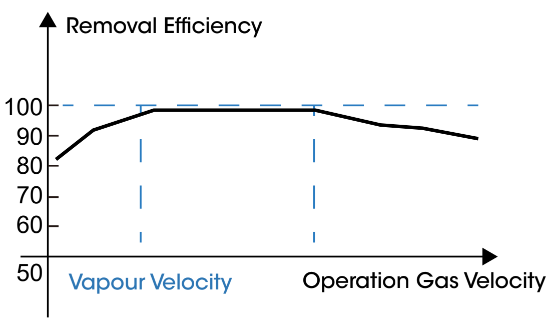
Operation gas velocity calculation

The operating gas velocity is the speed at which the gas passes through the screen, and the operating gas velocity should be selected appropriately.

If the operating gas velocity is too low, the inertia of the mist in the gas is too small, and it is in a floating state. When the gas passing through the wire mesh demister pads, the mist floating on the air cannot be removed.

If the operating gas velocity is too high, and the collected droplets are not easy to fall off from the wire mesh. They will fill the wire mesh, and the trapped droplets are splashed again, and then trapped by the gas, causing a flooding phenomenon, thereby reducing the mist eliminating efficiency.

The relation between operating gas velocity and mist eliminating efficiency is shown in the below.



(1) Actual Vapour Velocity calculation

$$Vs = K\sqrt{\frac{\rho_L - \rho_V}{\rho_V}}$$

Vs = Actual vapour velocity (m/s)
ρ_V = Vapour density (kg/m^3)
ρ_L = Liquid density (kg/m^3)
K = Demister pad constant.

It is related to the knitted mesh type:

Mesh Type	SP	HP	DP	HR
Constant K	0.201	0.233	0.198	0.222

(2) Operation gas velocity calculation

V_g = (0.2–1.0)Vs

(3) V_g = Operation Gas Velocity Calculation
Vs = Actual Vapour Velocity

Demister pad diameter calculation

The calculation of the diameter of the knitted mesh demister pad is related to the gas handling capacity and the operating gas velocity. For a circular wire mesh demister, the diameter is determined by the following formula:

$$D=\sqrt{\frac{4Q}{\pi \times Vg}}$$

D = knitted mesh demister pad diameter

Q = gas handling capacity. volume of gas passing through the wire mesh demister per second, m3/s

Vg = Operation gas velocity

Droplet Removal Efficiency Calculation

The gas and liquid separation efficiency is divided into direct interception efficiency and Inertial impact efficiency.

(1) Direct interception

When the gas flows through the knitted mesh structure, if the droplets in the gas are larger than the aperture size of the knitted mesh structure, they will be blocked by the mesh aperture and separated with gases. If the droplets hit the knitted mesh directly, they will also be intercepted. Direct interception can collect a certain number of particles smaller than its aperture size. The direct interception efficiency computational formula:

$$\eta R=\frac{1}{2Ku}[2(1+R)\ln(1+R)-(1+R)+\frac{1}{1+R}+\alpha(-2R2-\frac{R^4}{2}+\frac{R^5}{2})]$$

$$Ku=\frac{1}{2}-\ln\alpha+\alpha-\frac{\alpha^2}{2}-\frac{4}{2}$$

α=1-£, £ = knitted mesh porosity

$$R=\frac{d}{D_w}$$

d = Droplets diameter, mm;
D_w = Wire diameter, m

(2) Inertial impact efficiency

The droplet has mass and velocity in the flowing gas, so it has momentum. As the gas and the droplets it entrains pass through the demister pad, the gas will flow through the channel with the least resistance and will change direction along the screen structure, ie the streamline will deflect. Because the droplets have momentum, the larger droplets move linearly forward due to inertia, causing droplets located at or near the center of the gas stream to be directed toward or impacted onto the screen and separated. In gas-liquid separation, the effect of inertial impact on large droplets larger than 20 μm is obvious.
When the operating gas velocity is less than the flooding velocity, the calculation formula for the single-network inertial impact capturing efficiency is

$\eta 1 = ØK$

K = collision coefficient, $K = \frac{d^2 \rho_L V_g}{18\, \mu_g D_w}$

Ø = to data of α and R

α	R					
	0.01	0.02	0.05	0.1	0.2	0.5
0.005	0.00076	0.00294	0.0176	0.0638	0.217	–
0.01	0.0009	0.00339	0.0208	0.0755	0.257	–
0.02	0.0011	0.0048	0.0255	0.0926	0.313	1.21
0.05	0.00157	0.0059	0.0365	0.134	0.44	1.78
0.1	0.0023	0.00852	0.0528	0.199	0.624	2.36

d = droplet average diameter, m

D_w = knitted mesh wire diameter 0.19 × 10-3 m

μ_g = aerodynamic viscosity, kg/m.s

V_g = operating gas velocity

ρ_L = droplet density under working temperature and pressure, kg/m^3

ρ_g = gas density under working temperature and pressure, kg/m^3

(3) When the operating gas velocity is less than the flooding speed, the droplet removal efficiency of the knitted demister pad is calculated as:

$E=1-[1-C(\eta_R+\eta_1)]^n$,

E = total droplet removal efficiency, × 100%

C = coefficient related to knitted mesh model

n = knitted mesh layer

Knitted Mesh Model	SP	HP	DP	HR
Coefficient	0.16	0.17	0.15	0.165

Pressure Loss Calculation

The pressure drop loss of the gas after passing through the wire mesh demister can be calculated by the following formula. Generally, the pressure drop loss of the wire mesh demister is controlled below 250–500 Pa.

$$\triangle P = \frac{f V_g^2 H \rho_g (1-£)}{G_c D_w} \times 9.81$$

△ P = pressure loss, Pa

f = friction coefficient of knitted mesh to gas, e.g. metal demister pad, it is 1.5.

V_g = operating gas velocity, 1.584 m/s

G_c = gravitational acceleration, 9.8 m/s^2

H = demister pad thickness, 0.15 m

D_W = demister pad wire diameter, 0.19 × 10-3 m

ρ_g = gas density, 10.57 kg/m^3.

£ = demister pad voidage

Knitted Mesh Model	SP	HP	DP	HR
Voidage	0.9788	0.9839	0.9765	0.9832

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