UNIT 2

UNIT 1

UHT
UNITED HEAT TRANSFER

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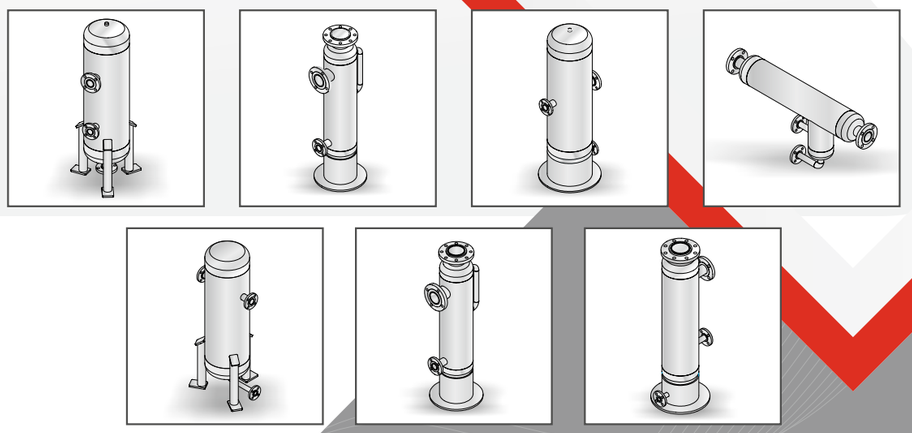
MOISTURE SEPARATORS

Efficient Moisture Separators with a Positive Difference



MOISTURE SEPARATORS

OUR PRODUCTS RANGE


Air Cooled Heat Exchanger

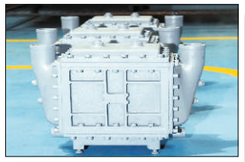

CNG Air Cooled Heat Exchanger


Automatic Backflush Filter


Moisture Separator


Duplex Cooler


Jacket Water Heat Exchanger


Charged Air Cooler

Safe Tube Heat Exchanger


Pressure Vessel


Shell & Tube Heat Exchanger


Surface Extended Heat Exchanger


Surface Extended Heat Exchanger


Skid Mounting Unit


Skid Mounting Unit

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COMPANY PROFILE

United Heat Transfer Pvt. Ltd. is ISO 9001:2015 & ASME U stamp Certified Design & manufacturing company with a wide range of products. UHTPL established in the year of 1995 extending its expertise and expanding with the growing national & multinational OEM industries.

SEPARATOR RANGE COMPRISES BUT LIMITED TO :

1. Vertical Down-Flow
2. Vertical Up-Flow
3. Separators for High Liquid Loads with Secondary Stripping Principle
4. Separators for High Gas Loads with Secondary Stripping Principle
5. In-Line Separators with Secondary Stripping Principle
6. In-Line Demister Separators
7. In-Line Plate (Vane) Separators

Separator vessels can be manufactured from a wide range of materials:

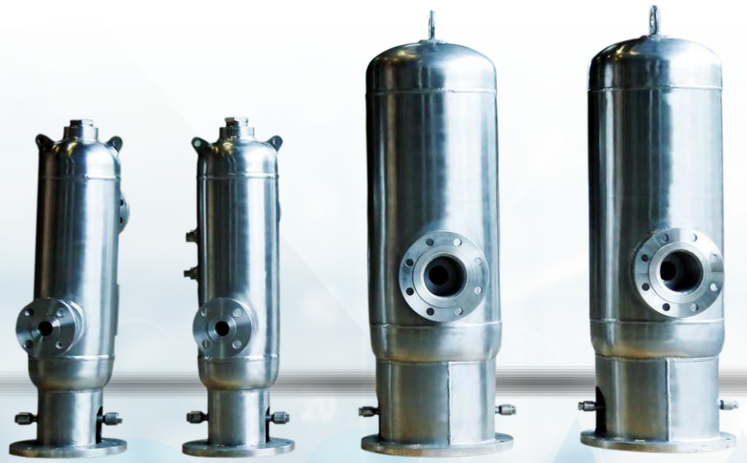
Carbon Steel (various grades)	**Titanium**	**Admirality Brass**
Stainless Steel (All 300 Series Grades)	**Hastealloy**	**Nickel**
Cupro-Nickel (70:30 / 90:10)	**Incoloy**	**Super Duplex**
Low Alloy Steel	**Monel**	**Duplex**
Carbon Steel to meet NACE MR0175/ISO 15156 for H_2S Service		

Pressure Vessel with accreditation to :

ASME or other specifications. Customer specific Nameplate and Tags can also be provided.

United Heat can provide vessels with various certification :

CE PED	**ASME 'U' Stamp & NB**	**UKCA**
IBR	**CU TR-032 / 2013 & 2017**	**ARH**
CRN	**MALAYSIAN DOSH.**	**MOM Singapore**



LIQUID & SOLIDS SEPARATION FROM GAS
DESIGNED BY UNITED HEAT TRANSFER PVT. LTD.

REQUIREMENTS FOR THE CORRECT SEPARATOR SELECTION INCLUDE BUT NOT LIMITED TO THE FOLLOWING :

A. Actual, normal and maximum gas flow condition

B. Maximum, Normal and Minimum Operating Pressure

C. Maximum, Normal and Minimum Operating Temperature

D. Gas details, Name, M.W if available or Gas S.G.

E. Name of the liquid, its density or S.G., Liquid Viscosity and expected liquid load in the gas flow.

F. Required separation cut off point. Microns or millimeters. To minimise equipment cost do not request lower cut off point than actually required. If 50 microns is acceptable do not specify 20 microns as this will consume more energy and a higher pressure loss to achieve a lower cut off point.

G. Expected cut off efficiency, if 75% is required don't specify 90% as this may require more energy to meet the higher efficiency

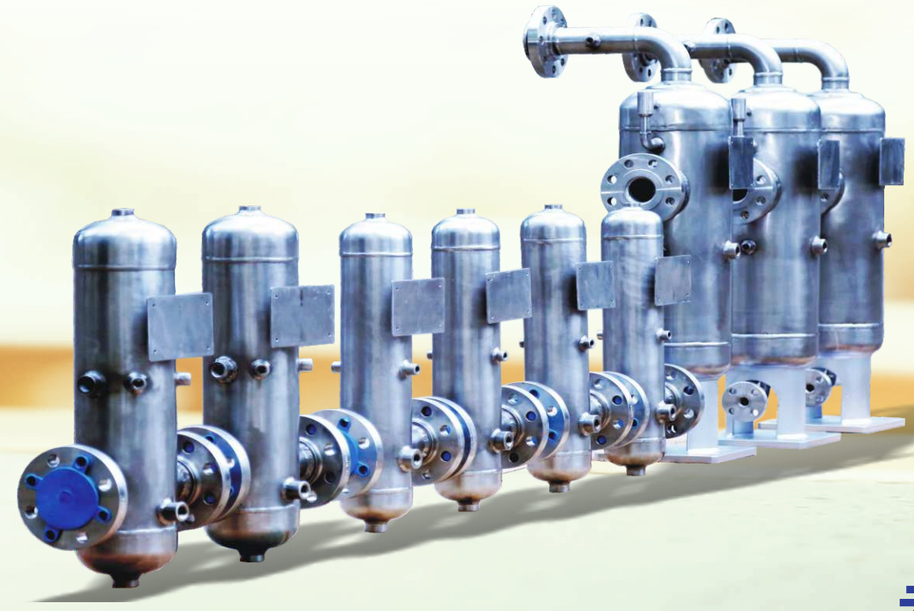
H. What is the purpose of the Separator i.e. Protection of Compressor, Treatment Tower, Boiler, Heat Exchanger

I. Any special conditions which may affect the operation of the separator type i.e. Sticky material and its nature

J. Are there any corrosive compounds i.e. H_2S, Carbonic Acid caused by CO2+ Carbon Monoxide & Water (boilers in particular), acids.

IT IS IMPORTANT - THE CORRECT SELECTION OF EQUIPMENT IS DETERMINED BY THE CORRECT ANSWERS.

REMEMBER IF IN DOUBT ASK, UNITED HEAT HAVE A WIDE RANGE OF SEPARATOR TYPES



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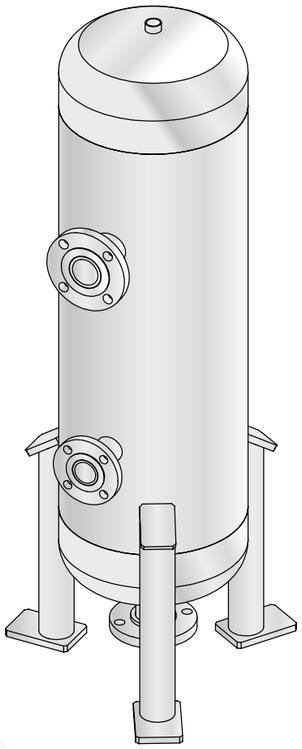
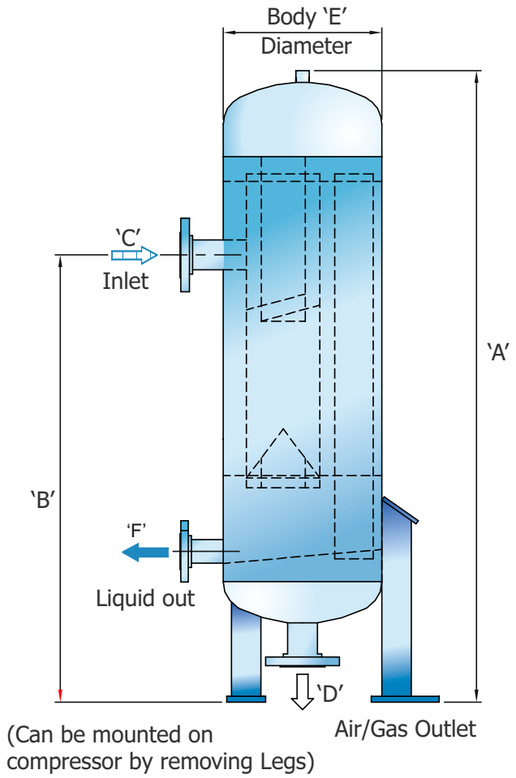
UH-D DOWN-FLOW SEPARATOR





1	Inlet nozzle on vessel centre line (CL)
2	Gas outlet on centre line (CL) of bottom head
3	Liquid outlet can be manual or automatic level controlled

Model	A - Height Inches/mm	B - Inlet to base Inches/ mm	C - Inlet Diameter Inches/mm	D - Outlet Diameter Inches/mm	E - Body O. Diameter Inches / mm	F - Liquid out Diameter Inches/mm
UHD4	40 / 686	30 / 762	2 / 50	3 / 75	12.8 / 324	1 / 20
UHD6	50 / 1270	36.5 / 927	3 / 75	4 / 100	16 / 406	1 / 25
UHD8	58 / 1473	43.5 / 1105	4 / 100	5 / 125	20 / 508	1.5 / 25
UHD10	68 / 1727	52 / 1321	5 / 125	6 / 150	22 / 559	1.5 / 40
UHD12	78 / 1981	61 / 1549	6 / 150	8 / 200	24 / 610	2 / 50
UHD16	95 / 2413	70 / 1778	8 / 200	10 / 250	30 / 762	2 / 50
UHD20	120 /3048	100 / 2540	10 / 254	12 / 300	36 / 914	2 / 50

Please note dimensions are subject to change & dependent on actual operating condition.

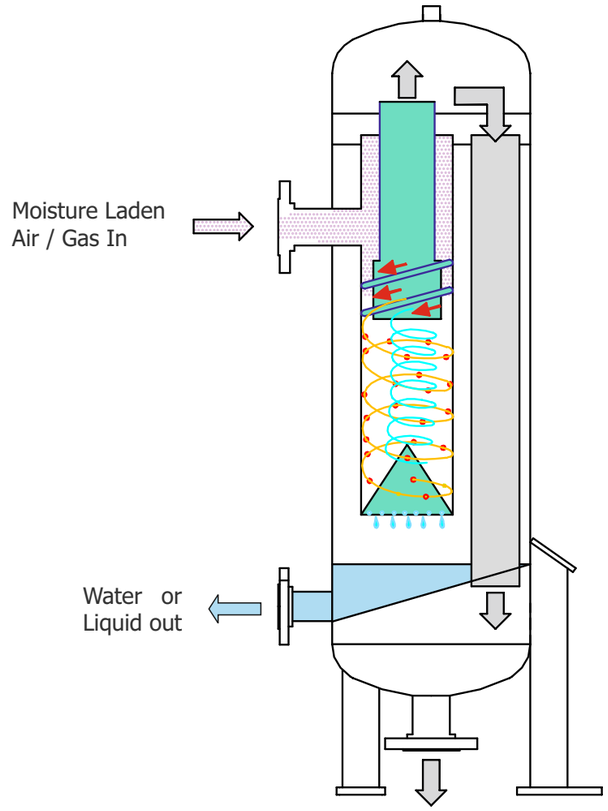
▸ OPERATION PRINCIPLE :

Cyclonic style separators are pressure drop dependent, the gas flow is directed into the cyclone inlet chamber where the unique UH spin assembly creates an effective centrifugal force causing the entrained liquid (and /or solids) to spin under a centrifugal force.

These strong forces cause the liquids and solids along with the gas to spiral downward against the wall of the separator.

Liquid (along with any entrained solids) spiral downward and will flow through drainage holes into the isolated collection chamber.

The gas at this point changes direction, and still spinning passes upward towards the dry gas outlet.



The gas flow reverses, still spinning heads toward the outlet nozzle. To prevent the exiting gas creating a centripetal suction effect as it leaves the separation chamber a flange is installed at the top of the cone. This flange also prevents any residual liquid being drawn into the gas outlet nozzle.

As the gas discharges from the vortex finder it flows through 180° and passes down the vertical discharge pipe before exiting from the clean gas outlet

During Testing results showed a separation efficiency of 99.5% with droplet size below 8 micron.

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▸ ADVANTAGES OF USING THE UH-D DOWN FLOW SEPARATORS : unique in their own right

- Such is the design of that flows volume can be decreased or increased whilst still maintaining good liquid (& Solid) removal efficiency.
- With a side entry inlet and vertically down outlet considerable space savings can be achieved, essential when protecting any device with a vertical entry such as compressor
- Being a self contained unit having Gas Entry Chamber, Separation Chamber, Integral Liquid (& solids) collection chambers all isolated from the gas outlet (Vortex finder).
- It is also an added advantage to have the Inlet and outlet on the same centre line unlike separators which have a tangential inlet to achieve the required centrifugal forces.
- The liquid collection chamber can be increased in size to hold large volumes & allows for fitting automatic level control devices, level gauging and pressure gauges.
- Differential pressure gauges (& or transmitters) can also be added to meet the customers requirements.
- In order to meet pressure vessel requirements all separators can be fitted with pressure safety devices (PSV) and or Bursting Discs.

United Heat can provide and fit all ancillary components such as:

Pressure Gauges
Pressure Transmitters
Differential Pressure Gauges (with transmitting attachment if required)
Level Gauging - whether glass or magnetic type.
Level Control - Pneumatic or Electric or integral Float system
Level Control Valves
Instrument isolation valving.

▸ OPERATING PARAMETERS

Maximum Pressure Drop Inlet to Outlet	10 psid
Maximum Gas Flow Rate (Dry Gas)	≈ 70MMSCFD, which equates to 77,700NM³/Hr or roughly 66,200 Kg/Hr The figures are naturally dependant on operating pressure & temperature
Maximum Liquid (dependent gas/liquid rates)	≈3,500 BPD (557 M³/D)
Recommended maximum liquid in gas flow	50 Barrels/mmscf which equates to (7950 L / 26,700 NM³) and approximately (0.35 L / Kg GAS) The figures are naturally dependant on operating pressure & temperature
Working Pressure Range	5 psi to 1,450 PSI 0.34Bar to ≈100 Bar
Working Temperature Range	-20° F to 350° F -29°C to 177° C

▸ USEFUL FACTS :

LIST OF PRINCIPAL FEATURES FOR UH-D SEPARATOR :

Range of sizes from 2" to 10" Inlet pipe sizes

Models range from UH-D4 to UH-D20

Pressure Range from 5 psi (0.345 Bar.g) to 1450 psi ≈ (100 Bar.g)

Temperature Range from -20°F to 350°F ≈ (-20°C to 177°C)

Inlet and Outlet can be fitted with pressure gauges and differential pressure gauges (or Transmitters)

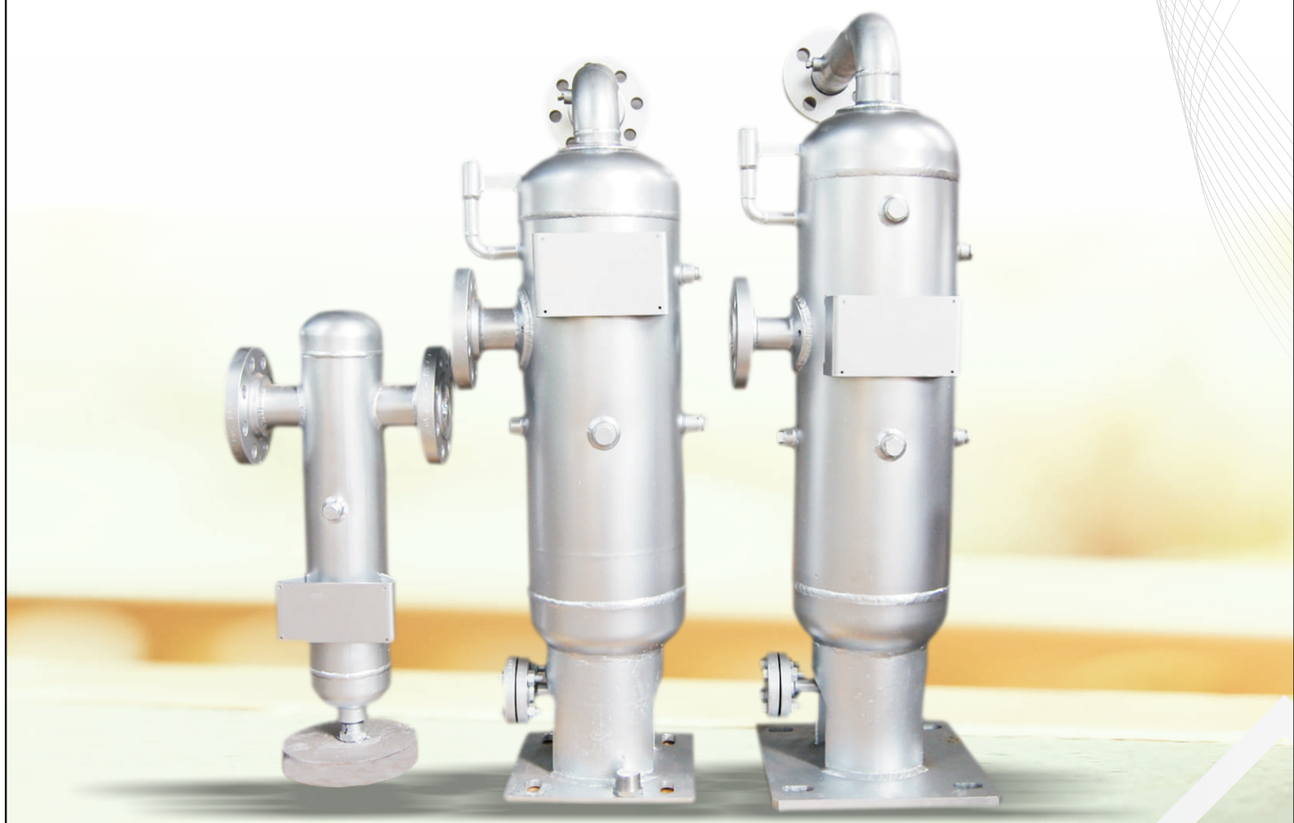
Liquid holding chamber can be fitted with automatic level control, transmitters and level gauging - Methods of control can be electronic and / or pneumatic, or even integral float type.

In order to meet Pressure Vessel requirements all vessels can be fitted with Pressure Safety devices (PSV) and or Bursting Discs

If required full vessel certification, calculations and inspection stamps as required

Connections can be provided with Flat, Raised Face or Ring Joint type flanges.

Small bore connections can be fitted with Flanges, Screwed fittings or Socket weld fittings as required.



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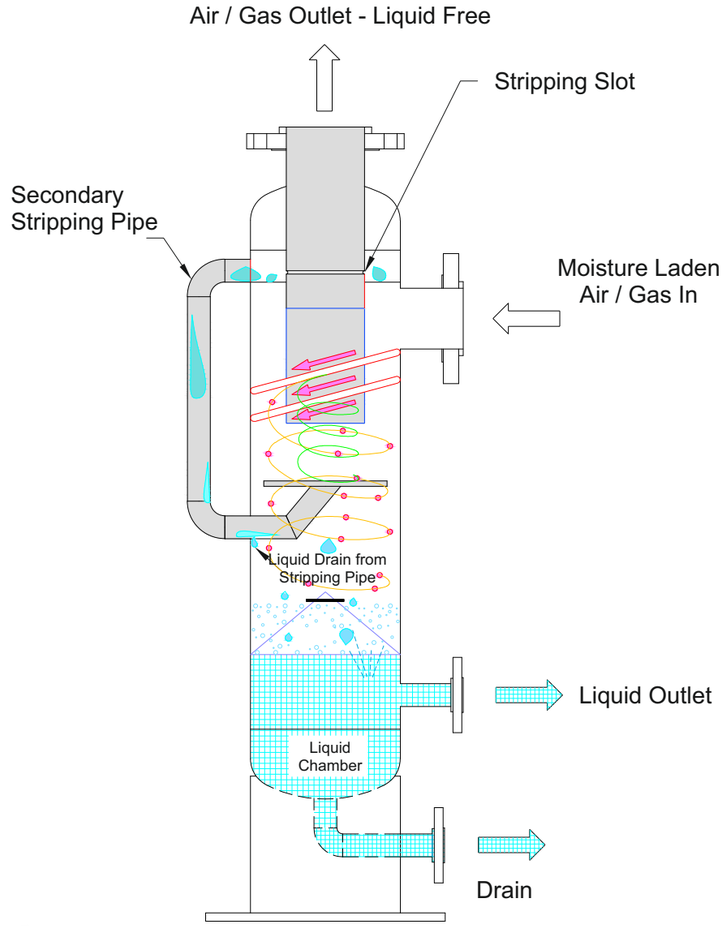
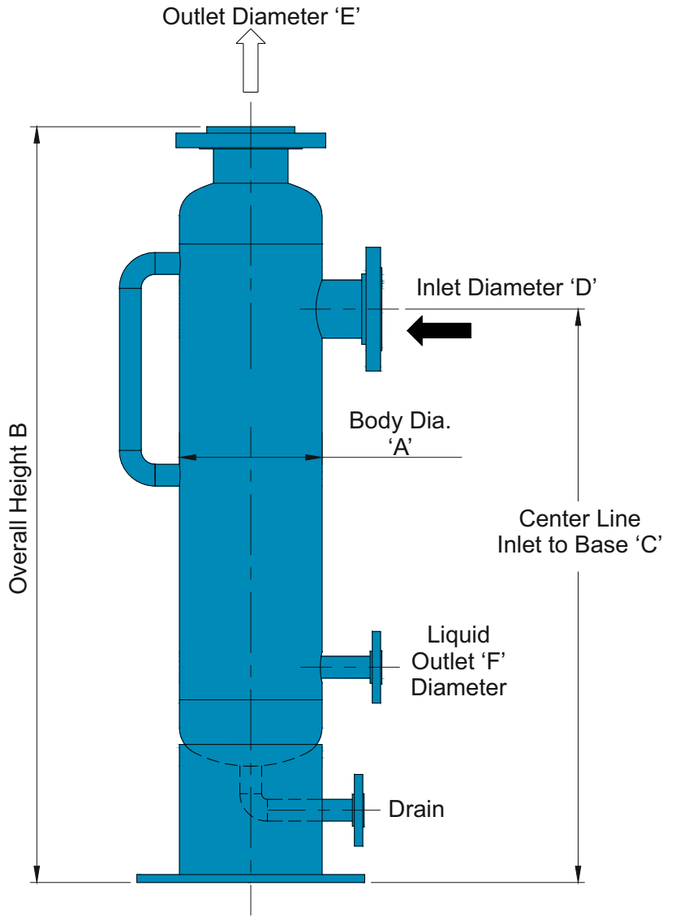
UH-HF SEPARATOR WITH SECONDARY SEPARATION PRINCIPLE



1	Inlet nozzle on vessel centre line (CL)
2	Gas outlet on vessel vertical centre line (CL)
3	Secondary separation for high efficiency removal of liquid (and solids if present)
4	Provision of liquid removal - manual or automatic
5	Manual drain for collected solids and liquid in the vessel sump

UH-HF SEPARATOR WITH SECONDARY STRIPPING PRINCIPLE



Model	‘A’ Body dia. Inches / mm	‘B’ Overall Height Inches / m	‘C’ Inlet to base Inches / mm	‘D’ Inlet Dia Inches / mm	‘E’ outlet Dia Inches / mm	‘F’ Liquid Outlet Inches/mm	‘G’ Drain Inches/mm
UHF 4	4.5 / 114	42 / 1067	32 / 813	2 / 50	2.5 / 63.5	1 / 25	1.5 / 38
UHF 6	6.6 / 168	48 / 1220	36 / 914	3 / 75	4 / 100	1 / 25	1.5 / 38
UHF 8	8.6 / 219	72 / 1828	56 / 1420	4 / 100	5 / 125	1.5 / 38	1.5 / 38
UHF 10	10.8 / 273	78 / 1980	61 / 1550	5 / 125	6 / 150	1.5 / 38	1.5 / 38
UHF 12	12.8 / 324	90 / 2295	70 / 1778	6 / 150	8 / 200	.2 / 50	1.5 / 38
UHF 16	16 / 406	108 / 2745	84 /2134	8 / 200	10 / 254	2 / 50	2 / 50
UHF 20	20 / 508	120 / 3050	93 / 2362	10 / 254	12 / 305	2 / 50	2 / 50
UHF 24	24 / 610	144 / 3660	114 / 2895	12 / 305	16 / 406.4	3 / 75	2 / 50

Please note dimensions are approximate & subject to change dependant on actual operating conditions

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▸ OPERATION PRINCIPLE :

Cyclonic style separators are pressure drop dependent, the gas flow is directed into the cyclone inlet chamber where the unique UH spin assembly creates an effective centrifugal force causing the entrained liquid (and /or solids) to spin under a centrifugal force.

These strong forces cause the liquids and solids along with the gas to spiral downward against the wall of the separator.

Liquid (along with any entrained solids) spiral downward and will flow through drainage holes into the isolated collection chamber.

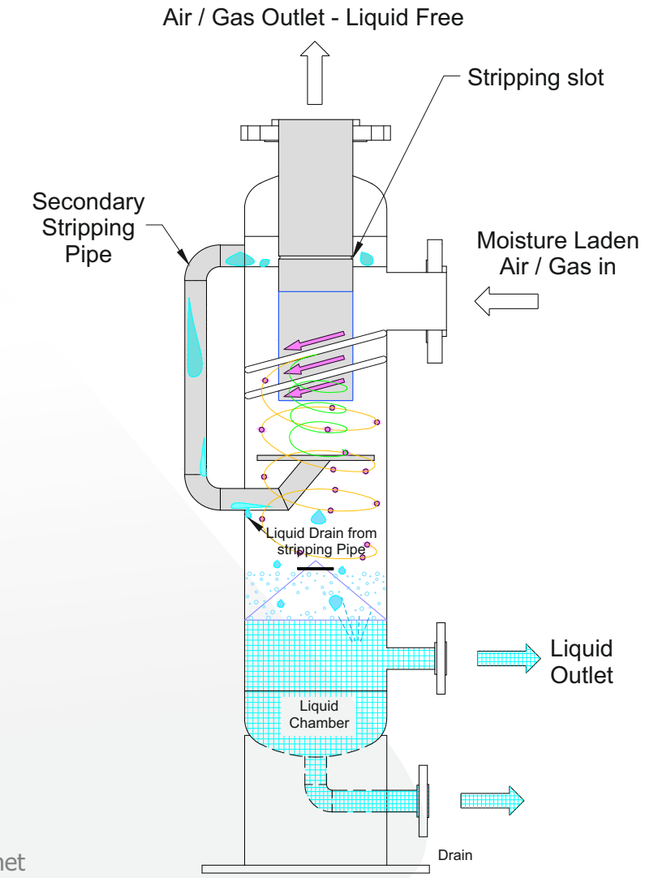
The gas at this point changes direction, and still spinning passes upward towards the dry gas outlet, the resultant centripetal action of gas moving upwards creates a low pressure suction effect which acts on the hole in the baffle plate.

To ensure any residual liquid attached to the separation cone is not drawn by the upward gas flow into the outlet a flange is fitted to stop upward liquid flow.

However by virtue of the Secondary Stripping action any potential micronic droplets entering the vortex finder (gas outlet) will be sucked out at the stripping slot in the vortex finder as a result of the suction effect acting on the centre hole of the baffle plate.

Any liquids drawn into the secondary stripping tube will drop out of the secondary stripping tube at the drain point and will enter into the spinning downward flow on the wall of the separator

Once clear of the vortex finder the gas flow exits free of liquid droplets



▸ ADVANTAGES OF USING THE UH-HF:
Separator with Secondary Stripping principle. Unique in their own right

- Such is the design of that flow volume can be decreased or increased whilst still maintaining good liquid (& Solid) removal efficiency
- Being a self contained unit having Gas Entry Chamber, Separation Chamber, Integral Liquid (& solids) collection chambers all isolated from the gas outlet (Vortex finder).
- The principle feature of this range of separators is the improved efficiency provided by the secondary stripping principle. Conventional vertical cyclone separators can provide 10 to 50 micron separation, however the secondary separation principle improves separation efficiency dramatically - between 2 and 10 micron, even for a 24" (60 cm) diameter vessel
- It is also an added advantage to have the Inlet and Outlet on the same centre line unlike separators which have a tangential inlet to achieve the required centrifugal forces.
- The liquid collection chamber can be increased in size to hold large volumes & allows for fitting automatic level control devices, level gauging and pressure gauges.
- Pressure gauges, Differential pressure gauges (& or transmitters) can also be added to meet the customers requirements.
- In order to meet pressure vessel requirements all separators can be fitted with pressure safety devices (PSV) and or Bursting Discs.

United Heat can provide and fit all ancillary components such as:

Pressure Gauges
Pressure Transmitters
Differential Pressure Gauges (with transmitting attachment if required)
Level Gauging - whether glass or magnetic type.
Level Control - Pneumatic or Electric or integral Float system
Level Control Valves
Instrument isolation valving.

▸ OPERATING PARAMETERS

Maximum Pressure Drop Inlet to Outlet	5 psid
Maximum Gas Flow Rate (Dry Gas)	≈ 70MMSCFD, which equates to 77,700NM³/Hr or roughly 66,200 Kg/Hr The figures are naturally dependant on operating pressure & temperature
Maximum Liquid (dependent gas/liquid rates)	≈3,500 BPD (557 M³/D)
Recommended maximum liquid in gas flow	50 Barrels/mmscf which equates to (7950 L / 26, 700 NM³) and approximately (0.35 L / Kg GAS) The figures are naturally dependant on operating pressure & temperature
Working Pressure Range	5 psi to 1,450 PSI 0.34Bar to ≈100 Bar
Working Temperature Range	-20° F to 350° F -29°C to 177° C

▸ USEFUL FACTS :

LIST OF PRINPAL FEATURES FOR UH-HF SEPARATOR

Range of sizes from 2" to 12" Inlet pipe sizes

Models range from UH-HF4 to UH-HF24

Pressure Range from 5 psi (0.345 Bar.g) to 1450 psi (98.6 Bar.g)

Temperature Range from -20^{0}F to 350^{0}F≈ (-20^{0}C to 177^{0}C)

Inlet and Outlet can be fitted with pressure gauges and differential pressure gauges (or Transmitters)

Liquid holding chamber can be fitted with automatic level control, transmitters and level gauging - Methods of control can be electronic and / or pneumatic, or even integral float type.

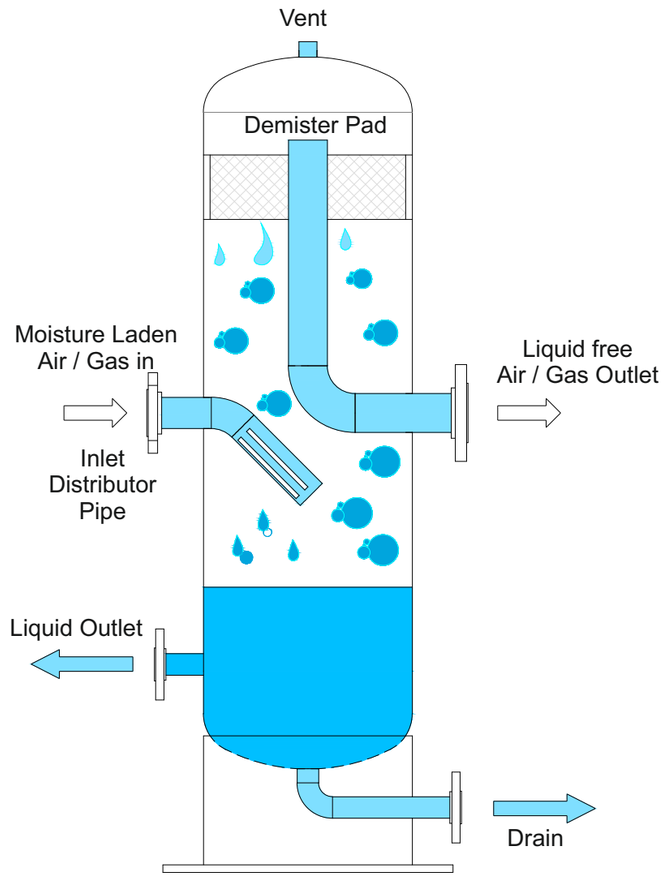
In order to meet Pressure Vessel requirements all vessels can be fitted with Pressure Safety devices (PSV) and or Bursting Discs

If required full vessel certification, calculations and inspection stamps as required

Connections can be provided with Flat, Raised Face or Ring Joint type flanges.

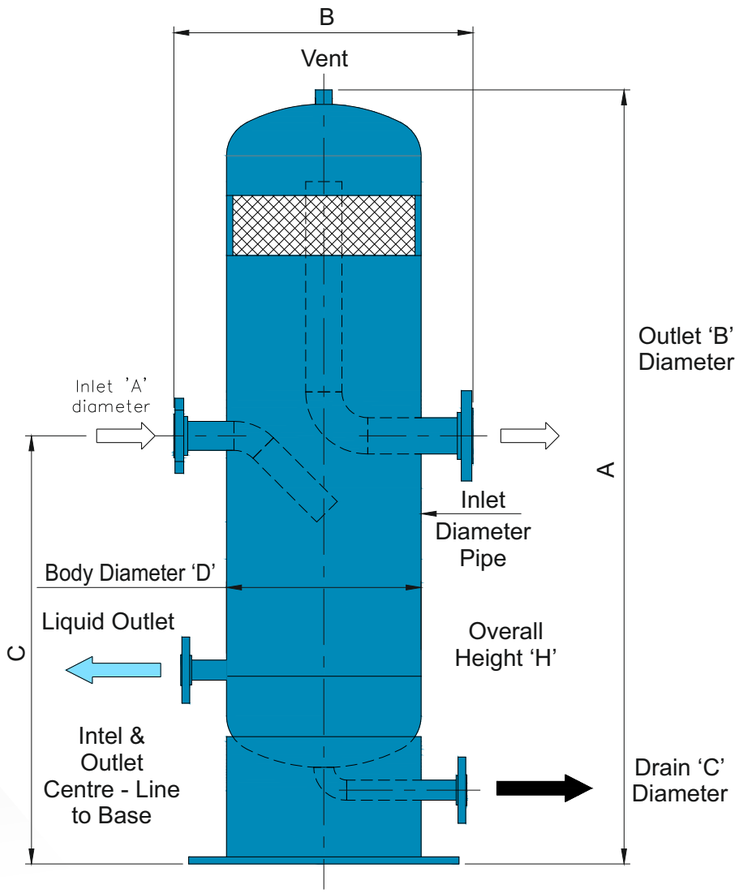
Small bore connections can be fitted with Flanges, Screwed fittings or Socket weld fittings as required.

UH-ID COALESCING DEMISTER SEPARATOR



1	Inlet nozzle on vessel centre line (CL)
2	Inlet flow entry is via an inlet distributor
3	The vessel can be fitted with a top flange connection
4	A quick opening 'T' bolt closure with 'O' ring sealing upto 150 psi (10 Bar) can be provided as a standard, higher pressures can be accommodated.

UH-ID COALESCING DEMISTER SEPARATOR

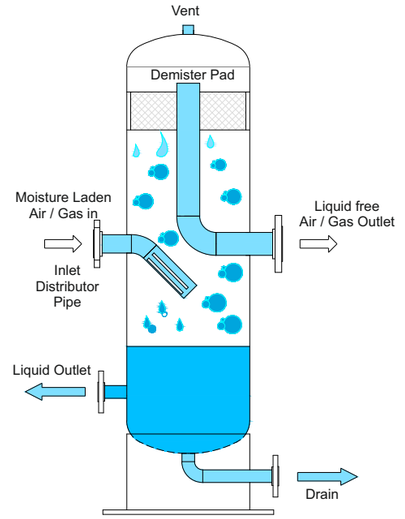


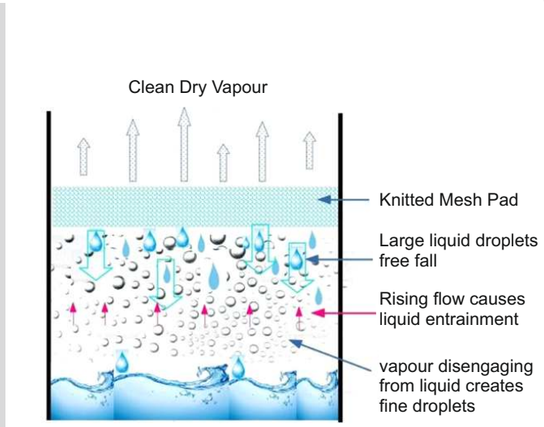
Model Size Inch/mm	'A' - Overall Height Inches/mm	'B' - Face /Face Inlet - Outlet Inches/mm	'C' - Centre Inlet to base Inches/mm	'D' -Body O.Diameter Inches/mm	'E' - Inlet & outlet Inches / mm	'F' - Liquid out diameter Inches/mm	'G' - Drain Inches/mm
UHID 6 / 150	27 / 686	12 / 305	16 / 406	6.63 / 168	1.5 / 40	0.75 / 20	1 / 25.4
UHID 8 / 200	36 / 914	16.8 / 427	22.5 / 572	8.63 / 50	2 / 50	1 / 25	1.5 / 38
UHID 10/ 250	40 / 1016	20 / 508	23.5 / 597	10.8 / 273	2 / 50	1 / 25	1.5 / 38
UHID 12 / 300	46 / 1168	23 / 584	26.5 / 673	12.8 / 324	3 / 75	1.5 / 40	2 / 50
UHID 16 / 400	56 / 1422	26 / 660	31 / 787	16 / 406	4 / 100	2 / 50	2 / 50
UHID 18 / 450	62 / 1575	28 / 711	34 / 864	18 / 457	5 / 125	2 / 50	2 / 50
UHID 20 / 500	68 / 1727	30 / 762	37 / 940	20 / 508	5 / 125	2 / 50	2 / 50
UHID 24 / 600	81 / 2057	36 / 914	46.5/1181	24 / 610	6 / 150	2 / 50	2 / 50

Please note dimensions are subject to change dependant on actual operating condition

▸ OPERATION PRINCIPLE of UH - ID MODEL COALESCING DEMISTER SEPARATORS :

- Coalescing demister separators are designed to provide a high degree of liquid mist removal from gas streams
- Entry to the demister is via an inlet distributor which ensures gas and liquids are released in a uniform manner to the body of the unit without creating gas bubbles or gas carry under with the released liquid.
- Gas free, of high concentrations of liquid mist or bubbles rises upward where entry to the demisting pad causes mist droplets to impinge onto the wires within the pad. As a result fine droplets coalesce into large droplets which overcome the upward flow of gas and fall under gravity into the liquid settling chamber.
- The demister pad will normally be manufactured from stainless steel wire and fibre glass fibres interwoven within the knitted pad structure.
- In the event the liquid is viscous or is sticky in nature a pad knitted of stainless steel wire only is employed as the fine fibre glass strands could result in impairing the coalescing attributes of the pad.
- After leaving the coalescing demister pad the gas free of liquid droplets passes into the outlet pipe and travels downward exiting on the opposite side of the vessel to the gas inlet connection.





▸ OPERATING PARAMETERS

Maximum Pressure Drop Inlet to Outlet	5 PSID
Efficiency down to	2 Microns
Maximum Gas Flow Rate (Dry Gas)	≈7.5 MMSCFD / (10,600) Kg/Hr) 8160 NM³/Hr Dependant on operating pressure & temperature
Liquid mist entering the pad is limited to	228 L/Sq. Ft of Pad Area/Hr ≈(0.12 L / Kg GAS)
Maximum Liquid (dependent gas/liquid rates)	86 BPD (14 M³/Day) Note: liquid rates based on pad loading and does not include free liquid in entry pipe.
Working Pressure Range	1,450 PSI / (100 BAR)
Working Temperature Range	-20 to 350° F / (-29 TO 177°C)

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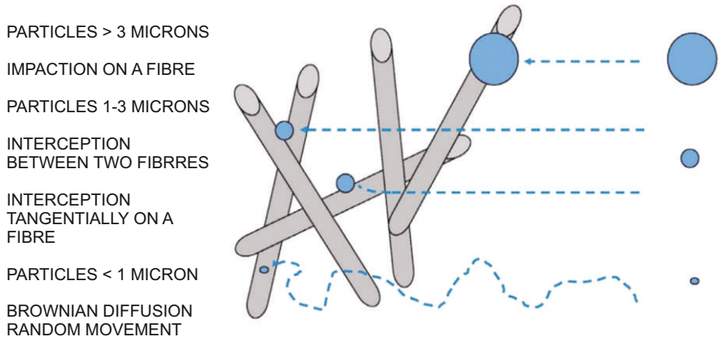
DEMISTER PADS OPERATION PRINCIPLE :

The Demister pad is a device used for removing entrained liquid droplets from a gas stream. As the name indicates the coalescing demister is used for removal of the mist from gaseous phase. Normally the Demister pad is fitted just below the top vapour outlet of a vapor liquid separator, but the UH design is unique in that it allows the inlet and outlet gas connections to be in-line. The demister pads work by coalescing smaller liquid droplets by obstructing their path. Obstruction of path causes increased collisions among the liquid droplets. Most of these droplets stick together and form larger droplets which are too heavy to rise with the gas stream. Thus the bigger liquid drops fall down, against the rising gas flow, into the collection area.

The flow of the Gas stream is unaffected by the obstruction in the path and escapes through the vapour outlet. Actual droplet impingement and droplet formation is shown in the following figure.

COLLECTION MECHANISMS OF LIQUID PARTICLES ON WIRES OR FIBRES



ADVANTAGES OF USING THE UH-ID COALESCING DEMISTER SEPARATOR :

With a side entry inlet and its outlet opposite the inlet space savings can be achieved, essential when protecting any device with a horizontal entry.

Being a self contained unit having Gas Entry Distributor, Separation Chamber, Integral Liquid (& solids) collection chambers all isolated from the gas outlet.

It is also an added advantage to have the Inlet and Outlet on the same centre line unlike separators which have a side inlet and vertical outlet.

The liquid collection chamber can be increased in size to handle large volumes & allows for fitting automatic level control devices, level gauging and pressure gauges.

Differential pressure gauges (& or transmitters) can also be added to meet the customers requirements.

In order to meet pressure vessel requirements all separators can be fitted with pressure safety devices (PSV) and or Bursting Discs.

United Heat can provide and fit all ancillary components such as:

Pressure Gauges
Pressure Transmitters
Differential Pressure Gauges (with transmitting attachment if required)
Level Gauging - whether glass or magnetic type.
Level Control - Pneumatic or Electric or integral Float system • Level Control Valves
Instrument isolation valving.

USEFUL FACTS :

LIST OF PRINPAL FEATURES FOR UH-D SEPARATOR

Range of sizes from 1.5" (40 MM) to 6" (150 MM) Inlet pipe sizes

Models range from UH-ID4 (100 MM) to UH-ID24 (610 MM)

The range of sizes can be increased up to 100" (2.54 M) and Inlet up to 24"(61Cm)

Pressure Range from 5 psi (0.345 Bar.g) to 1450 psi (98.6 Bar.g)

Temperature Range from -20°F to 350°F (-20°C to 177°C)

Inlet and Outlet can be fitted with pressure gauges and differential pressure gauges (or Transmitters)

Liquid holding chamber can be fitted with automatic level control, transmitters and level gauging - Methods of control can be electronic and / or pneumatic, or even integral float type.

In order to meet Pressure Vessel requirements all vessels can be fitted with Pressure Safety devices (PSV) and or Bursting Discs

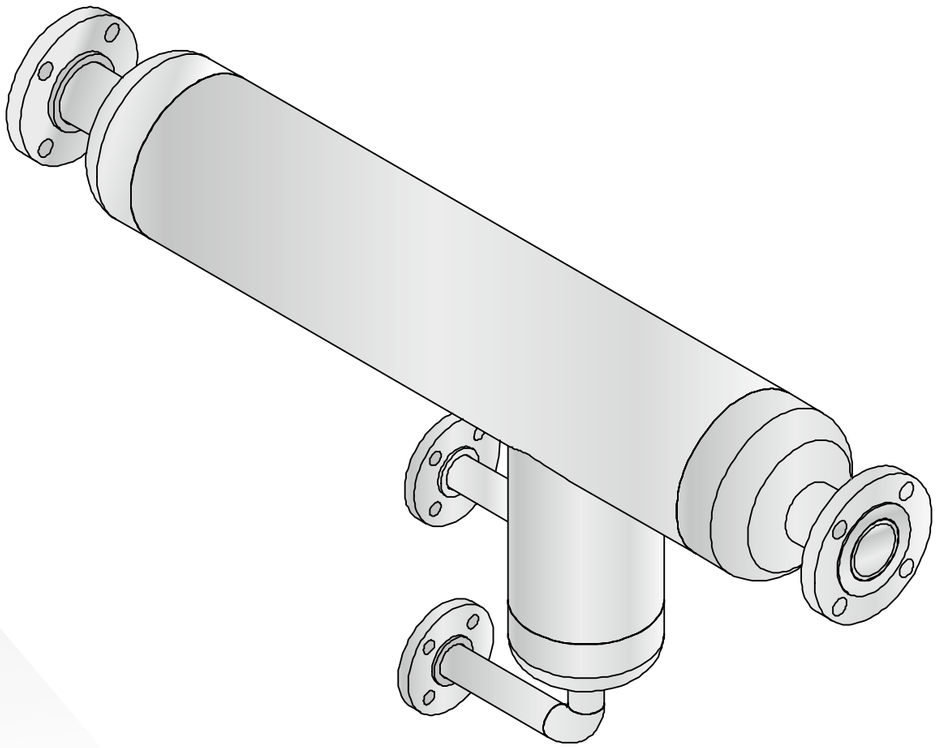
If required full vessel certification, calculations and inspection stamps as required

Connections can be provided with Flat, Raised Face or Ring Joint type flanges.

Small bore connections can be fitted with Flanges, Screwed fittings or Socket weld fittings as required.

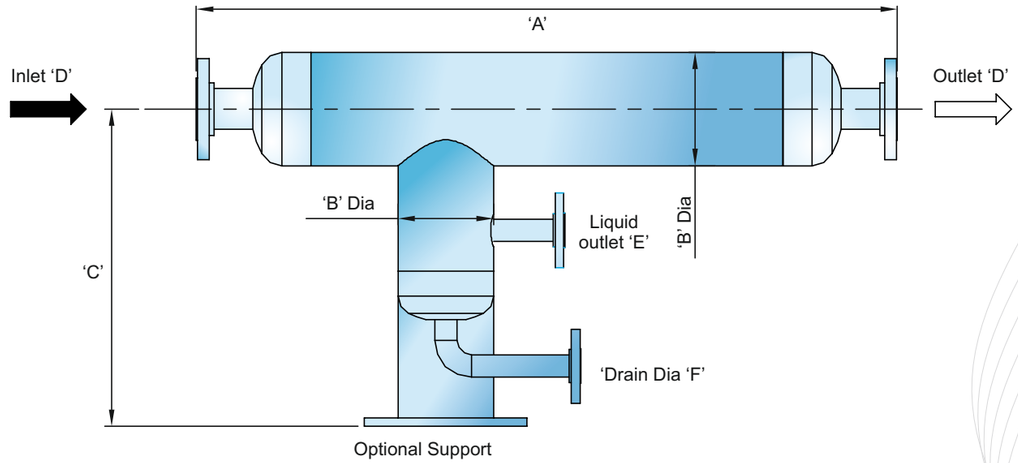
UHT
UNITED HEAT TRANSFER

UH-IN-LINE SEPARATOR WITH SECONDARY SEPARATION PRINCIPLE



1	Inlet and outlet in-line
2	Secondary separation to provide excellent liquid (and solid) removal efficiency
3	Liquid collection sump fitted with liquid outlet and drain connections. Note the drain should be larger then the liquid outlet as it has to cope with any solid which may have accumulated in the sump

UH-IN-LINE SEPARATOR WITH SECONDARY STRIPPING PRINCIPLE



Model	A - Overall Length Inches / mm	B - Body and Sump diameter Inches / mm	C - Centre Line Inlet to base Inches / mm	D - Inlet and Outlet diameter Inches / mm	E - Liquid outlet Inches / mm	F - Drain diameter Inches / mm
1 UH-IL	21 / 558	2 / 50	14 / 355	1 / 25	0.375 / 10	1 / 25.4
1.5 UH-IL	26 / 660	3 / 76	16 / 410	1.5 / 40	0.5 / 13	1 / 25.4
2 UH-IL	30 / 760	4 / 100	18.5 / 470	2 / 50	0.5 / 13	1 / 25.4
3 UH-IL	46 /1170	5 / 127	21 / 534	3 / 75	0.75 / 20	1 / 25.4
4 UH-IL	58 / 1473	6 / 152	22.5 / 572	4 / 100	1 / 25	1 / 25.4
5 UH-IL	68 / 1727	8 / 203	26 / 660	5 / 125	1 / 25	1.5 / 38
6 UH-IL	78 / 1980	10 / 254	30 / 760	6 / 150	1.5 / 40	1.5 / 38
8 UH-IL	102/2590	12 / 304	34"/ 654	8 / 200	1.5 / 40	2 / 50

Please note dimensions are subject to change dependant on actual operating conditions.

▸ OPERATING PARAMETERS

Maximum Pressure Drop Inlet to Outlet	5 PSID
Maximum Gas Flow Rate (Dry Gas)	≈ 70MMSCFD, which equates to 77, 700NM³/Hr or roughly 66,200 Kg/Hr The figures are naturally dependant on operating pressure & temperature
Maximum Liquid (dependent gas/liquid rates)	≈70 BPD / (11 M³/D)
Recommended maximum liquid in gas flow	1 Barrels/mmscf which Which equates to (159 L / 26, 700 NM³) and approximately (0.007 L / Kg GAS) The figures are naturally dependant on operating pressure & temperature
Working Pressure Range	5 psi to 1,450 PSI / 0.34Bar to 98.6 Bar
Working Temperature Range	-20° F to 350° F / -29°C to 176.6° C

▸ OPERATION PRINCIPLE :

Cyclonic style separators are pressure drop dependent, the gas flow is directed into the cyclone tube where the unique spinner assembly creates an effective centrifugal force causing the entrained liquid (and /or solids) to spin under centrifugal force onto the vortex wall of the separator.

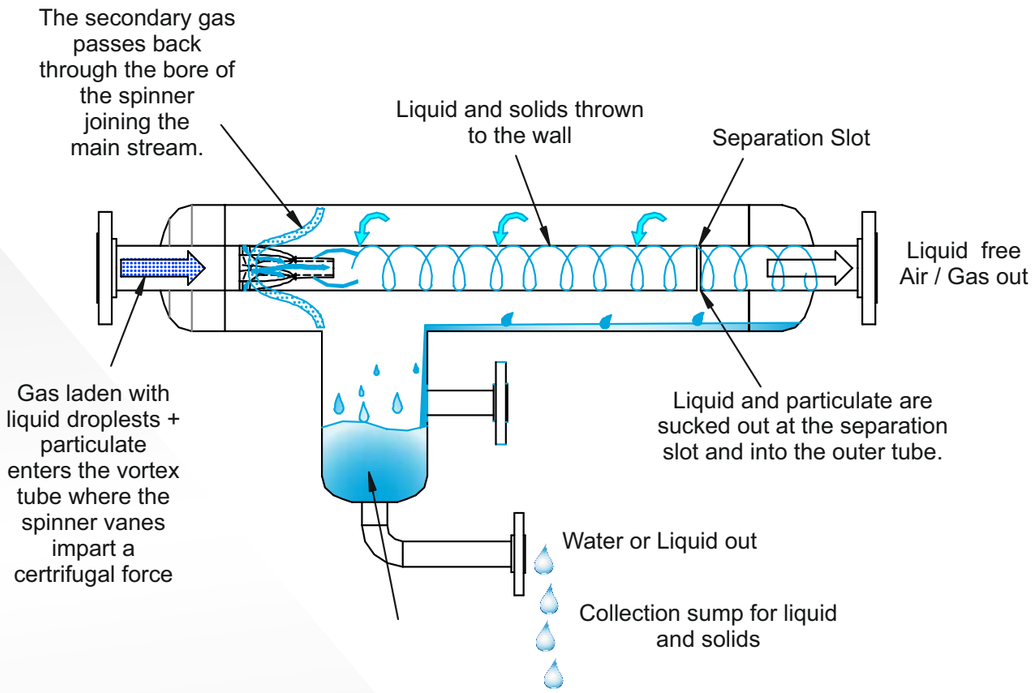
These strong centrifugal forces cause the liquids and solids along with the gas to spiral along the wall of the vortex finder.

Liquid (along with any entrained solids) still spinning will be sucked out of the separation gap along with a small percentage of gas as a result of the secondary separation principle.

The gas at this point still spinning and free of liquid and solids continues through the dry gas outlet.

Liquid and solids sucked out of the separation slot continue to flow along the outer tube as a result of the secondary gas flow where they are deposited into the collection sump.

The secondary gas flow (created by gas passing over the spinner causing a suction effect) flows along the outer tube and back through the secondary separation slot into the center of the spinner to rejoin the main gas flow.



United Heat can provide and fit all ancillary components such as:

Pressure Gauges
Pressure Transmitters
Differential Pressure Gauges (with transmitting attachment if required)
Level Gauging - whether glass or magnetic type.
Level Control - Pneumatic or Electric or integral Float system
Level Control Valves
Instrument isolation valving.

▸ ADVANTAGES OF USING THE UH-IN-LINE SEPARATOR WITH SECONDARY STRIPPING PRINCIPLE. UNIQUE IN THEIR OWN RIGHT

- Such is the design of that flow volume can be decreased or increased whilst still maintaining good liquid (& Solid) removal efficiency
- With its horizontal in-line design this separator is ideal for stripping operations in heat exchanger outlets, fuel systems, gas instrumentation assemblies, steam condensate systems or anywhere where stripping of liquids from gas is required in confined spaces.
- The principle feature of this range of separators is the improved efficiency provided by the secondary stripping principle. Conventional In-Line cyclone separators can provide 10 to 50 micron separation, however the secondary separation principle improves separation efficiency dramatically - between 2 and 10 micron, even for a 8" (20 cm) inlet & outlet connection.
- The liquid collection chamber can be increased in size to hold large volumes & allows for fitting automatic level control devices, level gauging and pressure gauges.
- Pressure gauges, Differential pressure gauges (& or transmitters) can also be added to meet the customers requirements.
- In order to meet pressure vessel requirements all separators can be fitted with pressure safety devices (PSV) and or Bursting Discs.

▸ USEFUL FACTS :

LIST OF PRINPAL FEATURES FOR UH-In-Line SEPARATORS

Range of sizes from 1" to 8" Inlet pipe sizes

Models range from UH-In-Line 1" to UH-In-Line 8"

Pressure Range from 5 psi (0.345 Bar.g) to 1450 psi (98.6 Bar.g)

Temperature Range from -20°F to 350°F (-20°C to 177°C)

Inlet and Outlet can be fitted with pressure gauges and differential pressure gauges (or Transmitters)

Liquid holding chamber can be fitted with automatic level control, transmitters and level gauging - Methods of control can be electronic and / or pneumatic, or even integral float type.

In order to meet Pressure Vessel requirements all vessels can be fitted with Pressure Safety devices (PSV) and or Bursting Discs

If required full vessel certification, calculations and inspection stamps as required

Connections can be provided with Flat, Raised Face or Ring Joint type flanges.

Small bore connections can be fitted with Flanges, Screwed fittings or Socket weld fittings as required.

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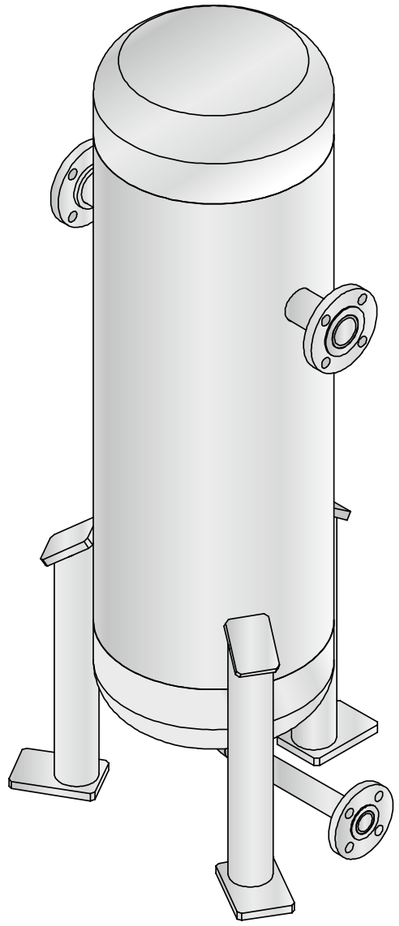
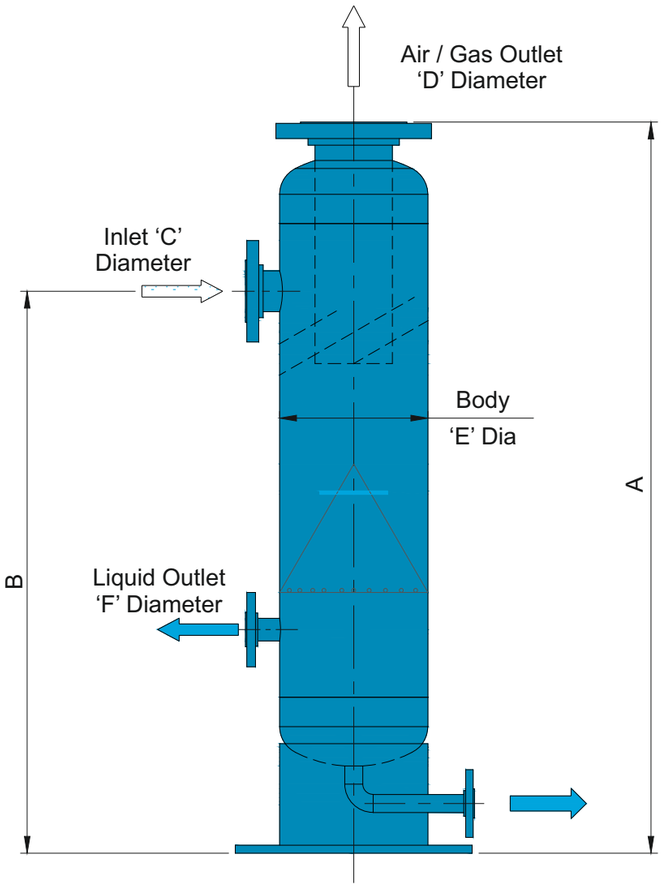
UH-IV PLATE (VANE) DEMISTER SEPARATOR



1	Inlet and outlet connections in-line
2	Inlet flow entry is via an inlet distributors which increases the separators liquid handling characteristics
3	The load on the vane pack is minimised has a result of the inlet distributers

UH-IV PLATE (VANE) DEMISTER SEPARATOR



Model Body Dia. Inches / mm	'A' Face to face Inches / mm	'B' Inlet to base Inches/mm	'C' Overall Height Inches/mm	'D' Inlet Diameter Inches/mm	'E' Outlet Diameter Inches / mm	'F' Liquid out Inches/mm	'G' Drain Inches/mm
UHV6 6.6 / 168	15 / 381	16.5 / 419	26 / 660	1.5 / 40	1.5 / 40	0.75 / 20	1 / 25.4
UHV8 8.6 / 218	17 / 432	17 / 432	28 / 711	2 / 50	2 / 50	1 / 25	1 / 25.4
UHV10 10.8 / 274	21 / 533	18 / 457	33 / 838	2.5 / 62.5	2.5 / 62.5	1.5 / 25	1.5 / 38
UHV12 12.8 / 325	23 / 584	20 / 508	36 / 914	3 / 75	3 / 75	1.5 / 40	1.5 / 38
UHV16 16 / 405	26 / 660	22 / 559	42 / 1067	4 / 100	4 / 100	2 / 50	2 / 50
UHV18 18 / 657	28 / 711	25 / 635	45 / 1143	5 / 125	5 / 125	2 / 50	2 / 50
UHV20 20 / 508	30 / 762	28 / 711	48 / 1219	6 / 150	6 / 150	2 / 50	2 / 50
UHV24 24 / 610	34 / 864	30 / 762	52 / 1270	8 / 200	8 / 200	2 / 50	2 / 50

Please note dimensions are approximate and subject to change dependant on actual operating condition

▸ OPERATION PRINCIPLE :

UH - MODEL HF-IV PLATE (VANE) DEMISTER SEPARATORS

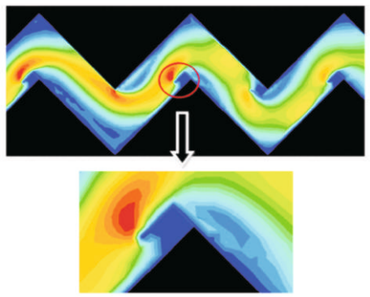
Vane mist eliminators are high capacity separators designed to provide a high degree of liquid mist removal from gas streams which collect essentially 100% of droplets in the range 5 to 30 microns in size

Gas on entering the Vane Pack is subjected to a torturous path which ensures the gas flow follows the Vane surface this in turn provides a coagulating surface for mist droplets to agglomerate and form larger droplets.

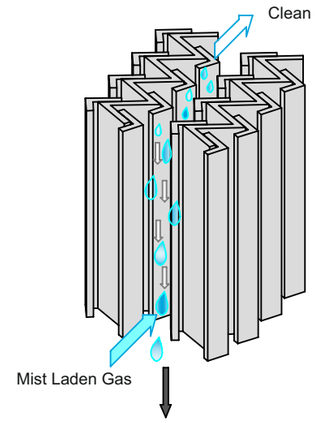
The Vanes have vertical drainage hooks which causes the agglomerated droplets to drain downward into the drainage collection cone.

The advantage of Vane Separators is that they operate at approximately 3 times that of Coalescing Demister pads and are largely unaffected by foaming or sticky liquids which could foul demister pads .

On passing through the Vane Pack Assembly the gas free of liquid droplets exit opposite the gas entry nozzle.



Vane-Mist Eliminator with Hook



▸ REQUIREMENTS :

- Vane packs rely for efficiency on a wetted surface, if the gas is dry it is necessary to wet the surface to ensure that when the mist arrives it is removed efficiently.
- UH can provide a misting nozzle on the Inlet pipe if required.

▸ SEPARATION EFFICIENCY :

Vane mist eliminators are among the most effective devices to separate liquid droplets from a gas flow.

Separation efficiency of these devices is largely dependent on the gas velocity, vane spacing and vane turning angles.

In studies the efficiency of this type of mist eliminator was investigated, using computational fluid dynamics (CFD). In addition, a prediction model of the separation efficiency was obtained based on the response surface methodology.

The simulation results showed that there was a dependency of separation efficiency on the gas velocity and geometrical parameters of vanes.

The optimal values of these parameters were determined in order to achieve the maximum separation efficiency.

Citation: Gharib J, Moraveji MK (2012) Determination the Factors Affecting the Vane-Plate Demisters Efficiency Using CFD Modeling.

▸ ADVANTAGES OF USING THE UH-IV PLATE (VANE) DEMISTER SEPARATOR :

- With a side entry inlet and its outlet opposite the inlet space savings can be achieved, essential when protecting any device with a horizontal entry.
- Being a self contained unit the vapour flow enters the Vane pack assembly and separated liquid falls via a collection point into the isolated Liquid (& solids) collection chamber.
- It is also an added advantage to have the Inlet and Outlet on the same centre line unlike separators which have staggered connections, low side inlet and high side outlet.
- The liquid collection chamber is sized to handle adequate liquid volume & allows for fitting automatic level control devices, level gauging and pressure gauges.
- Differential pressure gauges (& or transmitters) can also be added to meet the customers requirements.
- In order to meet pressure vessel requirements all separators can be fitted with pressure safety devices (PSV) and or Bursting Discs.

▸ OPERATING PARAMETERS :

Maximum Pressure Drop Inlet to Outlet	5 PSID
Efficiency down to	5 Microns
Maximum Gas Flow Rate (Dry Gas)	≈ 45 MSCFD / (42,500 Kg/Hr) 50000 NM^3/Hr Dependant on operating pressure & temperature
Liquid mist entering the vane pack (inlet area) is limited to	1135 $L/Ft^2/Hr$ / ≈(0.12 L / Kg GAS)
Maximum Liquid (dependent gas/liquid rates)	86 BPD (14 M^3/Day) Note : Liquid rates based on demister loading and does not include free liquid in entry pipe.
Working Pressure Range	1,450 PSI / (100 BAR)
Working Temperature Range	-20^0 F to 350^0 F / -29^0C to 176.6^0C

▸ USEFUL FACTS :

LIST OF PRINPAL FEATURES FOR UH-IV PLATE (VANE) SEPARATOR

Range of sizes from 1.5" (40 MM) to 8" (150 MM) Inlet pipe sizes

Models range from UH-IV4 (100 MM) to UH-IV24 (610 MM)

The range of sizes can be increased up to 100" (2.54 M) and Inlet up to 24"(61Cm)

Pressure Range from 5 psi (0.345 Bar.g) to 1450 psi ≈(100 Bar.g)

Temperature Range from -20°F to 350°F (-20°C to 177°C)

Inlet and Outlet can be fitted with pressure gauges and differential pressure gauges (or Transmitters)

Liquid holding chamber can be fitted with automatic level control, transmitters and level gauging - Methods of control can be electronic and / or pneumatic, or even integral float type.

In order to meet Pressure Vessel requirements all vessels can be fitted with Pressure Safety devices (PSV) and or Bursting Discs

If required full vessel certification, calculations and inspection stamps as required

Connections can be provided with Flat, Raised Face or Ring Joint type flanges.

Small bore connections can be fitted with Flanges, Screwed fittings or Socket weld fittings as required.

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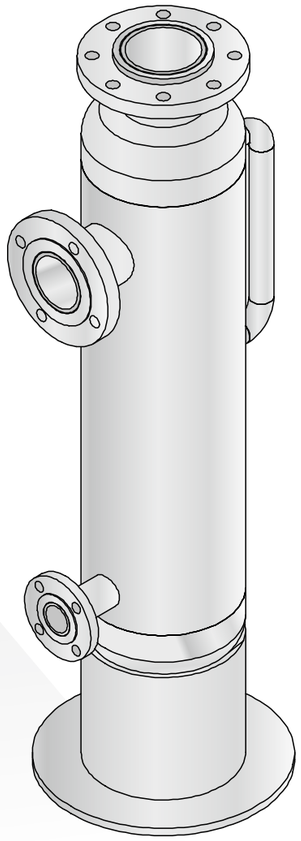
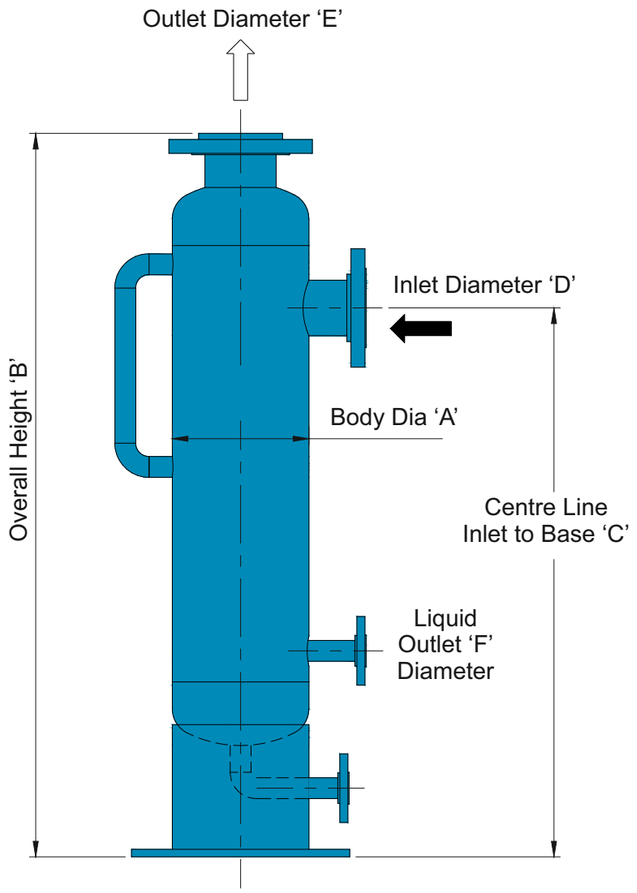
UH-MF SEPARATOR WITH SECONDARY SEPARATION PRINCIPLE





Model	‘A’ Body dia. Inches / mm	B’ Overall Height Inches / m	‘C’ Inlet to base Inches / mm	‘D’ Inlet Dia Inches / mm	‘E’ outlet Dia Inches / mm	‘F’ Liquid Inches/mm	‘G’ Drain Inches/mm
UH MF 4	4.5 / 114	42 / 1067	32 / 813	1.5 / 38	2 / 50	1 / 25	1 / 25
UH MF 6	6.6 / 168	48 / 1220	36 / 914	2 / 50	3 /75	1 / 25	1 / 25
UH MF 8	8.6 / 219	72 / 1828	56 / 1420	3 / 75	4 / 100	1.5 / 38	2 / 50
UH MF 10	10.8 / 273	78 / 1980	61 / 1550	4 / 100	5 / 125	1.5 / 38	2 / 50
UH MF 12	12.8 / 324	90 / 2295	70 / 1778	4 / 100	6 / 150	.2 / 50	2 / 50
UH MF 16	16 / 406	108 / 2745	84 /2134	5 / 125	8 / 200	2 / 50	2 / 50
UH MF 20	20 / 508	120 / 3050	93 / 2362	6 / 150	10 / 250	2 / 50	2 / 50
UH MF 24	24 / 610	144 / 3660	114 / 2895	8 / 200	12 / 300	3 / 75	3 / 75

Please note dimensions are approximate & subject to change dependant on actual operating conditions

OPERATION PRINCIPLE :

Cyclonic style separators are pressure drop dependent, the gas flow is directed into the cyclone inlet chamber where the unique UH spin assembly creates an effective centrifugal force causing the entrained liquid (and /or solids) to spin under a centrifugal force.

These strong forces cause the liquids and solids along with the gas to spiral downward against the wall of the separator.

Liquid (along with any entrained solids) spiral downward and will flow through drainage holes into the isolated collection chamber.

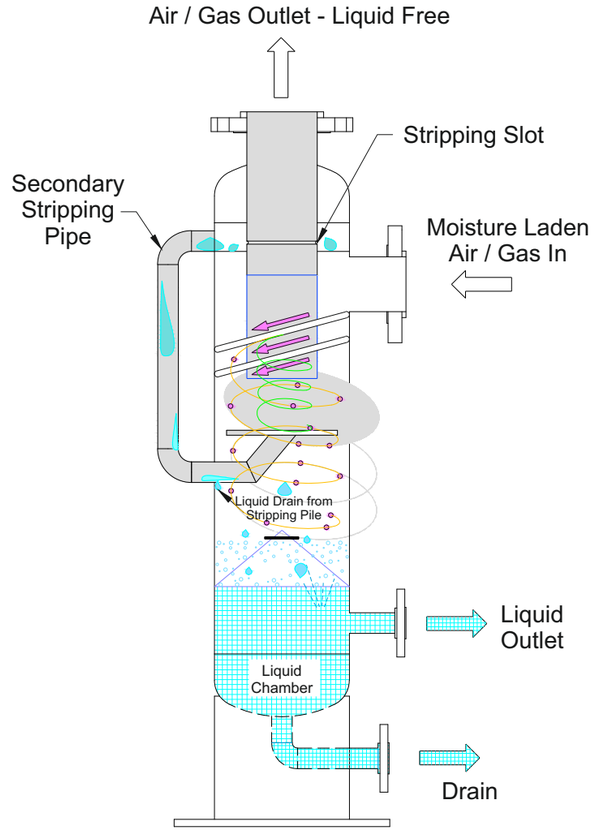
The gas at this point changes direction, and still spinning passes upward towards the dry gas outlet, the resultant centripetal action of gas moving upwards creates a low pressure suction effect which acts on the hole in the baffle plate.

To ensure any residual liquid attached to the separation cone is not drawn by the upward gas flow into the outlet a flange is fitted to stop upward liquid flow.

However by virtue of the Secondary Stripping action any potential micronic droplets entering the vortex finder (gas outlet) will be sucked out at the stripping slot in the vortex finder as a result of the suction effect acting on the centre hole of the baffle plate.

Any liquids drawn into the secondary stripping tube will drop out of the secondary stripping tube at the drain point and will enter into the spinning downward flow on the wall of the separator

Once clear of the vortex finder the gas flow exits free of liquid droplets



▸ ADVANTAGES OF USING THE UH-MF SEPARATOR WITH SECONDARY STRIPPIMH PRINCIPLE. UNIQUE IN THEIR OWN RIGHT

- Such is the design of that flows volume can be decreased or increased whilst still maintaining good liquid (& Solid) removal efficiency
- Being a self contained unit having Gas Entry Chamber, Separation Chamber, Integral Liquid (& solids) collection chambers all isolated from the gas outlet (Vortex finder).
- The principle feature of this range of separators is the improved efficiency provided by the secondary stripping principle. Conventional vertical cyclone separators can provide 10 to 50 micron separation, however the secondary separation principle improves separation efficiency dramatically - between 2 and 10 micron, even for a 24" (60 cm) diameter vessel
- It is also an added advantage to have the Inlet and outlet on the same centre line unlike separators which have a tangential inlet to achieve the required centrifugal forces.
- The liquid collection chamber can be increased in size to hold large volumes & allows for fitting automatic level control devices, level gauging and pressure gauges.
- Pressure gauges, Differential pressure gauges (& or transmitters) can also be added to meet the customers requirements.
- In order to meet pressure vessel requirements all separators can be fitted with pressure safety devices (PSV) and or Bursting Discs.

United Heat can provide and fit all ancillary components such as:

Pressure Gauges
Pressure Transmitters
Differential Pressure Gauges (with transmitting attachment if required)
Level Gauging - whether glass or magnetic type.
Level Control - Pneumatic or Electric or integral Float system
Level Control Valves
Instrument isolation valving.

▸ CONSTRUCTIONAL KEY POINTS :

1	Inlet nozzle on vessel centre line
2	Gas outlet on vessel vertical centre line
3	Secondary separation for high efficiency removal of liquid (and solids if present)
4	Provision for liquid removal-manual or automatic
5	Manual drain for collected solids and liquid in the vessel sump

▸ OPERATING PARAMETERS

Maximum Pressure Drop Inlet to Outlet	10 PSID
Maximum Gas Flow Rate (Dry Gas)	≈ 70MMSCFD, which equates to 77,700NM³/Hr or roughly 66,000 Kg/Hr The figures are naturally dependant on operating pressure & temperature
Maximum Liquid (dependent gas/liquid rates)	≈14.000 BPD (2226 M³/D)
Recommended maximum liquid in gas flow	200 Barrels/mmscf Which equates to (31.800 L / 26700 NM³) and approximately (1.4 L / Kg GAS) The figures are naturally dependant on operating pressure & temperature
Working Pressure Range	5 psi to 1,450 PSI ≈ 0.34Bar to 98.6 Bar
Working Temperature Range	-20° F to 350° F -29°C to 176.6°C

▸ USEFUL FACTS :

LIST OF PRINCIPAL FEATURES FOR UH-MF SEPARATOR

Range of sizes from 1.5" to 8" Inlet pipe sizes

Models range from UH-D4 to UH-D24

Pressure Range from 5 psi (0.345 Bar.g) to 1450 psi ≈(100 Bar.g)

Temperature Range from -20°F to 350°F (-20°C to 177°C)

Inlet and Outlet can be fitted with pressure gauges and differential pressure gauges (or Transmitters)

Liquid holding chamber can be fitted with automatic level control, transmitters and level gauging - Methods of control can be electronic and / or pneumatic, or even integral float type.

In order to meet Pressure Vessel requirements all vessels can be fitted with Pressure Safety devices (PSV) and or Bursting Discs

If required full vessel certification, calculations and inspection stamps as required

Connections can be provided with Flat, Raised Face or Ring Joint type flanges.

Small bore connections can be fitted with Flanges, Screwed fittings or Socket weld fittings as required.

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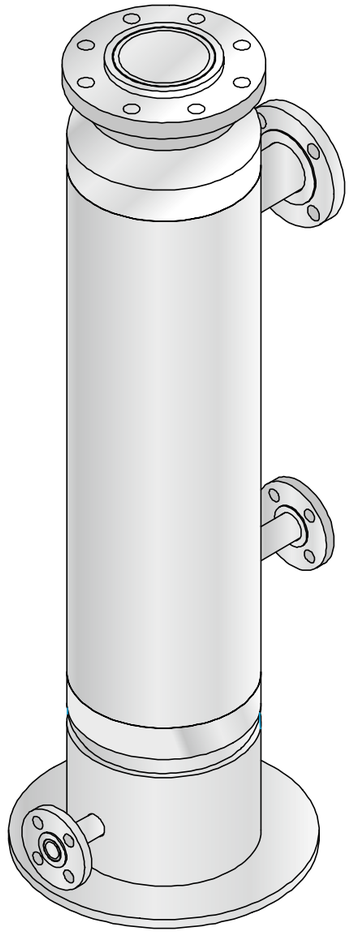
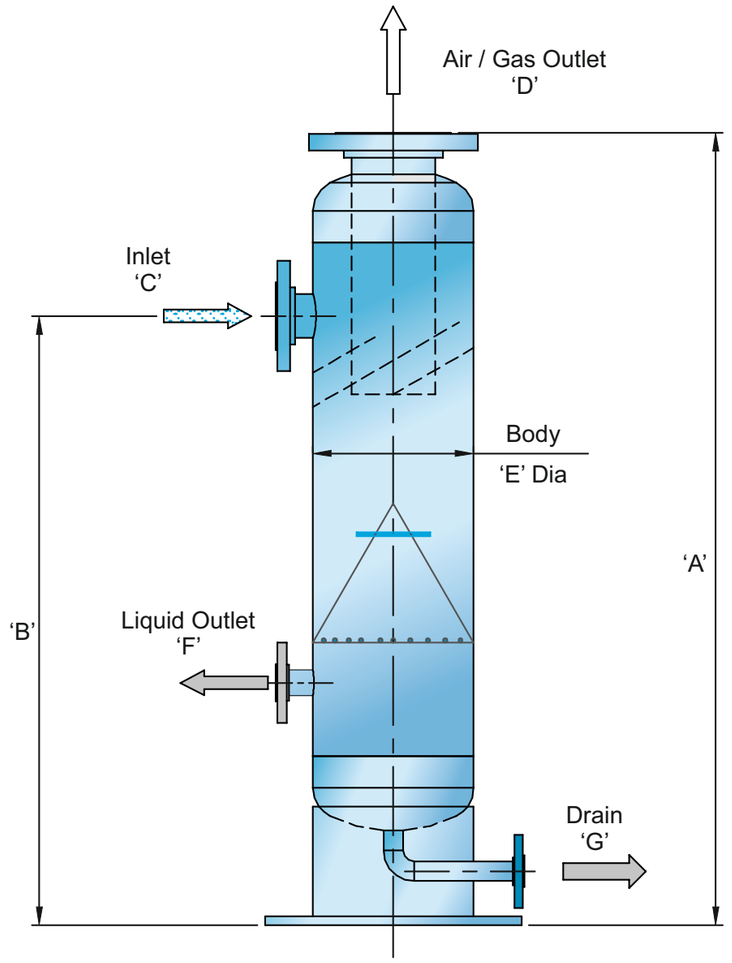
UH-U UP-FLOW SEPARATOR



1	Inlet nozzle on vessel centre line
2	Gas outlet on vessel vertical centre line
3	Provision for liquid removal-manual or automatic
4	Manual drain for colleted solid and liquid in the vessel sump

UH-U UP-FLOW SEPARATOR



Model	'A' Height Inches/mm	'B' Inlet to base Inch/mm	'C' Inlet Diameter Inches/mm	'D' Outlet Diameter Inches/mm	'E' Body O.Diameter Inches / mm	'F' Liquid out Inches/mm	'G' Drain Inches/mm
UH-U4	44 / 1118	30 / 762	2 / 50	3 / 75	4.5 / 114	0.5 / 12	1 / 25
UH-U6	54 / 1372	37 / 940	3 / 75	4 / 100	6.63 / 168	0.75 / 20	1 / 25
UH-U8	64 / 1625	44 / 1118	4 / 100	5 / 125	8.63 / 220	1.0 / 25	1 / 25
UH-U10	74 /1880	52 / 1321	5 / 125	6 / 150	10.8 / 274	1.5 / 40	1 / 25
UH-U12	84 / 2134	61 / 1549	6 / 150	8 / 200	12.8 / 325	2 / 50	1.5 / 38
UH-U16	102 / 2590	70 / 1778	8 / 200	10 / 250	16 / 406	2 / 50	2 / 50
UH-U20	128 /3250	100 / 2540	10 / 254	12 / 300	20 / 508	2 / 50	2 / 50
UH-U24	132 /3353	108 /2743	12 / 254	16 / 300	24 / 610	2 / 50	2 / 50

Please note dimensions are subject to change dependant on actual operating condition

▸ OPERATION PRINCIPLE :

Cyclonic style separators are pressure drop dependent, the gas flow is directed into the cyclone inlet chamber where the unique UH spin assembly creates an effective centrifugal force causing the entrained liquid (and /or solids) to spin under a centrifugal force.

These strong forces cause the liquids and solids along with the gas to spiral downward against the wall of the separator.

Liquid (along with any entrained solids) spiral downward and will flow through drainage holes into the isolated collection chamber.

The gas at this point changes direction, and still spinning passes upward towards the dry gas outlet.

The gas flow reverses, still spinning heads toward the outlet nozzle. To prevent the exiting gas creating a centripetal suction effect as it leaves the separation chamber a flange is installed at the top of the cone. This flange also prevents any residual liquid being drawn into the gas outlet nozzle.

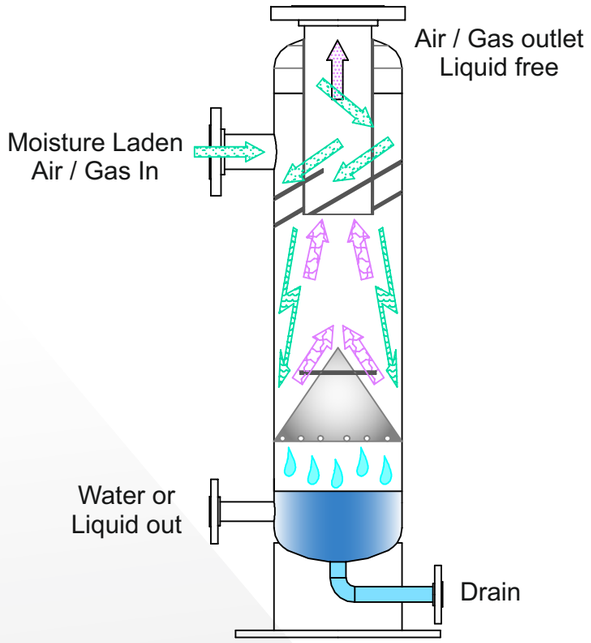
This flange also alleviates any centripetal force creating a suction vortex as the gas exits the separation chamber and enters the vortex finder.

Once clear of the vortex finder the gas flows exits free of liquid droplets.

▸ OPERATION PRINCIPLE :

Gas laden with Liquid enters the Inlet chamber where it is set into a rotating motion by the unique vane assembly to ensure all liquid contained in the gas flow is spun to the separator wall by centrifugal force.

Liquid drains down ward and falls through the drainage holes into the liquid collection chamber for subsequent drainage .



During Testing results showed a separation efficiency of 99.5% with droplet size below 8 micron.

▸ ADVANTAGES OF USING THE UH-U UP FLOW SEPARATORS - UNIQUE IN THEIR OWN RIGHT

- Such is the design of that flows volume can be decreased or increased whilst still maintaining good liquid (& Solid) removal efficiency
- Being a self contained unit having Gas Entry Chamber, Separation Chamber, Integral Liquid (& solids) collection chambers all isolated from the gas outlet (Vortex finder).
- It is also an added advantage to have the Inlet and outlet on the same centre line unlike separators which have a tangential inlet to achieve the required centrifugal forces.
- The liquid collection chamber can be increased in size to hold large volumes & allows for fitting automatic level control devices, level gauging and pressure gauges.
- Pressure gauges, Differential pressure gauges (& or transmitters) can also be added to meet the customers requirements.
- In order to meet pressure vessel requirements all separators can be fitted with pressure safety devices (PSV) and or Bursting Discs.

United Heat can provide and fit all ancillary components such as:

Pressure Gauges
Pressure Transmitters
Differential Pressure Gauges (with transmitting attachment if required)
Level Gauging - whether glass or magnetic type.
Level Control - Pneumatic or Electric or integral Float system
Level Control Valves
Instrument isolation valving.

▸ THE ADVANTAGES OF USING THE MODEL, UD-U Up-flow separator OPERATING PARAMETERS

Maximum Pressure Drop Inlet to Outlet	5 PSID
Maximum Gas Flow Rate (Dry Gas)	≈ 70MMSCFD, which equates to 77,700NM³/Hr or roughly 66,200 Kg/Hr The figures are naturally dependant on operating pressure & temperature
Maximum Liquid (dependent gas/liquid rates)	≈3.500 BPD (557 M³/D)
Recommended maximum liquid in gas flow	50 Barrels/mmscf which equates to (7950 L / 26667 NM³) and approximately (0.35 L / Kg GAS) The figures are naturally dependant on operating pressure & temperature
Working Pressure Range	5 psi to 1,450 PSI 0.34 Bar to ≈ 100 Bar
Working Temperature Range	-20° F to 350° F -29°C to 176.6° C