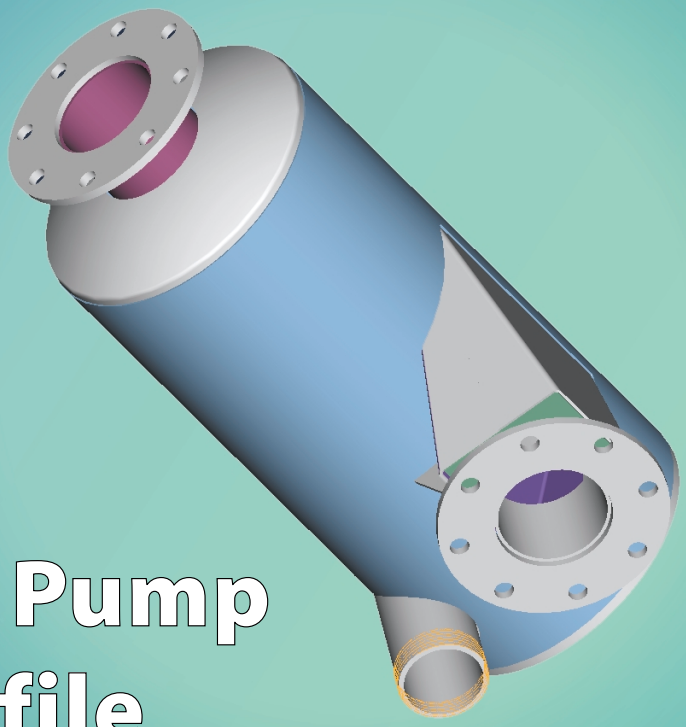
PRODUCT SELECTION GUIDE

NEW



Vacuum Pump Low-Profile Liquid Separator-Silencers

High-performance Liquid Separation and Silencing

- **High-performance liquid removal efficiencies, 90% to 99%, to suit your application.**
- **Choice of high or moderate acoustic performance.**
- **Choose from two inlet models (UWVS and UWSI) designed for full vacuum or two discharge models (UVCS and UVRS) designed for discharge to atmosphere.**

Built to Suit Your Application

- **Designed to application requirements, including easy installation and low maintenance.**
- **Optional design features for special production and assembly conditions are available.**
- **ASME Code construction and special materials are available.**

Outstanding Construction

- **Carbon steel construction with a high-quality shop coat primer finish.**
- **Special materials such as stainless steel are available.**
- **Optional leak test available upon request.**

Immediate Availability

- **Off-the-shelf delivery for most sizes.**

Universal Silencer separator-silencers separate liquid particles from gas flow, while attenuating noise at the inlet and discharge ports of blowers and liquid ring vacuum pumps. These separator-silencers support better working conditions, lower operating costs, and a quieter environment.

CONTENTS

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Noise Control and Air Filtration

UNIVERSAL SILENCER

VACUUM PUMP LOW-PROFILE LIQUID SEPARATOR-SILENCERS

Product Catalog 285-A

Vacuum Pump Systems

Separator-silencers are used to remove liquid from gas flow vacuum systems using either liquid-sealed rotary positive blowers or liquid ring vacuum pumps (Fig. 1).

Separator-silencers may be required for both the inlet (vacuum) and the discharge (atmospheric) of a vacuum pump system. Only the most stringent acoustical environments require significant inlet silencing. An inlet separator provides corrosion protection for the vacuum pump by removing most, if not all, of the process liquid before it enters the vacuum pump.

The vacuum pump or blower discharge is normally extremely noisy and requires a high-performance separator-silencer.

Operation and Capacity

When a vacuum pump first starts operating at normal atmospheric pressure, system pressure drop and power requirements are at their maximum. As the vacuum pump continues to evacuate the system, the inlet pressure decreases so the system pressure losses and power requirements decrease.The inlet volume flow in actual cubic feet per minute (ACFM) stays essentially constant throughout system operation, but because of decreasing inlet pressure, the discharge volume decreases until normal operating conditions are reached.

Vacuum pump capacities at operating conditions are expressed by the inlet volume flow of air and the amount that the inlet pressure has been reduced below atmospheric pressure. Thus, vacuum pump capacities are stated in inlet ACFM at a relative vacuum, usually measured in inches of mercury (Hg).

Liquid Separation Performance

Separator-silencers meet their rated liquid separation efficiency at a nozzle velocity of 5500 fpm. At lower velocities their performance improves. At higher velocities their efficiency decreases. The nozzle velocity is the air velocity in the inlet or discharge nozzle and is equal to the actual volume flow rate (ACFM) divided by the nozzle area.

Since the ***inlet volume flow rate*** is nearly constant during normal vacuum pump operation, the inlet separator-silencer should be sized so the velocity does not exceed 5500 fpm during all phases of operation (Table 1).

The ***discharge flow rate*** decreases from startup to normal operation, and in some applications it may be acceptable to exceed a velocity of 5500 fpm during startup. If it is not acceptable to discharge liquid during startup, the velocity must be reduced (Table 1). If some liquid bypass is allowed during startup, the selection of the discharge separator-silencer should be based on pressure drop.

Inlet and discharge separator-silencers require drain systems to remove the liquid. These systems (both inlet and discharge) must provide an adequate drain sealing system or liquid level to offset the vacuum on the inlet side and prevent blowout on the discharge side. See Tables 2 and 3 for liquid removal data.

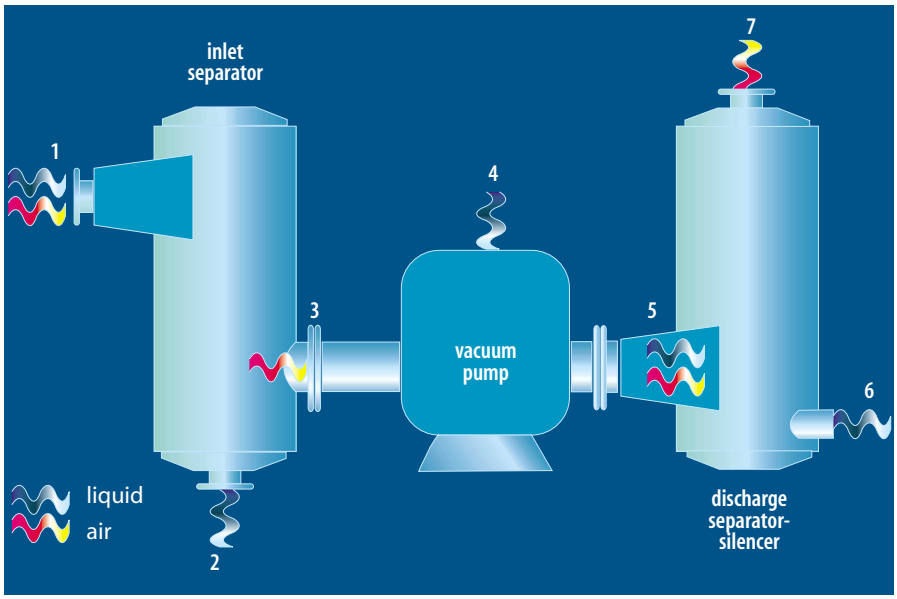


FIGURE 1.

This is an example of a vacuum pump and liquid removal system. Air and liquid enter the inlet separator-silencer during processing (1). Process liquid is removed (2), and air enters the vacuum pump (3). The pump takes in seal liquid (4). Air and seal liquid are pumped into the discharge separator-silencer (5), which removes the liquid (6) and sends the air into the atmosphere (7).

Technical Details

Separator-silencer pressure drop depends on velocity and pressure. In a vacuum system, pressure drop is at a maximum during startup. Under normal atmospheric conditions, the pressure drop at startup, for either an inlet or discharge separator-silencer, is calculated from the following equation:

$$\Delta P = \frac{C}{477}\left(\frac{ACFM}{p^2}\right)^2 = C\left(\frac{V}{4005}\right)^2$$

where $ACFM$ = inlet volume flow rate
C = separator-silencer ΔP coefficient (Table 3)
ΔP = pressure drop in inches of water
p = separator-silencer size (nozzle diameter) in inches
V = velocity in feet per minute

If the startup pressure drop is too great, use the flow given for a lower relative vacuum, or calculate a separator-silencer size from this equation:

$$p = 0.214\sqrt{ACFM\sqrt{\frac{C}{\Delta P}}}$$

where C = separator-silencer ΔP coefficient
ΔP = desired pressure drop in inches of water
p = separator-silencer size (nozzle diameter) in inches

Easy to Specify and Order

When you work with Universal Silencer, you can simply provide the flow conditions and the pump manufacturers' information, and we can recommend a separator-silencer best suited for your application. We use the following operating conditions for system analysis and separator-silencer selection:

1. Pressure
2. Temperature
3. Molecular weight or specific gravity
4. Flow rate in SCFM at 14.7 PSIA and 70° F
5. Liquid flow rate in GPM
6. Maximum allowable pressure drop (inches of water) for the separator-silencer
7. Pump manufacturer's name, and equipment model number, if available
8. Unsilenced noise levels from the system, if available
9. Silenced noise level required at a specified distance from the source
10. Required liquid removal efficiency

Using your information, we can prepare a comprehensive technical proposal and price quotation.

TABLE 1. Maximum capacity (inlet ACFM) for full liquid separation efficiency at operating vacuum.

Nominal Size	Operating Vacuum, inches of Hg						
	0*	5	10	15	18	20	25**
1	30	36	45	60	75	90	98
1½	70	81	101	135	169	204	221
2	120	144	180	241	301	362	393
2½	190	225	282	376	471	565	614
3	270	324	406	541	678	814	884
3½	370	441	552	737	922	1110	1200
4	480	576	721	963	1200	1450	1570
5	750	900	1130	1500	1880	2260	2450
6	1080	1300	1620	2170	2710	3260	3530
8	1920	2310	2880	3850	4820	5790	6280
10	3000	3600	4510	6020	7530	9050	9800
12	4300	5190	6490	8660	10800	13000	14100
14	5900	7060	8830	11800	14800	17700	19200
16	7700	9220	11500	15400	19300	23200	25100
18	9700	11670	14600	19500	24400	29300	31800
20	12000	14410	18000	24100	30100	36200	39300
22	14500	17430	21800	29100	36400	43800	47500
24	17300	20750	26000	34700	43400	52100	56500
26	20300	24350	30500	40700	50900	61200	66400
28	23500	28240	35300	47200	59000	70900	77000
30	27000	32420	40600	54100	67800	81400	88400

* This column is used for inlet separator-silencers and discharge separator-silencers with no liquid bypass during startup.

** Capacity at operating vacuum greater than 20" Hg is limited by startup conditions.

TABLE 2. Maximum liquid flow in GPM for various drain sizes.*

Drain Size (O)	UWVS and UWSI	UVCS and UVRS
1	15	10
1½	30	20
2	50	35
2½	75	60
3	120	100
3½	150	125
4	200	160
5	300	260
6	450	400
8	800	650
10	1200	1000

* Values are based on gravity drain and may be larger with a positive drainage system.

TABLE 3. Pressure drop coefficients and separation efficiency.

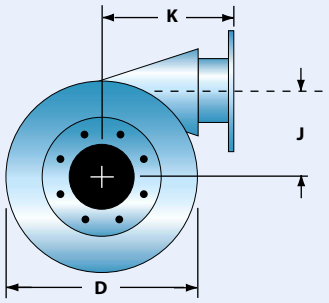
Model	Pressure Drop Coefficient (C)	Separation Efficiency
UWVS	4.0	99 %
UWSI	3.0	90 %
UVCS	4.0	99 %
UVRS	4.5	>99 %

UWVS SERIES LOW PROFILE

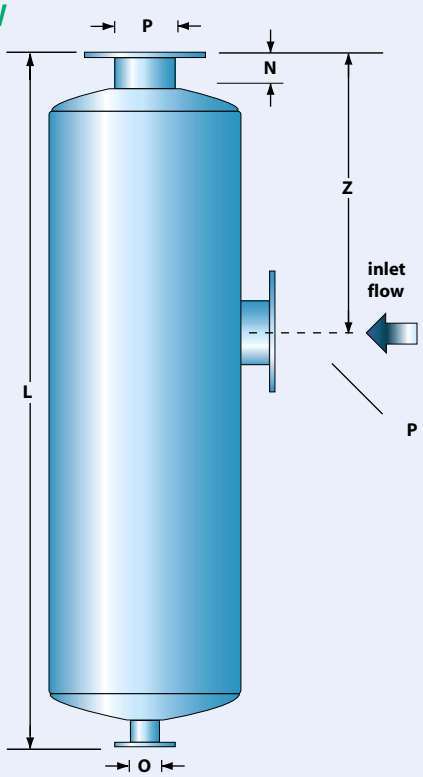
Inlet Liquid Separator-Silencer

The UWVS inlet liquid separator-silencers provide corrosion protection for vacuum pumps by removing most of the process liquid before it enters the vacuum pump. These separators are best suited for full vacuum conditions under critical applications, which require inlet silencing.

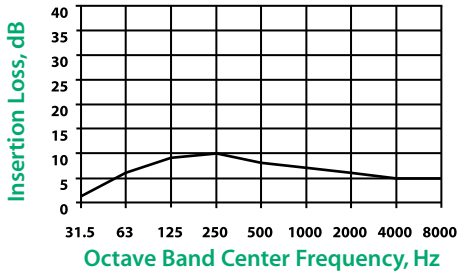
TOP VIEW



SIDE VIEW



TYPICAL INSERTION LOSS



DIMENSIONS, WEIGHTS, AND RATED CAPACITIES

MODEL	P (nom.)	D	N	L	K	Z	J	O (nom.)	WEIGHT	RATED CAPACITY* MAX. ACFM AT VACUUM (BLOWER INLET)	RATED CAPACITY* LIQUID GPM**
UWVS-4	4	12	3	52	9	19½	5⅝	2	76	530	35
UWVS-5	5	16	3	58	11	23½	7⅛	2½	144	830	55
UWVS-6	6	18	3	66	12	30	8	3	189	1200	80
UWVS-8	8	22	3½	78	14	36	9¾	3½	355	2100	150
UWVS-10	10	24	3½	85	15	37	10½	4	442	3300	200
UWVS-12	12	30	3½	97	18	45	13¼	5	630	4700	300
UWVS-14	14	36	3½	105	21	47	16	6	1029	6000	400
UWVS-16	16	42	3½	114	24	50	18⁹⁄₁₆	6	1401	7800	500
UWVS-18	18	42	3½	135	24	68	18⁷⁄₁₆	8	1645	10000	600
UWVS-20	20	48	4½	138	27	66	21⅛	8	1925	12000	800
UWVS-22	22	54	4½	149	30	70	23⅞	10	2384	15000	1000
UWVS-24	24	60	4½	158	33	74	26⅝	10	3502	18000	1200

* Capacities for larger sizes available on request.

** If maximum gas flow is not exceeded for a given separator size, liquid GPM may exceed nominal capacity shown, up to the capacity of the next larger separator.

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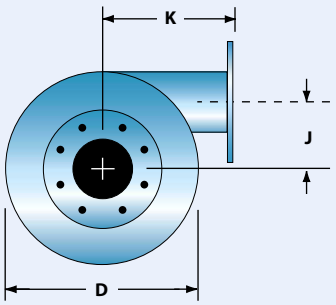
UWSI SERIES LOW PROFILE

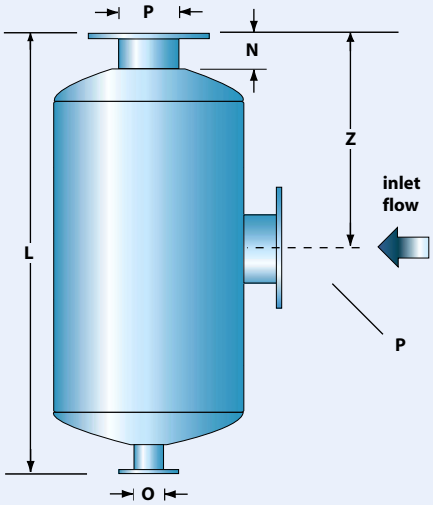
Inlet Liquid Separator-Silencer

The UWSI inlet liquid separator-silencers provide corrosion protection for vacuum pumps by removing most of the process liquid before it enters the vacuum pump. These separators are best suited for full vacuum conditions under critical applications, which require inlet silencing. The UWSI models include larger pipe sizes than the UWVS and have a different profile.

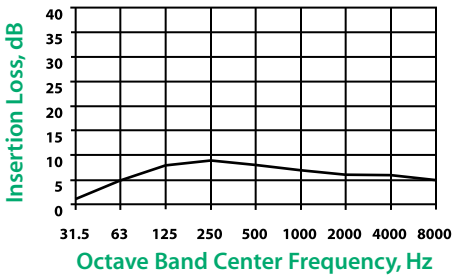
TOP VIEW



SIDE VIEW



TYPICAL INSERTION LOSS



DIMENSIONS, WEIGHTS, AND RATED CAPACITIES

										RATED CAPACITY*	
MODEL	P (nom.)	D	N	L	K	Z	J	O (nom.)	WEIGHT	MAX. ACFM AT VACUUM (BLOWER INLET)	LIQUID GPM**
UWSI-4	4	12	3	26	9	15	3¾	2	40	530	35
UWSI-5	5	16	3	31	11	18	5 3/16	2½	82	830	55
UWSI-6	6	18	3	36	12	21	5 11/16	3	108	1200	80
UWSI-8	8	22	3½	46	14	27	6 11/16	3½	202	2100	150
UWSI-10	10	24	3½	58	15	34	6⅝	4	276	3300	200
UWSI-12	12	30	3½	68	18	40	8⅝	5	403	4700	300
UWSI-14	14	36	3½	78	21	46	11	6	708	6000	400
UWSI-16	16	42	3½	88	24	52	13	6	950	7800	500
UWSI-18	18	42	3½	98	24	58	12	8	1050	10000	600
UWSI-20	20	48	4½	108	27	64	14	8	1308	12000	800
UWSI-22	22	54	4½	120	30	71	16	8	1619	15000	1000
UWSI-24	24	60	4½	130	33	77	18	10	2481	18000	1200
UWSI-26	26	66	4½	140	36	83	20	10	2986	21000	1400
UWSI-28	28	72	4½	150	39	89	22	10	3554	24000	1600
UWSI-30	30	78	4½	160	42	95	24	10	4959	28000	1800

* Capacities for larger sizes available on request.

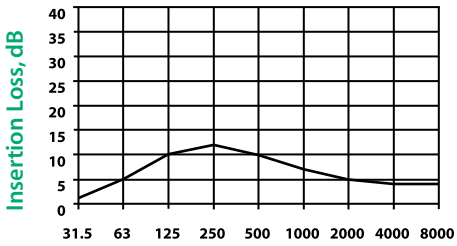
** If maximum gas flow is not exceeded for a given separator size, liquid GPM may exceed nominal capacity shown, up to the capacity of the next larger separator.

UVCS SERIES LOW PROFILE

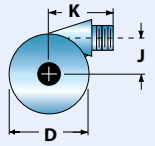
Discharge Liquid Separator-Silencer

The UVCS model provides high-performance liquid separation and noise attenuation. When an inlet separator is not installed, the discharge separator might need to be over-sized.

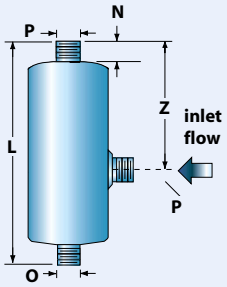
TYPICAL INSERTION LOSS



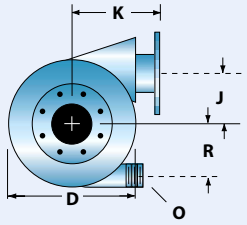
TOP VIEW
Pipe sizes 1 in. through 3½ in.



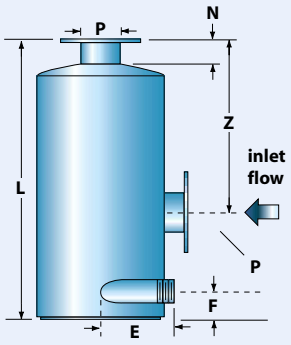
SIDE VIEW
Pipe sizes 1 in. through 3½ in.



TOP VIEW
Pipe sizes 4 in. through 16 in.



SIDE VIEW
Pipe sizes 4 in. through 16 in.



DIMENSIONS AND WEIGHTS

MODEL	P (nom.)	D	N	L	K	E	F	Z	R	J	O (nom.)	WEIGHT
UVCS-1	1	4½	2	14	5¼	–	–	8¾	–	2 3/32	1	4
UVCS-1¼	1¼	4½	2	14	5¼	–	–	8	–	2 1/16	1	5
UVCS-1½	1½	6	2	17	6	–	–	10	–	2¾	1½	10
UVCS-2	2	8	3	22	7	–	–	13	–	3 11/16	2	15
UVCS-2½	2½	10	3	24	8	–	–	14	–	4⅝	2	20
UVCS-3	3	10	3	27	8	–	–	16	–	4 9/16	2½	25
UVCS-3½	3½	12	3	30	9	–	–	18	–	5½	2½	35
UVCS-4	4	12	3	29	9	8	3	18½	4¼	5 7/16	3	50
UVCS-5	5	16	3	35	11	9	3½	21½	6¼	7 5/16	3	95
UVCS-6	6	18	3	42	12	10	3½	27	7¼	8 3/16	3	130
UVCS-8	8	22	3½	52	14	12	4	32	9¼	9 15/16	3	240
UVCS-10	10	24	3½	56	15	14	4½	32	10¼	10 11/16	3	300
UVCS-12	12	30	3½	69	18	16	5	40½	12¾	13 7/16	4	445
UVCS-14	14	36	3½	75	21	16	5	43	15¾	16¼	4	620
UVCS-16	16	42	3½	88	24	19	6½	52	18¾	18⅞	4	1035

- All models use a pipe thread connection (MNPT) for the liquid outlet (O).
- Sizes **1 in. through 3½ in.** are standard with male pipe thread connection (MNPT).
- Sizes **4 in. through 16 in.** are standard with 150# ANSI drilled plate flanges.

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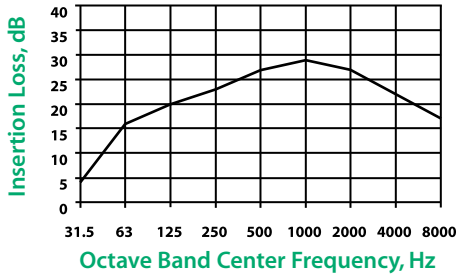
UVRS SERIES LOW PROFILE

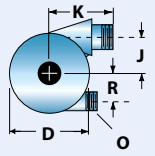
Discharge Liquid Separator-Silencer

The UVRS model is similar to the UVCS model. For pipe sizes 1 in. through 3½ in., the UVRS has a side liquid outlet, while the UVCS has a vertical liquid outlet.

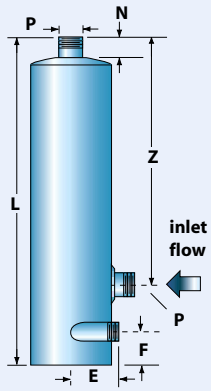
TYPICAL INSERTION LOSS



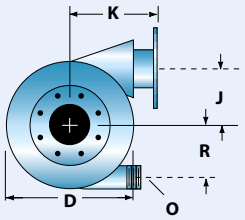
TOP VIEW
Pipe sizes 1 in. through 3½ in.



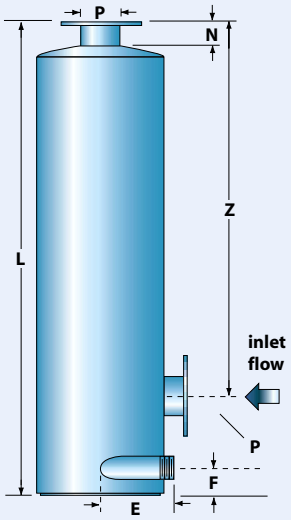
SIDE VIEW
Pipe sizes 1 in. through 3½ in.



TOP VIEW
Pipe sizes 4 in. through 16 in.



SIDE VIEW
Pipe sizes 4 in. through 16 in.



DIMENSIONS AND WEIGHTS

MODEL	P (nom.)	D	N	L	K	E	F	Z	R	J	O (nom.)	WEIGHT
UVRS-1	1	4½	2	20¾	5¼	3½	1¼	15½	1 19/32	2 1/16	1	10
UVRS-1¼	1¼	4½	2	20¾	5¼	3½	1¼	14¾	1 19/32	2 1/16	1	10
UVRS-1½	1½	6	2	25	6	4	1¾	19	2 3/64	2¾	1½	15
UVRS-2	2	8	3	32⅞	7	5	2	25	2 13/16	3 11/16	2	30
UVRS-2½	2½	10	3	35½	8	6	3	26	3 13/16	4⅝	2	40
UVRS-3	3	10	3	41	8	6	3	31	3 9/16	4 9/16	2½	45
UVRS-3½	3½	12	3	44⅝	9	7	3	33	4 9/16	5½	2½	55
UVRS-4	4	12	3	47	9	8	3	36½	4¼	5 7/16	3	70
UVRS-5	5	16	3	59½	11	9	3½	47	6¼	7 5/16	3	140
UVRS-6	6	18	3	71¾	12	10	3½	57	7¼	8 3/16	3	244
UVRS-8	8	22	3½	90¼	14	12	4	71	9¼	9 15/16	3	355
UVRS-10	10	24	3½	103¼	15	14	4½	80	10¼	10 11/16	3	460
UVRS-12	12	30	3½	128½	18	16	5	101	12¾	13 7/16	4	1092
UVRS-14	14	36	3½	141¼	21	16	5	109¼	15¾	16¼	4	1678
UVRS-16	16	42	3½	154¼	24	19	6½	118¼	18¾	18⅞	4	2212

- **All models use a pipe thread connection (MNPT) for the liquid outlet (O).**
- **Sizes 1 in. through 3½ in.** are standard with male pipe thread connection (MNPT).
- **Sizes 4 in. through 16 in.** are standard with 150# ANSI drilled plate flanges.

UNIVERSAL SILENCER

Our corporate headquarters are located in Stoughton, Wisconsin, just southeast of Madison, the state capital. This new building houses administration, sales, and engineering departments.

Manufacturing facilities are in Muscoda (above), 75 miles west of Stoughton, and Montello (below), 70 miles north.

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Keeping industrial equipment clean and quiet.

UWVS, UWSI, UVCS, AND UVRS SERIES

Vacuum Pump Low-Profile Liquid Separator-Silencers

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- Vacuum pump liquid separator-silencers, catalog 280-A
- Rotary positive blowers, catalog 244-D
- Acousti-Tube® and Acousti-Ring® vent silencers, catalog 243-C
- Acousti-Tube® and Acousti-Ring® vent silencer specification sheet, form 88-0063
- Air filters and filter silencers, catalog 241-B
- Cartridge air filters and filter silencers, catalog 242-C
- CB compact blower silencers, catalog 255-A
- CBF/CBFI compact blower filter-silencers, catalog 261-A
- Reciprocating engines, catalog 246-A
- Compressors, information provided by application
- Industrial fans, catalog 249-A
- Steam ejectors, pressure reduction valves, and other special applications
- Universal Silencer guide to gas turbine products, catalog 265
- Gas turbine products, catalog B-249-A

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