Fliteway Technologies, Inc.

Air Sparging System

2129 East Birchwood Ave. Cudahy, WI 53110

(414) 483-5600 1-800-236-3580 FAX (414) 483-1957

Company: Fliteway Technologies, Inc.
Address: 2129 East Birchwood Ave. Cudahy, WI 53110
Ph: 414-483-5600

Customer: Olsson Associates - All Points Coop - Lexington, NE
Project: Q14190 Air Sparge Blowers

ROOTS BLOWER PERFORMANCE SUMMARY : Program Version 6.000 Release Date 2/28/2008
Program Mode: SELECTION Run Date: 03/19/2012

AMBIENT CONDITIONS:

Gas	AIR	
Relative Humidity	36%	
Molecular Weight	28.869	
k-Value	1.396	
Specific Gravity	.997	
Ambient Temperature	68	deg F
Ambient Pressure	13.46	PSIA
Elevation	2390	feet

STANDARD CONDITIONS:

Pressure	14.7	PSIA
Temperature	68	deg F
Relative Humidity	36	%

INPUT CONDITIONS:

Actual Inlet Volume	335	ICFM +/-5 %
Standard Volume	300	SCFM
Mass/Weight Flow	22.47	#/min +/-5 %
System Inlet Pressure	13.46	PSIA
Inlet Pressure Loss	0.3	PSI
Blower Inlet Pressure	13.16	PSIA
Blower Discharge Pressure	21.86	PSIA
Discharge Pressure Loss	0.4	PSI
System Discharge Pressure	8.0	PSIG
Inlet Temperature	68	deg F

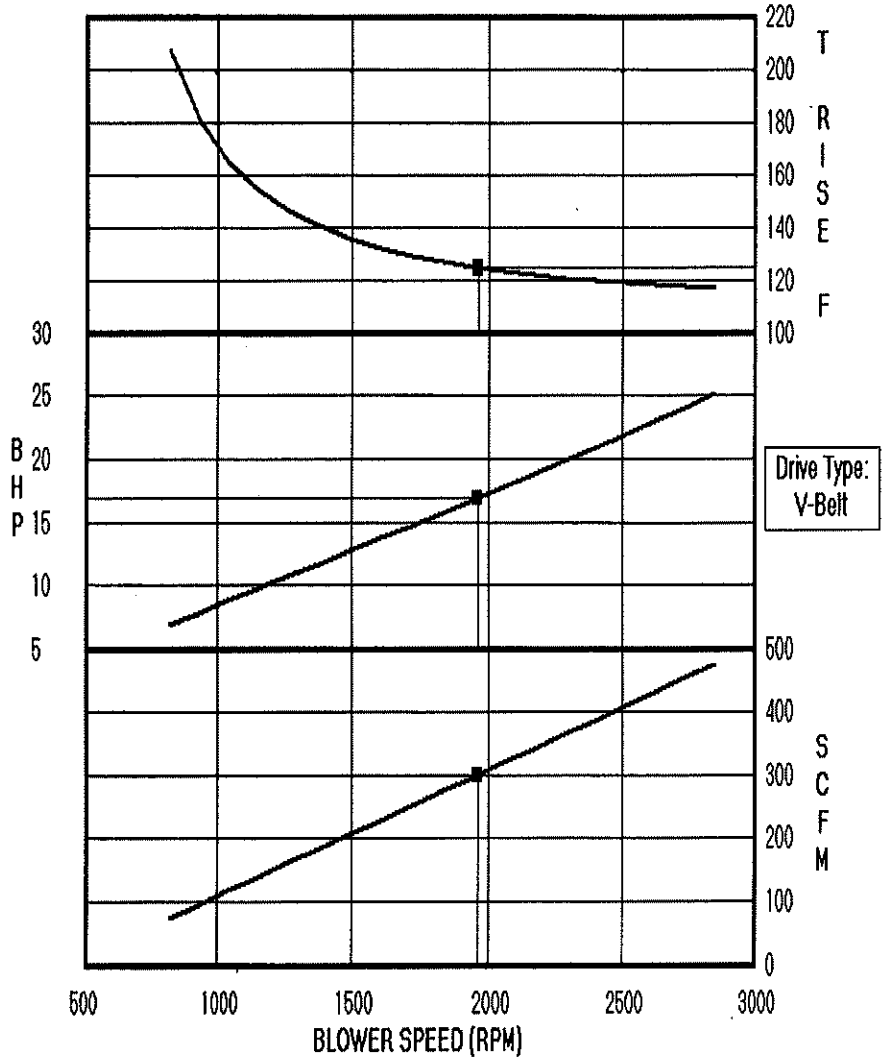
SELECTED UNIT DETAIL:

Model	56	URAI-J	
Speed	1961	RPM	68.8%
Blower Differential Pressure	8.70	PSI	66.9%
Power at Blower Shaft	16.85	BHP	+/- 4%
Temperature Rise	125	deg F	55.4%
Discharge Temperature	193	deg F	
System Discharge Volume	249	ACFM	
Relief Valve Setting	NO RELIEF VALVE SPECIFIED		
V-Belt: Est. B10 Brg Life:	317768	hours	
Coupling: Est. B10 Brg Life:	317768	hours	
Est. Free Field Noise	86.4	dBa	

Measured as sound pressure level per ISO 2151:2004E with +/-3 dBA tolerance.

56 URAI-J: Variable Speed Performance

Dresser ROOTS



Drive Type: V-Belt

Enter a new Speed

Recalc

Close Form

Print Curve

You must press the Print Screen keyboard button before the Print Curve Button.

```
INLET CONDITIONS: AIR
                  RH = 36.00%, MW = 28.869, k = 1.396, Tin = 68 deg F
         DESIGN: Speed = 1961 RPM
                  System Inlet P = 13.46 PSIA, Inlet P Loss = 0.3 PSI
                  System Disch P = 8 PSIG, Disch P Loss = 0.4 PSI
STD:       RH = 36%, T = 68 deg F, P = 14.7 PSIA
```

Design Data ———

CUSTOMER: Olsson Associates - All Points Coop - Lexington, NE
PROJECT: Q14190 Air Sparge Blowers

ESTIMATED NOISE LEVEL

TYPICAL BLOWER PACKAGE WITH PREMIUM GRADE SILENCERS

Customer: Olsson Associates - All Points Coop - Lexington, NE

Unit: 56 URAI-J

Blower RPM: 1961

Delta-P (PSI): 8.7

Noise (dBa): 86.4

Octave Band	Sound Pressure Level (dB)
31.5	71.4
63.0	71.4
125	78.4
250	82.4
500	85.4
1000	81.4
2000	78.4
4000	74.4
8000	71.4
16000	56.4

NOTE : 1) Free field sound pressure level estimate when measured per ISO 2151:2004E
2) Due to environmental influences beyond ROOTS' control, these levels cannot be guaranteed on jobsite.
3) Premium Grade Silencers are assumed.

Absorption Silencers

L21

Application

Silencing of intake and discharge of centrifugal compressors in areas requiring standard silencing.

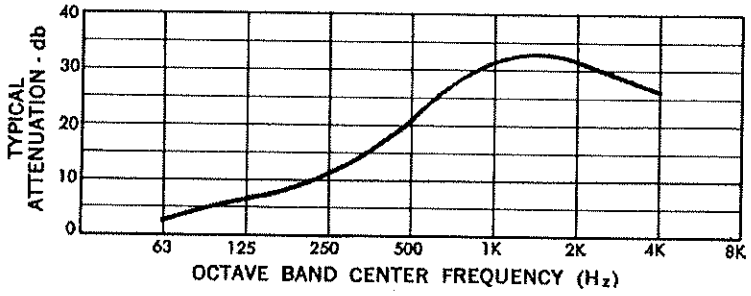
Design

This silencer employs a perforated tube surrounded by acoustic absorption material at a controlled density to achieve silencing. Exterior shell retains acoustical pack and reflects noise back into pack to achieve maximum noise reduction. Designed for very low pressure drop and long service life. They can be installed either in vertical or horizontal position.

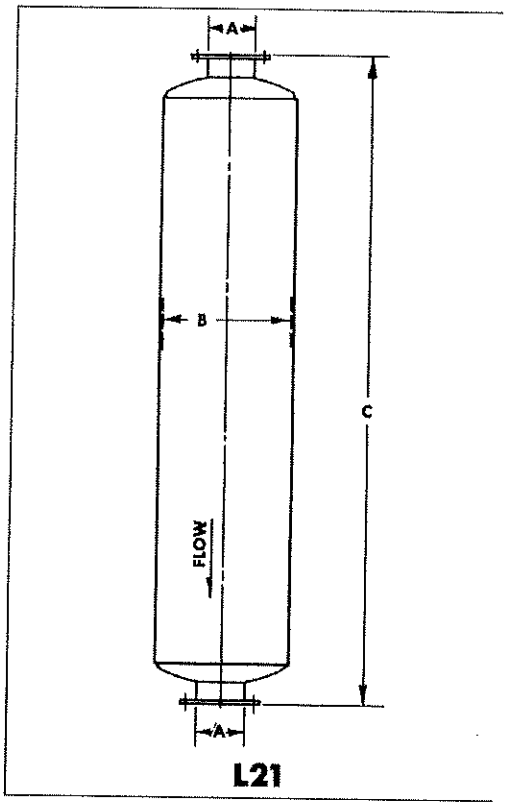
Construction

All welded sheet and plate steel. Absorption material appropriate for operating conditions. Exterior surfaces are prime coated. Flanges are drilled to match 125 lb. American Standard Flanges. Side connections, mounting brackets, or special paint available at extra cost.

Typical Attenuation Curve



Model	A	B	C	Wt.
L21-½	½*	3¼	10	2
L21-¾	¾*	3¼	13	3
L21-1	1 *	3¼	16	4
L21-1½	1½*	4½	23	8
L21-2	2 *	5	34½	13
L21-2½	2½*	6	35½	18
L21-3	3 *	6½	43½	28
L21-3½	3½*	8	44	27
L21-4	4	10	53	55
L21-5	5	12	56	70
L21-6	6	12	66	90
L21-8	8	14	58	138
L21-10	10	16	70	160
L21-12	12	18	80	250
L21-14	14	20	92	300
L21-16	16	22	107	340
L21-18	18	24	116	650
L21-20	20	26	128	705
L21-22	22	28	147	885
L21-24	24	30	152	1026



L21

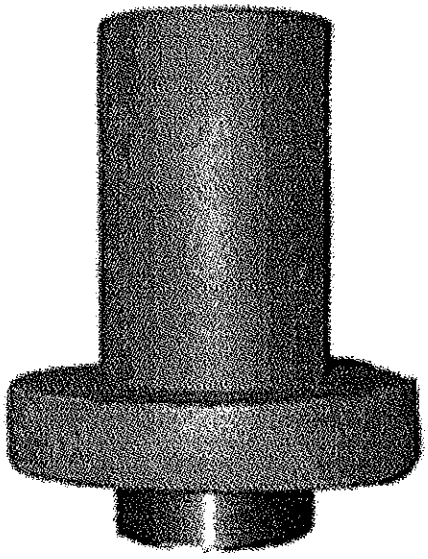
*NPT Connections

Sutorbilt

Date Sheet	SB-5-415
	July 31, 1989
Supersedes	90912-B
Dated	10-25-69

SUTORBILT(R) WEIGHT LOADED PRESSURE RELIEF VALVES

THREADED - 1" THRU 4"



The SUTORBILT[r] weight loaded pressure relief valve offers inexpensive relief capacity in a sturdy, trouble free design in 1" through 8" sizes.

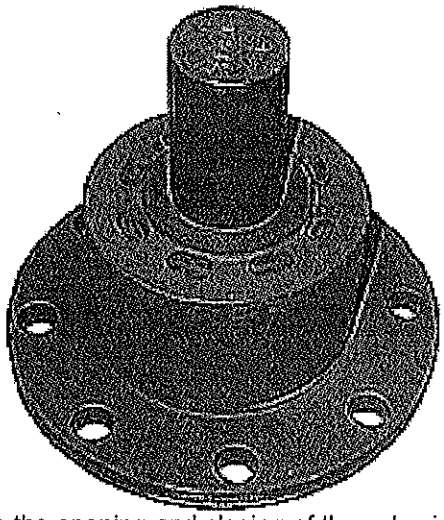
Sizes 1" through 4" have sandard male threaded connections. Sizes 6" and 8" have standard 125# ANSI flange drilings.

Removable weights have been carefully designed to permit accurate pressure settings in 1/2 PSI increments in the 1" through 4" size and 1/2 and 1 PSI increments in 6" and 8" size.

The operation of the relief valve is simple. As the service line air pressure reaches the pressure setting, the weight loaded cap is forced upwards off the valve seat. As pressure increases, the cap rises to expose the discharge ports. The flow-through capacity of the valve is such that no damage can be caused to the blower or related systems.

The valve automatically reseats itself as line pressure is reduced.

FLANGED 125# ANSI - 6" AND 8"



Since the opening and closing of the valve is essentially the sliding of a piston in a cylinder, the valve is virtually chatter-free.

The body and cap of the valve are made of cast iron with close tolerance machined surfaces in the operating areas. The weights are cut from uniform steel plate or uniformly cast to give accurate pressure adjustment.

Application of light oil to the mating surfaces of the cap and body periodically is all the maintenance required on this valve.

The SUTORBILT weight loaded relief valve was engineered to provide long life and dependable protection for the SUTORBILT blower and associated systems by its simplicity of design. Weight loaded pressure relief valves are designed to protect the blower against damage caused by operation at greater than design pressure or vacuum. **However, they are not intended as pressure regulators.**

For proper operation, the valve must be mounted in exact upright position.

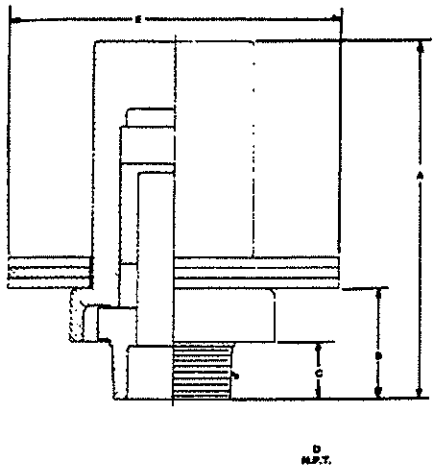
Use only FULL FLANGE gasket.

For prices, see Price List SB-5-134

Gardner Denver

SUTORBILT WEIGHT LOADED PRESSURE RELIEF VALVES

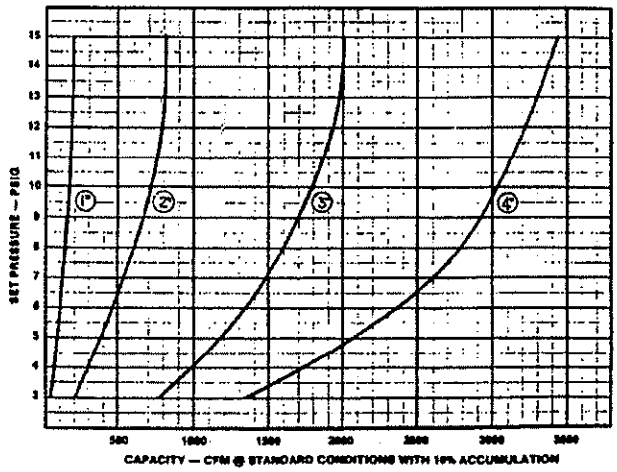
THREADED CONNECTION – 1", 2", 3" AND 4"



DIMENSION CHART

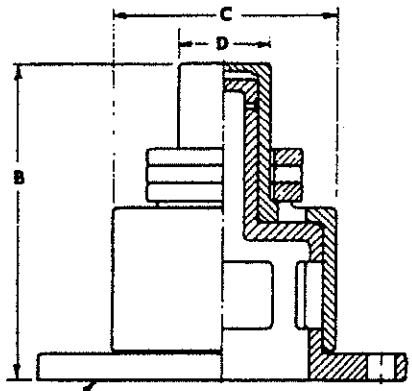
VALVE SIZE	A	B	C	D	E
1 INCH	6-13/16	2-1/16	1-7/16	1" N.P.T.	3-1/2
2 INCH	7-1/8	2-3/8	1-5/16	2" N.P.T.	6-13/16
3 INCH	9-7/8	3-1/16	1-9/16	3" N.P.T.	9-1/4
4 INCH	11-3/8	3-7/16	1-11/16	4" N.P.T.	11-11/16

CAPACITY CHART



NOTE: Valves not recommended to relieve at set pressures under 3 psig.

FLANGED CONNECTION – 6" AND 8"

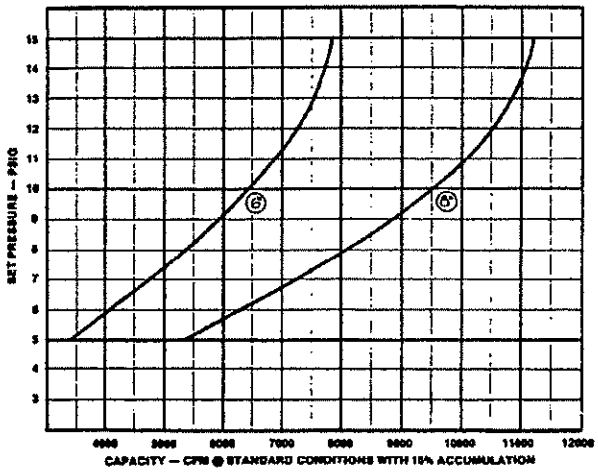


A, MOUNTING FLANGE, ASA 125# DRILLING
USE ONLY FULL FLANGE GASKET.

DIMENSION CHART

VALVE SIZE	DIMENSIONS — INCHES			
	A	B	C	D
6 INCH	8	9-5/8	6-1/2	2-5/8
8 INCH	8	11-1/4	9-1/4	2-3/4

CAPACITY CHART



NOTE: Valves not recommended to relieve at set pressures under 5 psig.

All prices subject to change without notice.
All prices are F.O.B. shipping point.

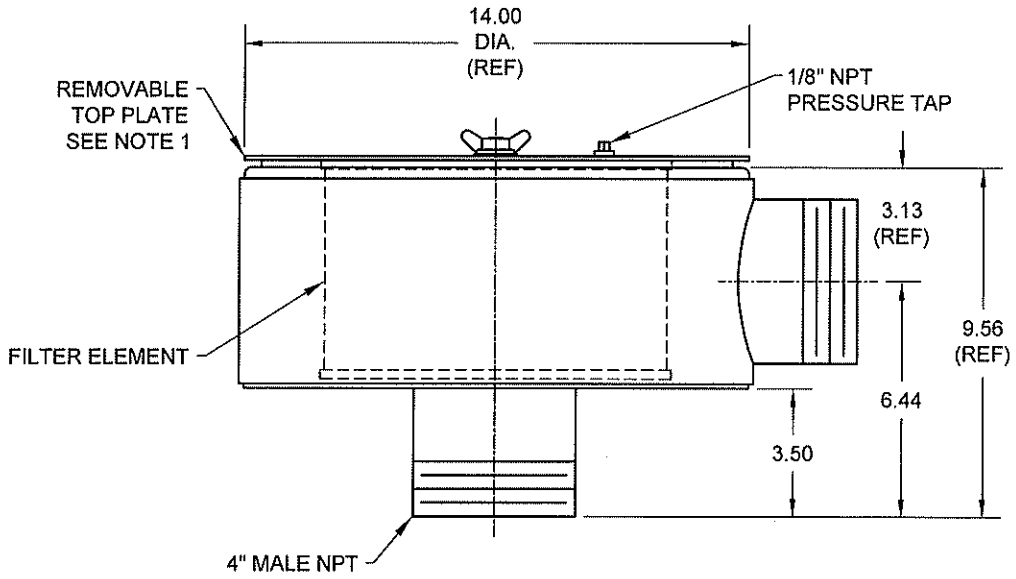
F	No.	SB-5-330
	Eff.	1-13-89
	Sup.	90910-D

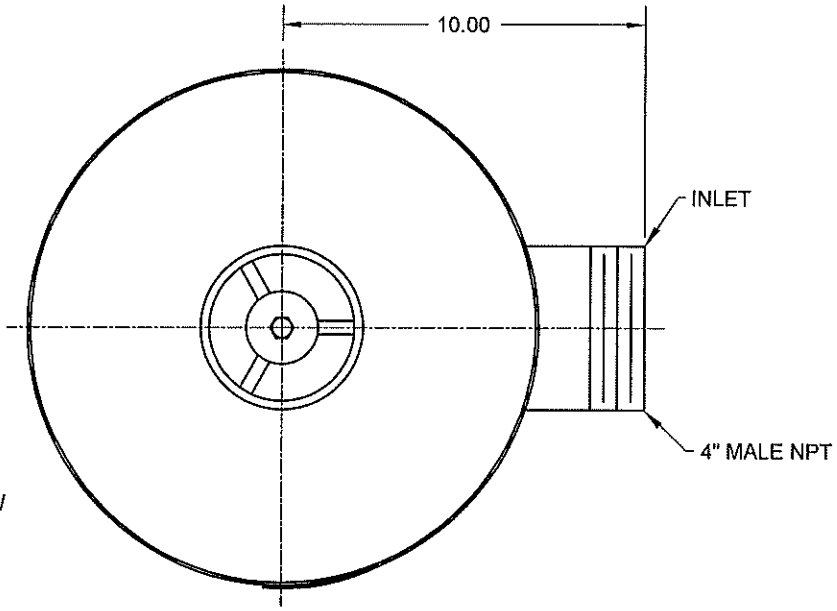
UNIVERSAL SILENCER
A FLEETGUARD/NELSON COMPANY
P.O. Box 411, Stoughton, Wisconsin 53589
608-873-4272 Fax 608-873-4298

STANDARD ILFV-4 INLINE AIR FILTER

DATE 02-05-02
SHEET OF
SCALE NTS

NO.	REVISION	DRAWN	APP'D
6	REDRAWN AND REVISED HEIGHT	DY 02-12-02	MB 02-14-02





NOTES:

1. CLEARANCE REQUIRED FOR FILTER ACCESS IS 7.00"

2. CLEAN OR REPLACE FILTER WHEN ΔP INCREASES 4" H_20 OVER CLEAN FILTER

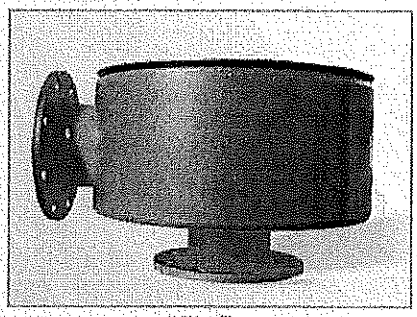
3. NOMINAL CAPACITY: 500 CFM AT FLOW VELOCITY OF APPROX. 5,500 FT/MN

DIMENSIONAL DRAWING NO. 34-D04-AP

FILTER ELEMENTS INCLUDED (APPLIED ONLY TO ORDER FOR WHICH DRAWING IS CERTIFIED)				DIMENSIONS CERTIFIED FOR:
FILTER TYPE AND PART NUMBER	SINGLE STAGE	DUAL STAGE		
		PRE-FILTER	FINAL FILTER	
CC-4P (PAPER) 81-1063	1			P.O. NO:
				U.S. S.O. NO:
				BY
				DATE

REV.					
6	APPROX WT 25 LBS.	MATERIAL STEEL	DRAWN DY	DIMENSIONAL DRAWING NO.	REV.
	FINISH 88-1085 BLUE ENAMEL		CHECK MB 02-14-02	34-D04-AP	6

ILFV Series Vacuum Service Inline Air Filters



ILFV-4 filter

Built to Suit Your Application

- Designed for vacuum service application requirements.
- Optional design features for special production and assembly conditions are available.
- Special materials such as stainless steel are available.
- Interchangeable paper or felt elements, for desired filtration characteristics in the same housing.
- Filter restriction gauges are optional for all units.

Durable Construction

- Carbon steel construction with a high-quality blue semi-gloss enamel finish.
- Removable top plate for easy access to the filter element.

Immediate Availability

- Fast delivery for most sizes.

Advanced Design and Testing

- Our extensive in-house engineering, manufacturing, and testing facilities ensure optimized process, mechanical, and acoustic performance for your application.

Quality You Can Count On

Universal Silencer's new ILFV Series of inline air filters has been designed especially for vacuum applications as an economical alternative to our ILF Series. Choose from ten standard pipe sizes ranging from 2 in. to 14 in. and flow capacities ranging from 120 to 5900 CFM. Two choices of filter element media — pleated paper or pleated felt — are available to suit your specific application.

Universal's Filter Restriction Gauge provides a convenient, accurate means of monitoring filter pressure drop as the filter element becomes increasingly loaded with dirt. Inline air filters are standard with threaded connections for directly mounting the gauge. See product bulletin 81-1234 for a complete description.

DNV Certification, Inc. ISO 9001 REGISTERED FIRM

40 YEARS OF PRODUCT VALUE — UNIVERSAL SILENCER

UNIVERSAL™

UNIVERSAL SILENCER

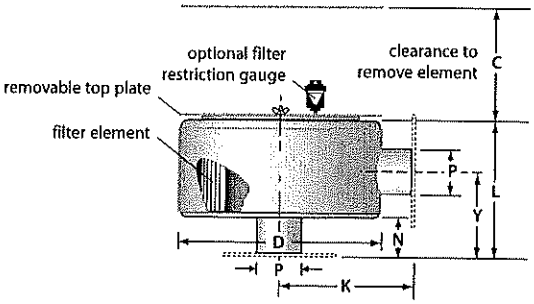
A FLEETGUARD/NELSON COMPANY

Noise Control and Air Filtration

UNIVERSAL SILENCER — ILF SERIES INLINE AIR FILTERS — Product Catalog 2291

SPECIFICATIONS

ILFV Series Vacuum Service Inline Air Filters



DIMENSIONS, WEIGHTS, AND REPLACEMENT ELEMENTS

Model	P (nom.)	D	L	N	Y	C	K	Weight (est.)	Rated Cap. (CFM)	Element Part No. Paper	Element Part No. Felt
ILFV-2	2	14	9.38	3.5	6.44	7	10	18	120	81-1063	81-1205
ILFV-2 1/2	2 1/2	14	9.38	3.5	6.44	7	10	19	190	81-1063	81-1205
ILFV-3	3	14	9.38	3.5	6.44	7	10	20	275	81-1063	81-1205
ILFV-4	4	14	9.38	3.5	6.44	7	10	21	500	81-1063	81-1205
ILFV-5	5	18	12.00	3.5	7.75	10	12	50	750	81-0475	81-1207
ILFV-6	6	18	20.56	3.5	12.00	10	12	65	1100	(2) 81-0475	(2) 81-1207
ILFV-8	8	24	13.19	3.5	8.35	11	15	90	2200	81-1163	81-1209
ILFV-10	10	24	22.69	3.5	13.00	11	15	125	3000	(2) 81-1163	(2) 81-1209
ILFV-12	12	30	17.19	3.5	10.35	15	18	160	4300	81-1164	81-1210
ILFV-14	14	30	30.69	3.5	17.00	15	18	205	5900	(2) 81-1164	(2) 81-1210

- All models have a 1/8 in. FNPT tap for installation of a gauge or manometer to monitor pressure drop.
- The C dimension is clearance required to remove elements.
- Non-ASME code construction is suitable for 15" Hg vacuum. Not applicable for pressure applications.
- Rated capacity is based upon flow velocity of approximately 5500 ft/min. If pressure drop allowance permits, capacity may be increased by as much as 50%.
- Flange connections are drilled per ANSI standard for each size.
- Sizes 2" through 4" are standard with male pipe threaded inlet and outlet fitting (MNPT).
- Sizes 5" through 14" are standard with plate flanges drilled to ANSI standards (dashed lines on sketch).
- Weight does not include filter elements.

FILTER ELEMENTS

Two types of filter elements are available for Universal Silencer's vacuum service inline air filters. The pleated paper elements provide the highest efficiency and are considered standard. Pleated felt elements are available for less demanding service, with respect to efficiency. Both types of elements are completely interchangeable and will fit the ILFV filter housings.

SERVICE INTERVALS: Paper and felt elements are typically cleaned or replaced when the air flow resistance has increased 4 inches of water over the initial clean resistance. The maximum restriction recommended across the filter elements is 20 inches of water, but this value may be greater than the equipment can tolerate for best efficiency.

Pleated Paper Element

SPECIFICATIONS:

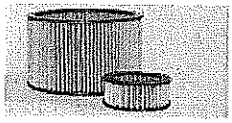
- High-quality industrial-grade filter paper—pleated and oven-cured during production.
- Oven-cured plastisol end caps with molded sealing beads (larger elements for pipe sizes (P) 8 in. through 14 in. have metal end caps with closed-cell rubber gaskets).
- Media efficiency: 99.5% on 2 microns; 97% on 1 micron.
- Maximum operating temperature: 200° F for units with 2 in. through 14 in. pipe sizes.

SERVICE INSTRUCTIONS:

Because of the low cost of the paper element, it is generally treated as a consumable and replaced when dirty. However, depending upon customer preference, the paper element may be cleaned with compressed air and reused.

Compressed Air Cleaning:

Carefully direct compressed air (100 PSI maximum) through the dry element, opposite the normal direction of flow. After cleaning, inspect carefully for holes or cracks. If the element is damaged, replace it.



Pleated Felt Element

SPECIFICATIONS:

- Durable polyester felt media — pleated.
- Oven-cured plastisol end caps with molded sealing beads (larger elements for pipe sizes (P) 8 in. through 14 in. have metal end caps with closed-cell rubber gaskets).
- Media efficiency: 99% on 10 microns.
- Maximum operating temperature: 200° F for units with 2 in. through 8 in. pipe sizes.

  250° F for units with 10 in. through 14 in. pipe sizes using elements with metal end caps.

SERVICE INSTRUCTIONS:

Pleated felt elements may be cleaned with compressed air or water and reused.

Water Cleaning:

Rap the element gently to dislodge accumulated dirt, and soak it thoroughly approximately 15 minutes in warm water and mild detergent. Rinse thoroughly under low-pressure water. Air dry—do not dry with compressed air. After cleaning, inspect carefully for holes or cracks. If the element is damaged, replace it.

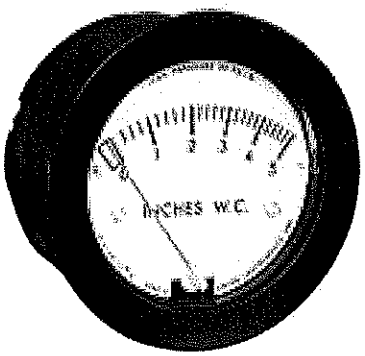
608.873.4272 ▪ 608.873.4298 fax ▪ US@universal-silencer.com ▪ www.universal-silencer.com

Dwyer®

Series 2-5000

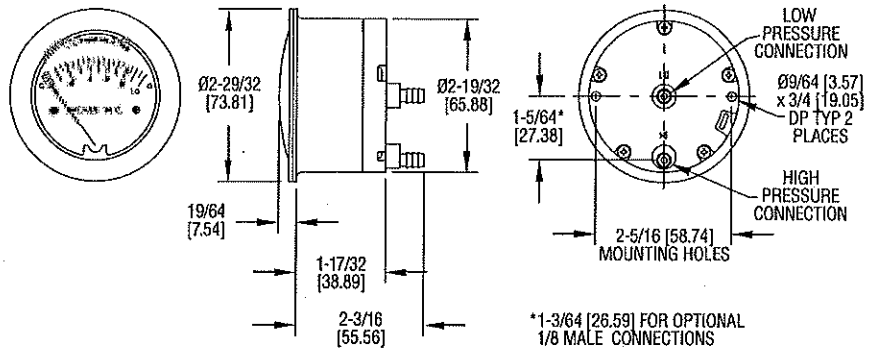
Minihelic® II Differential Pressure Gages

Combining High Accuracy, Compactness, Dependability, and Low Cost



Patent No. 4,347,744

The Series 2-5000 Minihelic® II low differential pressure gage provides excellent readability in a compact size.



Dimensions, Series 2-5000 Minihelic® II Gage.

Combining clean design, small size and low cost with enough accuracy for all but the most demanding applications our Minihelic® II gage offers the latest in design features for a dial type differential pressure gage. It is our most compact gage but is easy to read and can safely operate at total pressures up to 30 psig. The Minihelic® II is designed for panel mounting in a single 2⅝" diameter hole. Standard pressure connections are barbed fittings for ⅜" I.D. tubing; optional ⅛" male NPT connections are also available. Over-pressure protection is built into the Minihelic II® gage by means of a blow-out membrane molded in conjunction with the diaphragm. Accidental over-ranging up to the rated total pressure will not damage the gage. With removable lens and rear housing, the gage may be easily serviced at minimum cost.

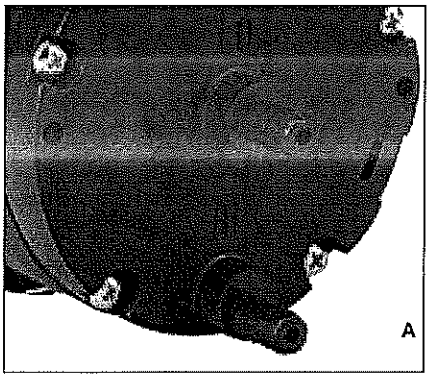
With the housing molded from mineral and glass filled nylon and the lens molded from polycarbonate, the gage will withstand rough use and exposure as well as high total pressure. The 5% accuracy and low cost of the Minihelic® II gage make it well-suited for a wide variety of OEM and user applications. OEM applications include cabinet air purging, medical respiratory therapy equipment, air samplers, laminar flow hoods, and electronic air cooling systems. As an air filter gage, the Minihelic® II finds many end use applications on large stationary engines, compressors, ventilators, and air handling units. The Minihelic® II gage is suitable for many of the same applications as the Magnehelic® gage where the greater accuracy, sensitivity, and higher and lower differential pressure ranges of the Magnehelic® gage are not required.

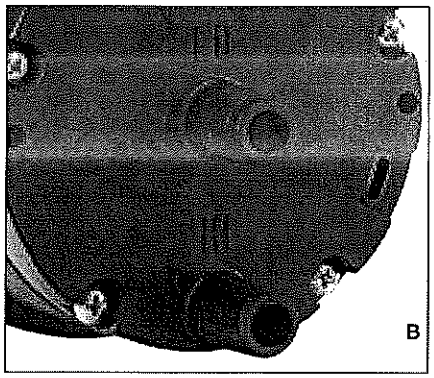
SPECIFICATIONS

Service: Air and compatible gases.
Wetted Materials: Consult factory.
Housing: Glass filled nylon; polycarbonate lens.
Accuracy: ±5% of full scale at 70°F (21.1°C).
Pressure Limits: 30 psig (2.067 bar) continuous to either pressure connection.
Temperature Limits: 20 to 120°F (-6.67 to 48.9°C).
Size: 2-1/16" (52.39 mm) diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: Barbed, for 3/16" I.D. tubing (standard); 1/8" male NPT (optional).
Weight: 6 oz (170.1g).

CAUTION: FOR USE ONLY WITH AIR OR COMPATIBLE GASES.

PRESSURE CONNECTIONS





A The standard Minihelic® II gage is supplied with two barbed pressure taps molded into the rear housing of the gage. These connections allow easy, fast connection to the gage using ⅜" I.D. rubber or plastic tubing.

B For applications in systems having higher total operating pressures, optional male ¼" NPT pressure connections can be supplied.

Note the oblong over-pressure vent hole on the back of the gage at the right of the connections. This vent is sealed by a membrane molded in conjunction with the diaphragm and will blow out at approximately 75 psi.

Simplicity of Design Ensures Reliable Operation

Housing is molded from strong mineral and glass filled nylon.

Pointer stops of molded rubber prevent pointer over-travel without damage.

Full view lens is removable and molded of tough polycarbonate.

Aluminum scale litho-printed black on white, enhances readability.

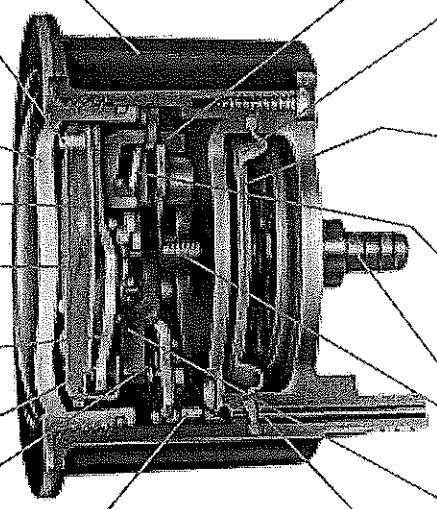
Red tipped aluminum pointer, rigidly mounted to helix is easy to see.

Wishbone assembly provides mounting for helix, helix bearings, and pointer shaft.

Jewel bearings provide virtually friction-free helix motion.

Helix is free to rotate in jewel bearings. It aligns with magnetic field of magnet to transmit pressure indications to pointer.

Zero adjustment screw, located behind the removable lens, eliminates tampering.



Range spring calibration clamp fixes live length of spring for proper gage calibration and is factory set and sealed.

Silicone rubber diaphragm allows accurate response to a broad range of temperatures and at extremely low pressure. Incorporates blow out area for overpressure protection.

Diaphragm support plates of lightweight aluminum on each side of the diaphragm minimize position or attitude sensitivity and help define pressure area.

Flat leaf range spring reacts to pressure on the diaphragm. Live length is adjustable for calibration. Small amplitude of motion minimizes inaccuracies and assures long life.

Low pressure tap connects to rear chamber.

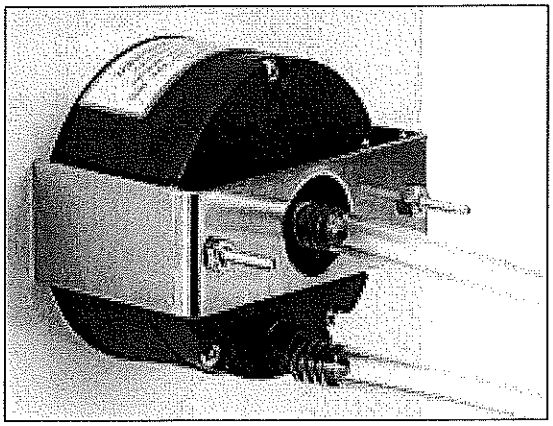
Coil spring link provides a resilient connection between the diaphragm and the range spring.

Ceramic magnet mounted on a molded bracket at the end of the range spring rotates the helix without direct mechanical linkage.

High pressure tap connects with the front chamber through passageway in the plastic case and a sealing ring molded into the edge of the diaphragm.

Patent No. 4,347,744

PANEL MOUNTING



Mounting hardware is supplied with the Minihelic® II gage for panel mounting through a single hole, 2-5/8″ (67 mm) in diameter. Panel thickness up to 1/2″ (13 mm) can be accommodated with the hardware supplied. If necessary, surface mounting of the gage can be accomplished by means of two 4-40 screws into the tapped mounting bracket stud holes in the rear of the gage. Surface mounting requires clearance holes in the panel for the two pressure taps.

STOCKED MODELS

Model Number	Range, Inches of Water
2-5000-0	0-0.5
2-5001	0-1.0
2-5002	0-2.0
2-5003	0-3.0
2-5005	0-5.0
2-5010	0-10
2-5020	0-20
2-5040	0-40
2-5060	0-60
2-5100	0-100

Model Number	Range, PSI
2-5205	0-5
2-5210	0-10
2-5215	0-15
*2-5230	0-30

Model Number	Range, MM of Water
2-5000-25MM	0-25
2-5000-50MM	0-50
2-5000-100MM	0-100

Model Number	Range, Pascals
2-5000-125Pa	0-125
2-5000-250Pa	0-250
2-5000-500Pa	0-500

Model Number	Range, kPa
2-5000-1 kPa	0-1
2-5000-3 kPa	0-3

Accessories
A-434 Portable Kit . . . . . .
A-497 Surface Mtg. Brkt. . .
A-609 Air Filter Kit . . . . . .

*THIS RANGE EMPLOYS SPIRALLY WOUND BERYLLIUM COPPER BOURDON TUBE POINTER DRIVE MECHANISM.

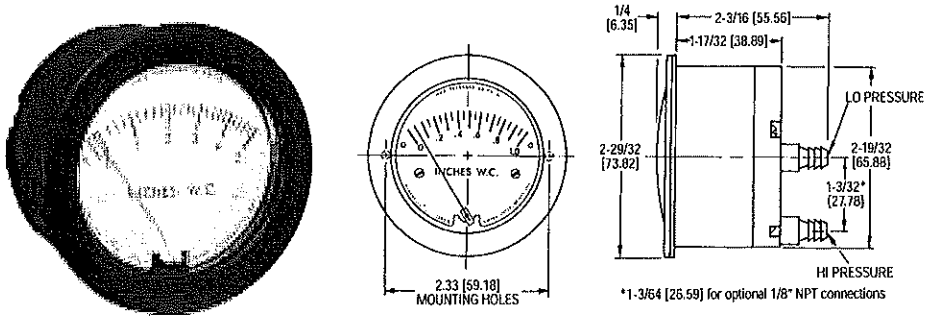
NOTE: CONSULT FACTORY REGARDING AVAILABILITY OF ADDITIONAL RANGES.

For optional ⅛" male NPT connections, add suffix -NPT to model numbers listed above. Example: 2-5001-NPT. No extra charge.

Bulletin A-36

Series 2-5000 Minihelic II® Differential Pressure Gage

Specifications: Installation & Operating Instructions



Dimensions, Series 2-5000 Minihelic II® Gage.

Series 2-5000 Minihelic II® Differential Pressure Gages have clean design, small size, low cost and sufficient accuracy for all but the most demanding applications. With housing molded from mineral- and glass-filled nylon and a lens molded from polycarbonate, this gage will withstand rough use and exposure, as well as high total pressure up to 30 psig [2.067 bar]. Over-pressure is accommodated by a blow-out membrane molded in conjunction with the diaphragm.

INSTALLATION

1. Select a location free from excessive vibration and where ambient temperature will be between 20° to 120°F (-6.7°C to 49°C). Sensing lines may be any length necessary without affecting accuracy. However, long runs of tubing will dampen readings slightly and cause a minor increase in response time. If pulsing pressure or vibration cause excessive pointer oscillation, please contact factory for ways to provide additional damping.

2. This gage is calibrated and zeroed in the vertical position at the factory. If the gage is used in any other position, it must be re-zeroed each time the position is changed. Gages with ranges under 5 inches w.c.(1.24 kPa), or the equivalent, should be used only in the vertical position unless special calibration was specified when ordering.

PHYSICAL DATA

Dimensions: 2-29/32" (73.82 mm) x 2- 7/16" (61.93 mm).
Weight: 6 oz. [170 gr].
Rated Total Pressure: 50 psig (3.445 bar) surge; 30 psig (2.067 bar) continuous to either pressure connection.
Ambient Temperature Range: 20°F to 120°F (- 6.7°C to 49°C).
Accuracy: ± 5% of full scale at 70°F (21.1°C).
Connections: standard, barbed for 3/16" I.D. tubing; optional,1/8" NPT(M).
Housing: glass-filled nylon, polycarbonate lens.
Finish: black
Standard Accessories: (2) 4-40 x 1-5/8" mounting studs, (2) 4-40 hex nuts, (1) .050" hex allen wrench, (1) panel mounting bracket.

CAUTION:

Use only with air or compatible non-corrosive gases.

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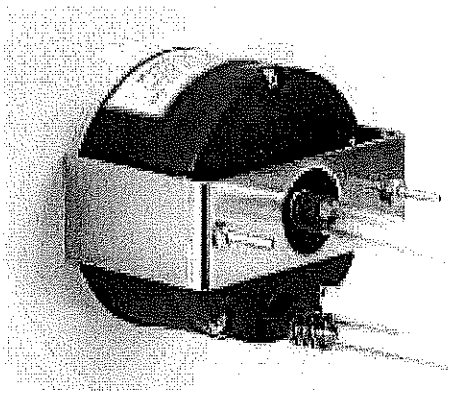

PANEL MOUNTED INSTALLATION

3. To surface-mount the gage, drill two 5/32″ holes on a horizontal line, 2-1/3″ apart for mounting screws. Next, drill two 7/16″ holes 1-1/32″ apart on a vertical line for pressure connections. Install mounting studs in back of the gage, insert through holes in the panel, and secure with hex nuts provided. Be careful not to block the slotted hole near the right-hand mounting hole. This provides a path for pressure relief in the event of over-pressurization.

4. To panel-mount gage, cut a 2-5/8″ diameter hole. Install the mounting studs in the back of gage, position gage in the panel, and place bracket over the studs. Thread hex nuts over studs and tighten.

5. After installation, the gage may need to be zeroed before placing in operation. If re-zeroing is required, firmly hold the case of gage with one hand and unscrew the front cover with the palm of the other hand in a counterclockwise direction. If difficult to loosen, place a small sheet of rubber between the cover and the palm of the hand. Zero-adjust screw is located behind the scale at the pair marked "zero." Use the hex allen wrench supplied and adjust until pointer is on zero. This must be done with both pressure connections vented to atmosphere and the gage oriented in the final mounting position. Replace cover.

6. To measure positive pressure, connect tubing to port marked "HI" and vent "LO" port to atmosphere. For negative pressure (vacuum), connect to port marked "LO" and vent "HI" port to atmosphere. For differential pressure, connect higher pressure to port marked "HI" and lower to "LO" port. If gage is supplied with 1/8″ NPT connections, be careful not to over-tighten fittings to avoid damage to the gage.

CALIBRATION CHECK

Select a second gage or manometer of known accuracy and in an appropriate range. Use short lengths of rubber or vinyl tubing to connect the high-pressure side of the Minihelic gage and the test gage to two legs of a tee. Very slowly, apply pressure through the third leg. Allow enough time for pressure to equalize throughout the system and for fluid to drain. if a manometer is being used. Compare readings. If the gage being tested exceeds rated accuracy, it should be returned to the factory for recalibration.

MAINTENANCE

No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally, disconnect pressure lines to vent both sides of the gage to atmosphere and re-zero per paragraph 5.

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A FLEETGUARD/NELSON COMPANY
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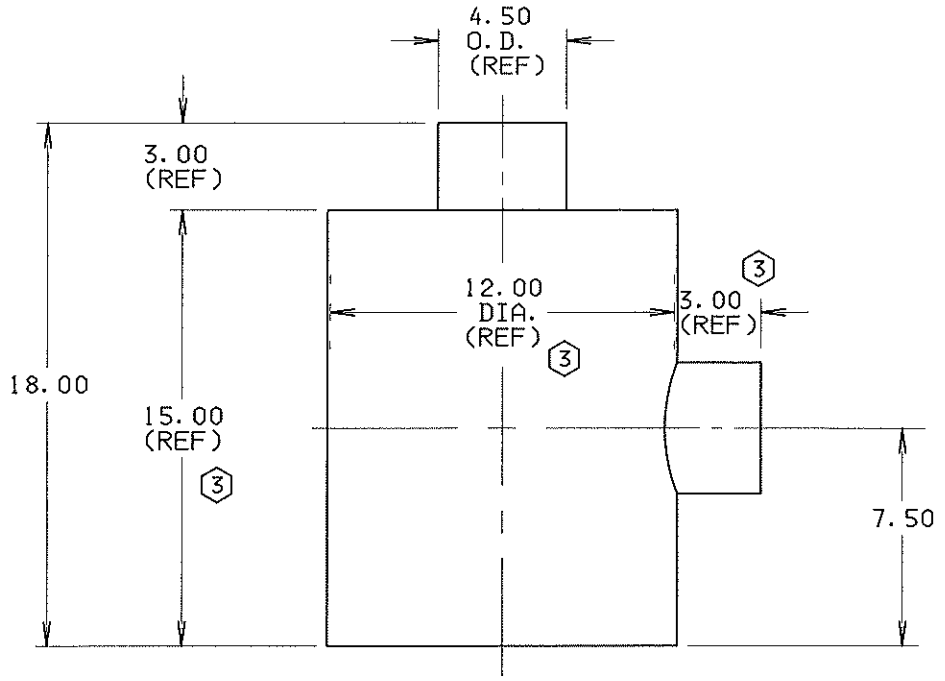
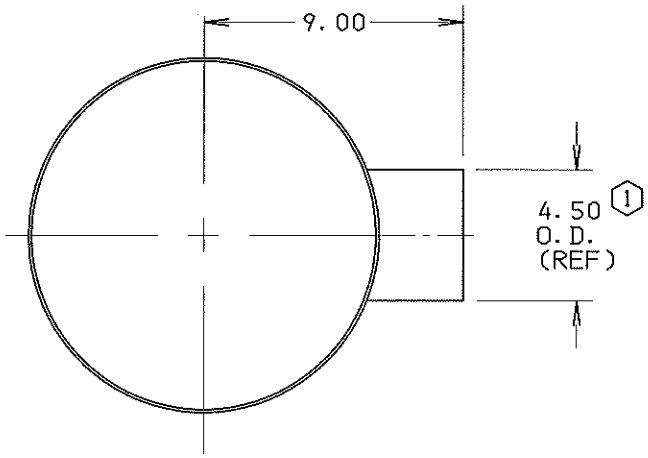
608-873-4272 Fax 608-873-4298

STANDARD
CB-4 SILENCER (2)

DATE 9-25-97
SHEET OF
SCALE NTS

NO.	REVISION	DRAWN	APP'D
(1)	UPDATED PER ECR #E00400.	2-02-98	DY
(2)	REMOVED DISCHARGE FROM NAME	7-7-98	BGL
(3)	ADDED (REF) TO NONCRITICAL DIMS.	9-28-99	BGL





DIMENSIONS CERTIFIED FOR:
P.O. NO:
U.S. S.O. NO:
BY

DIMENSIONAL DRAWING NO. 56-704-AA
REV. 3

APPROX WT 50 | MATERIAL STEEL
FINISH 88-0102 SHOP COAT PRIMER
DRAWN BGL
CHECK BC 10-29-99

DIMENSIONAL DRAWING NO. 56-704-AA REV. 3

CB 'LIL HUMMER™

Compact Blower Silencer

INLET OR DISCHARGE SILENCER FOR POSITIVE DISPLACEMENT BLOWERS

Benefits ...

Approximately 1/3 the size of conventional blower silencers.

Reduces overall package noise without further acoustic treatment.

Reduces cost, overall package size, weight, storage space, freight cost, and damage.

VERSATILE—Suitable for inlet or discharge application, forward or reverse flow, all without compromising acoustic or pressure drop performance.

Design Advantages ...

For conditions up to 15 PSIG.

Internal pack material suitable for temperatures up to 325 degrees F.

Standard connections, plain nominal pipe ends.

Flanged or threaded connections available.

Availability ...

Sizes 2" through 12" stock.

Larger sizes, special connections, and mounting hardware available for fast delivery.

UNIVERSAL SILENCER
A FLEETGUARD/NELSON COMPANY
Noise Control and Air Filtration

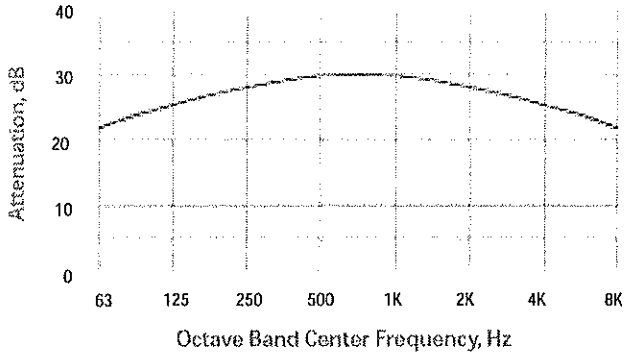
UNIVERSAL SILENCER
COMPACT DIMENSIONS
Patented Design

SPECIFICATIONS

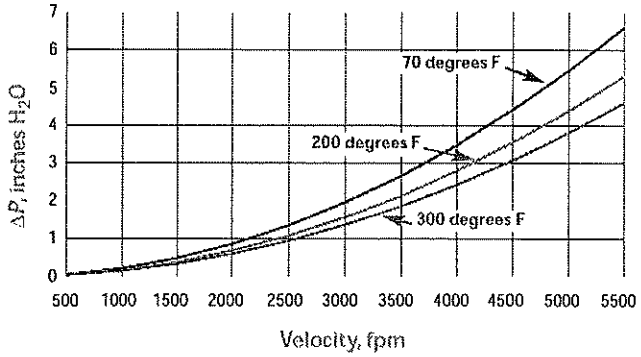
CB 'LIL HUMMER'

Compact Blower Silencer

ATTENUATION CURVE, TYPICAL

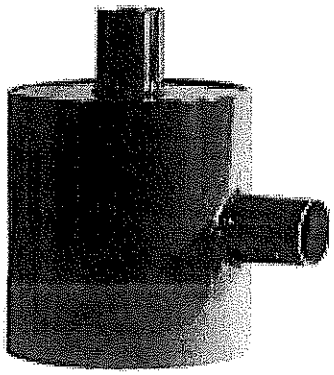


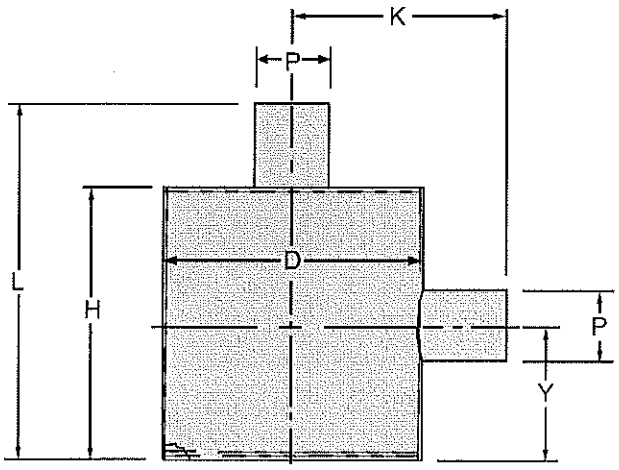
PRESSURE DROP



MODELS, DIMENSIONS & WEIGHTS

MODEL	P (nom.)	D	L	H	Y	K	WT.	CFM CAP
CB-2	2	8.00	11.00	8.00	4.00	7.00	15	120
CB-2.5	2.5	8.00	12.50	9.50	4.75	7.00	25	187
CB-3	3	12.00	13.50	10.50	5.25	9.00	35	270
CB-4	4	12.00	18.00	15.00	7.50	9.00	45	480
CB-5	5	16.00	20.00	17.00	8.50	11.00	70	750
CB-6	6	16.00	26.00	23.00	11.50	11.00	85	1080
CB-8	8	24.00	31.00	27.50	13.75	15.50	170	1920
CB-10	10	30.00	39.00	35.50	17.75	18.50	275	3000
CB-12	12	34.00	43.00	39.50	19.75	20.50	355	4320





NOTES:
1. Finish: Shop coat primer (88-0102).

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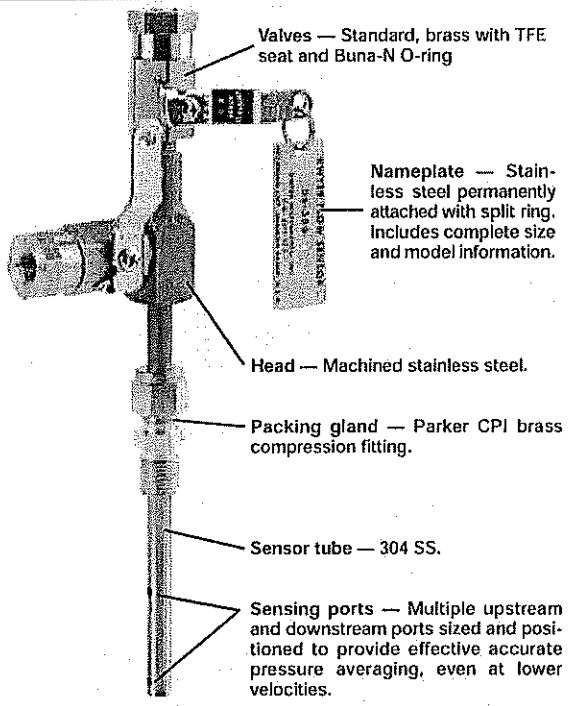
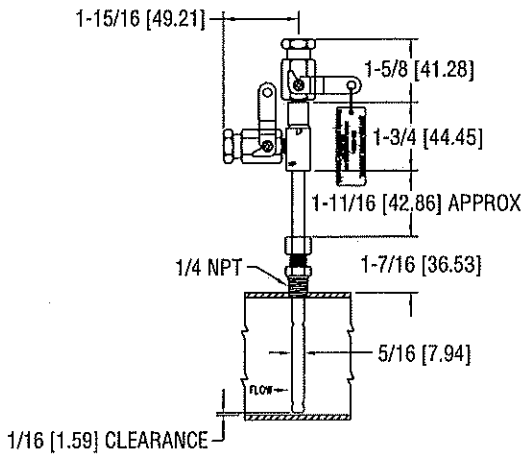
Series DS

In-Line Flow Sensors

Use with the Dwyer® Differential Pressure Gages or Transmitters





In-Line Flow Sensors are averaging Pitot tubes that provide accurate and convenient flow rate sensing for schedule 40 pipe. When purchased with a Dwyer® Capsuhelic® differential pressure gage of appropriate range, the result is a flow indicating system delivered off the shelf at an economical price.

Pitot tubes have been used in flow measurement for years. Conventional pitot tubes sense velocity pressure at only one point in the flowing stream. Therefore, a series of measurements must be taken across the stream to obtain a meaningful average flow rate. The Dwyer® flow sensor eliminates the need for "traversing" the flowing stream because of its multiple sensing points and built-in averaging capability.

The Series DS-300 flow sensors are designed to be inserted in the pipeline through a compression fitting. They are furnished with instrument shut-off valves on both pressure connections. Valves are fitted with ⅛" female NPT connections. Accessories include adapters with ¼" SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic® gage kit. Standard valves are rated at 200 psig (13.7 bar) and 200°F (93.3°C). Where valves are not required, they can be omitted at reduced cost. Series DS-300 flow sensors are available for pipe sizes from 1" to 10".

DS-400 Averaging Flow Sensors are quality constructed from extra strong ¾" dia. stainless steel to resist increased forces encountered at higher flow rates with both air and water. This extra strength also allows them to be made in longer insertion lengths up to 24 inches (61 cm). All models include convenient and quick-acting quarter-turn ball valves to isolate the sensor for zeroing. Process connections to the valve assembly are ⅛" female NPT. A pair of ⅛" NPT × ¼" SAE 45° flared adapters are included, compatible with hoses used in the Model A-471 Portable Capsuhelic® Gage Kit. Supplied solid brass mounting adapter has a ¾" dia. compression fitting to lock in required insertion length and a ¾" male NPT thread for mounting in a Threaded Branch Connection.

Select model with suffix which matches pipe size

DS-300-1"
DS-300-1¼"
DS-300-1½"
DS-300-2"
DS-300-2½"
DS-300-3"
DS-300-4"
DS-300-6"
DS-300-8"
DS-300-10"

DS-400-6"
DS-400-8"
DS-400-10"
DS-400-12"
DS-400-14"
DS-400-16"
DS-400-18"
DS-400-20"
DS-400-24"

Options and Accessories

A-160 Thredolet, ⅛" NPT, forged steel, 3000 psi
A-161 Brass Bushing, ¼" x ⅛"
(DS-300) To order, add suffix -LVdeduct
Ⓑ Items subject to Schedule B discounts

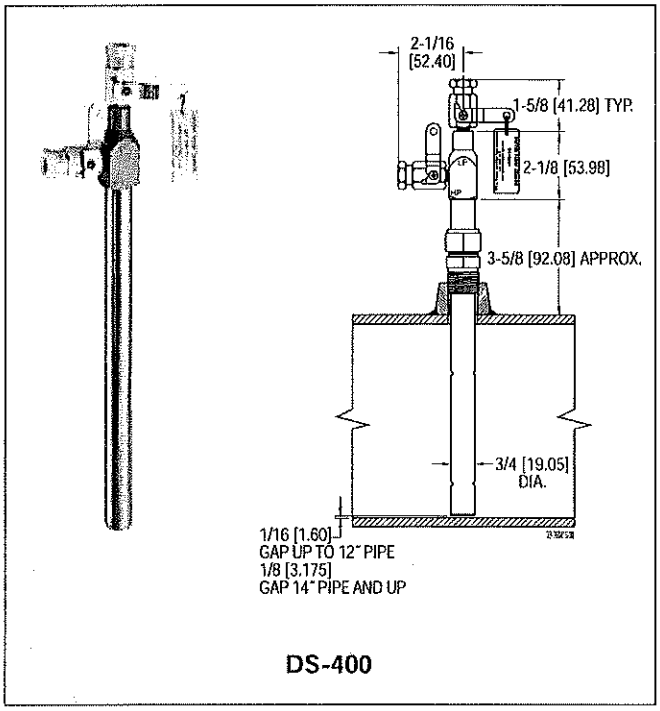
How To Order

Merely determine the pipe size into which the flow sensor will be mounted and designate the size as a suffix to Model DS-300. For example, a flow sensor to be mounted in a 2" pipe would be a Model No. DS-300-2".

For non-critical water and air flow monitoring applications, the chart below can be utilized for ordering a stock Capsuhelic® differential pressure gage for use with the DS-300 flow sensor. Simply locate the maximum flow rate for the media being measured under the appropriate pipe size and read the Capsuhelic® gage range in inches of water column to the left. The DS-300 sensor is supplied with installation and operating instructions, Bulletin F-50. It also includes complete flow conversion information for the three media conditions shown in the chart below. This information enables the user to create a complete differential pressure to flow rate conversion table for the sensor and differential pressure gage employed. Both the Dwyer® Capsuhelic® gage and flow sensor feature excellent repeatability so, once the desired flow rate is determined, deviation from that flow in quantitative measure can be easily determined. You may wish to order the adjustable signal flag option for the Capsuhelic® gage to provide an easily identified reference point for the proper flow.

Capsuhelic® gages with special ranges and/or direct reading scales in appropriate flow units are available on special order for more critical applications. Customer supplied data for the full scale flow (quantity and units) is required along with the differential pressure reading at that full flow figure. Prior to ordering a special Capsuhelic® differential pressure gage for flow read-out, we recommend you request Bulletin F-50 to obtain complete data on converting flow rates of various media to the sensor differential pressure output. With this bulletin and after making a few simple calculations, the exact range gage required can easily be determined.

Large 3/4 Inch Diameter for Extra Strength in Lengths to 24 Inches



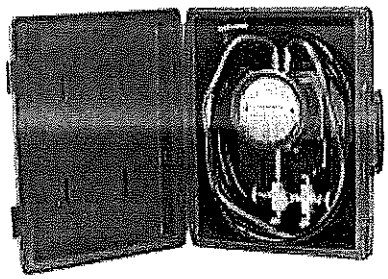
DS-400

GAGE RANGE (IN. W.C.)	MEDIA @ 70°F	FULL RANGE FLOWS BY PIPE SIZE (APPROXIMATE)									
		1"	1¼"	1½"	2"	2½"	3"	4"	6"	8"	10"
2	Water (GPM)	4.8	8.3	11.5	20.5	30	49	86	205	350	560
	Air @ 14.7 PSIA (SCFM)	19.0	33.0	42.0	65.0	113	183	330	760	1340	2130
	Air @ 100 PSIG (SCFM)	50.0	90.5	120.0	210.0	325	510	920	2050	3600	6000
5	Water (GPM)	7.7	14.0	18.0	34.0	47	78	138	320	560	890
	Air @ 14.7 PSIA (SCFM)	30.0	51.0	66.0	118.0	178	289	510	1200	2150	3400
	Air @ 100 PSIG (SCFM)	83.0	142.0	190.0	340.0	610	820	1600	3300	5700	10000
10	Water (GPM)	11.0	19.0	25.5	45.5	67	110	195	450	800	1260
	Air @ 14.7 PSIA (SCFM)	41.0	72.0	93.0	163.0	250	410	725	1690	3040	4850
	Air @ 100 PSIG (SCFM)	120.0	205.0	275.0	470.0	740	1100	2000	4600	8100	15000
25	Water (GPM)	18.0	32.0	40.5	72.0	108	173	310	720	1250	2000
	Air @ 14.7 PSIA (SCFM)	63.0	112.0	155.0	255.0	390	640	1130	2630	4860	7700
	Air @ 100 PSIG (SCFM)	185.0	325.0	430.0	760.0	1200	1800	3300	7200	13000	22000
50	Water (GPM)	25.0	44.0	57.5	100.0	152	247	435	1000	1800	
	Air @ 14.7 PSIA (SCFM)	90.0	161.0	205.0	360.0	560	900	1600	3700	6400	
	Air @ 100 PSIG (SCFM)	260.0	460.0	620.0	1050.0	1700	2600	4600	10000	18500	
100	Water (GPM)	36.5	62.0	82.0	142.0	220	350	620	1500		
	Air @ 14.7 PSIA (SCFM)	135.0	230.0	300.0	505.0	800	1290	2290	5000		
	Air @ 100 PSIG (SCFM)	370.0	660.0	870.0	1500.0	2300	3600	6500	15000		

Model A-471 Portable Kit

The Dwyer® Series 4000 Capsuhelic® differential pressure gage is ideally suited for use as a read-out device with the DS-300 Flow Sensors. The gage may be used on system pressures of up to 500 psig even when the flow sensor differential pressure to be read is less than 0.5" w.c. With accuracy of ±3% of full scale, the Capsuhelic® gage can be used in ambient temperatures from 32 to 200°F (0 to 93.3°C). Zero and range adjustments are made from outside the gage. The standard gage with a die cast aluminum housing can be used with the flow sensor for air or oil applications. For water flow measurements, the optional forged brass housing should be specified. The Capsuhelic® gage may be panel or surface mounted and permanently plumbed to the flow sensor if desired. The optional A-610 pipe mounting bracket allows the gage to be easily attached to any 1¼" - 2" horizontal or vertical pipe.

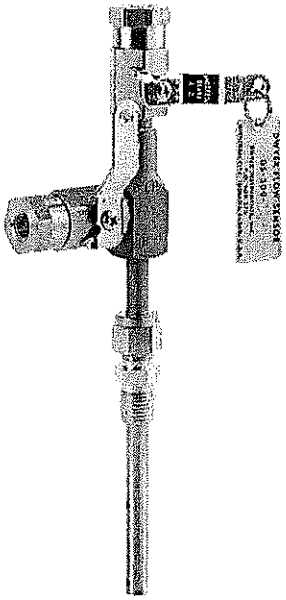
For portable operation, the A-471 Capsuhelic® Portable Gage Kit is available complete with tough polypropylene carrying case, mounting bracket, 3-way manifold valve, two 10' high pressure hoses, and all necessary fittings. See pages 8 and 9 for complete information on the Capsuhelic® gage.

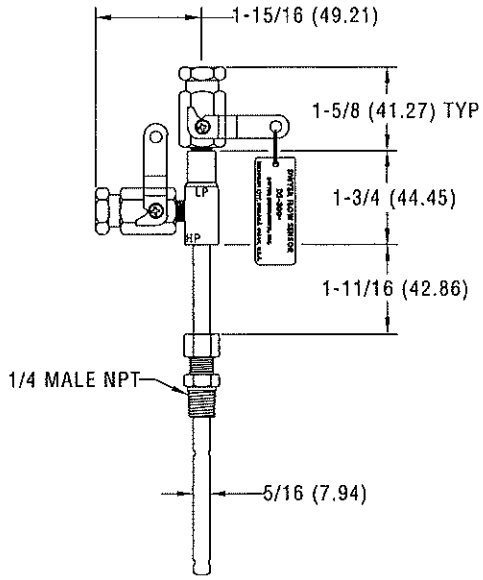


CAPSUHELIC® GAGE SHOWN INSTALLED IN A-471 PORTABLE KIT

Series DS-300 Flow Sensors

Installation and Operating Instructions Flow Calculations





Series DS-300 Flow Sensors are averaging pitot tubes that provide accurate, convenient flow rate sensing. When purchased with a Dwyer Capsuhelic® for liquid flow or Magnehelic® for air flow, differential pressure gage of appropriate range, the result is a flow-indicating system delivered off the shelf at an economical price. Series DS-300 Flow Sensors are designed to be inserted in the pipeline through a compression fitting and are furnished with instrument shut-off valves on both pressure connections. Valves are fitted with 1/8" female NPT connections. Accessories include adapters with 1/4" SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic® kit. Standard valves are rated at 200°F (93.3°C). Where valves are not required, they can be omitted at reduced cost. Series DS-300 Flow Sensors are available for pipe sizes from 1" to 10".

INSPECTION

Inspect sensor upon receipt of shipment to be certain it is as ordered and not damaged. If damaged, contact carrier.

INSTALLATION

General - The sensing ports of the flow sensor must be correctly positioned for measurement accuracy. The instrument connections on the sensor indicate correct positioning. The side connection is for total or high pressure and should be pointed upstream. The top connection is for static or low pressure.

Location - The sensor should be installed in the flowing line with as much straight run of pipe upstream as possible. A rule of thumb is to allow 10 - 15 pipe diameters upstream and 5 downstream. The table below lists recommended up and down piping.

PRESSURE AND TEMPERATURE

Maximum: 200 psig (13.78 bar) at 200°F (93.3°C).

Upstream and Downstream Dimensions in Terms of Internal Diameter of Pipe*

Upstream Condition	Minimum Diameter of Straight Pipe		
	Upstream		Downstream
	In-Plane	Out of Plane	
One Elbow or Tee	7	9	5
Two 90° Bends in Same Plane	8	12	5
Two 90° Bends in Different Plane	18	24	5
Reducers or Expanders	8	8	5
All Valves**	24	24	5

* Values shown are recommended spacing, in terms of internal diameter for normal industrial metering requirements. For laboratory or high accuracy work, add 25% to values.

** Includes gate, globe, plug and other throttling valves that are only partially opened. If valve is to be fully open, use values for pipe size change. **CONTROL VALVES SHOULD BE LOCATED AFTER THE FLOW SENSOR.**

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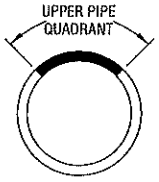
POSITION

Be certain there is sufficient clearance between the mounting position and other pipes, walls, structures, etc, so that the sensor can be inserted through the mounting unit once the mounting unit has been installed onto the pipe.

Flow sensors should be positioned to keep air out of the instrument connecting lines on liquid flows and condensate out of the lines on gas flows. The easiest way to assure this is to install the sensor into the pipe so that air will bleed into, or condensate will drain back to, the pipe.

For Air or Gas Flow

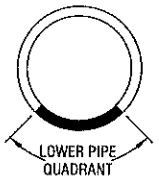
Install in upper quadrant of pipe



Condensate drains back to pipe

For Liquid or Steam Flow

Install in lower quadrant of pipe



Air bleeds back to pipe

INSTALLATION

1. When using an A-160 thred-o-let, weld it to the pipe wall. If replacing a DS-200 unit, an A-161 bushing (1/4" x 3/8') will be needed.

2. Drill through center of the thred-o-let into the pipe with a drill that is slightly larger than the flow sensor diameter.

3. Install the packing gland using proper pipe sealant. If the packing gland is disassembled, note that the tapered end of the ferrule goes into the fitting body.

4. Insert sensor until it bottoms against opposite wall of the pipe, then withdraw 1/16" to allow for thermal expansion.

5. Tighten packing gland nut finger tight. Then tighten nut with a wrench an additional 1-1/4 turns. Be sure to hold the sensor body with a second wrench to prevent the sensor from turning.

INSTRUMENT CONNECTION

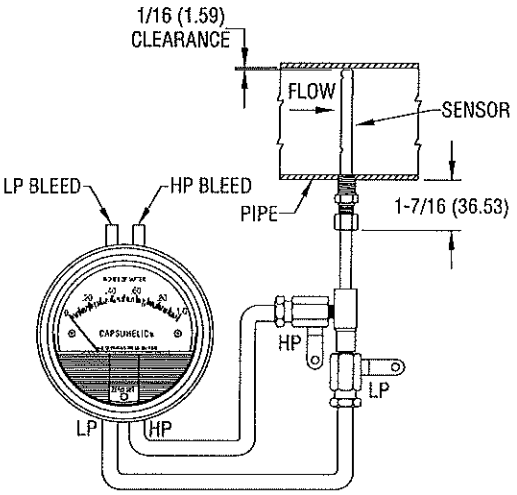
Connect the slide pressure tap to the high pressure port of the Magnehelic® (air only) or Capsuhelic® gage or transmitting instrument and the top connection to the low pressure port.

See the connection schematics below.

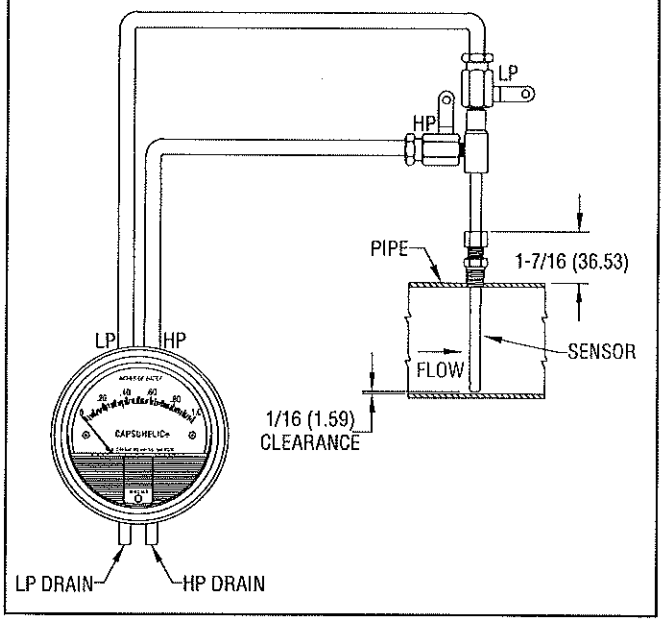
Bleed air from instrument piping on liquid flows. Drain any condensate from the instrument piping on air and gas flows.

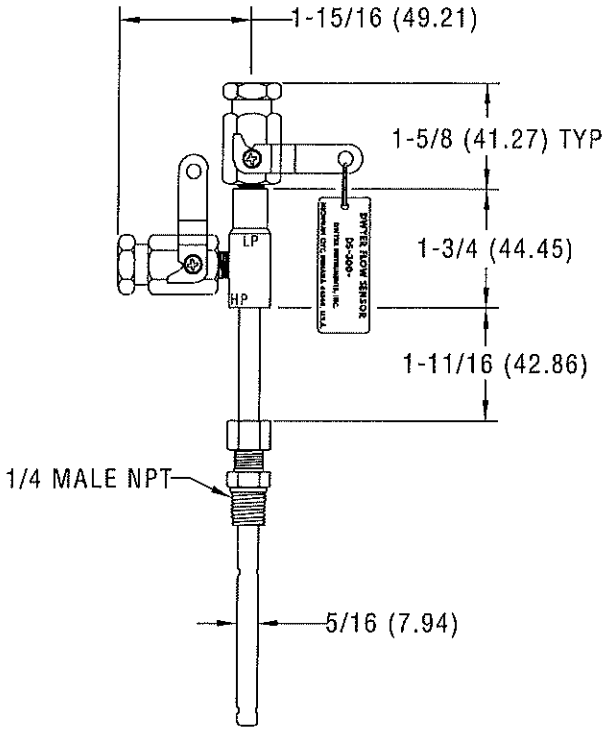
Open valves to instrument to place flow meter into service. For permanent installations, a 3-valve manifold is recommended to allow the gage to be zero checked without interrupting the flow. The Dwyer A-471 Portable Test Kit includes such a device.

Water Flow



Air or Gas Flow





Flow Calculations and Charts

The following information contains tables and equations for determining the differential pressure developed by the DS-300 Flow Sensor for various flow rates of water, steam, air or other gases in different pipe sizes.

This information can be used to prepare conversion charts to translate the differential pressure readings being sensed into the equivalent flow rate. When direct readout of flow is required, use this information to calculate the full flow differential pressure in order to specify the exact range of Dwyer Magnehelic® or Capsuhelic® gage required. Special ranges and calculations are available for these gages at minimal extra cost. See bulletins A-30 and F-41 for additional information on Magnehelic® and Capsuhelic® gages and DS-300 flow sensors.

For additional useful information on making flow calculations, the following service is recommended: Crane Valve Co. Technical Paper No. 410 "Flow of Fluids Through Valves, Fittings and Pipe." It is available from Crane Valve Company, www.cranevalve.com.

Using the appropriate differential pressure equation from Page 4 of this bulletin,calculate the differential pressure generated by the sensor under normal operating conditions of the system. Check the chart below to determine if this value is within the recommended operating range for the sensor. Note that the data in this chart is limited to standard conditions of air at 60°F (15.6°C) and 14.7 psia static line pressure or water at 70°F (21.1°C). To determine recommended operating ranges of other gases, liquids an/or operating conditions, consult factory.

Note: the column on the right side of the chart which defines velocity ranges to avoid. Continuous operation within these ranges can result in damage to the flow sensor caused by excess vibration.

Pipe Size (Schedule 40)	Flow Coefficient "K"	Operating Ranges Air @ 60°F & 14.7 psia (D/P in. W.C.)	Operating Ranges Water @ 70°F (D/P in. W.C.)	Velocity Ranges Not Recommended (Feet per Second)
1	0.52	1.10 to 186	4.00 to 675	146 to 220
1-1/4	0.58	1.15 to 157	4.18 to 568	113 to 170
1-1/2	0.58	0.38 to 115	1.36 to 417	96 to 144
2	0.64	0.75 to 75	2.72 to 271	71 to 108
2-1/2	0.62	1.72 to 53	6.22 to 193	56 to 85
3	0.67	0.39 to 35	1.43 to 127	42 to 64
4	0.67	0.28 to 34	1.02 to 123	28 to 43
6	0.71	0.64 to 11	2.31 to 40	15 to 23
8	0.67	0.10 to 10	0.37 to 37	9.5 to 15
10	0.70	0.17 to 22	0.60 to 79	6.4 to 10

FLOW EQUATIONS

1. Any Liquid

$$Q\ (GPM) = 5.668 \times K \times D^2 \times \sqrt{\Delta P / S_f}$$

2. Steam or Any Gas

$$Q\ (lb/Hr) = 359.1 \times K \times D^2 \times \sqrt{p \times \Delta P}$$

3. Any Gas

$$Q\ (SCFM) = 128.8 \times K \times D^2 \times \sqrt{\frac{P \times \Delta P}{(T + 460) \times S_s}}$$

DIFFERENTIAL PRESSURE EQUATIONS

1. Any Liquid

$$\Delta P\ (in.\ WC) = \frac{Q^2 \times S_f}{K^2 \times D^4 \times 32.14}$$

2. Steam or Any Gas

$$\Delta P\ (in.\ WC) = \frac{Q^2}{K^2 \times D^4 \times p \times 128{,}900}$$

3. Any Gas

$$\Delta P\ (in.\ WC) = \frac{Q^2 \times S_s \times (T + 460)}{K^2 \times D^4 \times P \times 16{,}590}$$

Technical Notations

The following notations apply:

ΔP = Differential pressure expressed in inches of water column
Q = Flow expressed in GPM, SCFM, or PPH as shown in equation
K = Flow coefficient— See values tabulated on Pg. 3.
D = Inside diameter of line size expressed in inches.

For square or rectangular ducts, use: $D = \sqrt{\frac{4 \times \text{Height} \times \text{Width}}{\pi}}$

P = Static Line pressure (psia)
T = Temperature in degrees Fahrenheit (plus 460 = °Rankine)
p = Density of medium in pounds per square foot
S_f = Sp Gr at flowing conditions
S_s = Sp Gr at 60°F (15.6°C)

SCFM TO ACFM EQUATION

$$SCFM = ACFM \times \left(\frac{14.7 + PSIG}{14.7}\right) \left(\frac{520^*}{460 + °F}\right)$$

$$ACFM = SCFM \times \left(\frac{14.7}{14.7 + PSIG}\right) \left(\frac{460 + °F}{520}\right)$$

$$\text{POUNDS PER CUBIC FOOT STD.} = \text{POUNDS PER CUBIC FOOT ACT.} \times \left(\frac{14.7}{14.7 + PSIG}\right) \left(\frac{460 + °F}{520^*}\right)$$

$$\text{POUNDS PER CUBIC FOOT ACT.} = \text{POUNDS PER CUBIC FOOT STD.} \times \left(\frac{14.7 + PSIG}{14.7}\right) \left(\frac{520^*}{460 + °F}\right)$$

1 Cubic foot of air = 0.076 pounds per cubic foot at 60° F (15.6°C) and 14.7 psia.
* (520°= 460 + 60°) Std. Temp. Rankine

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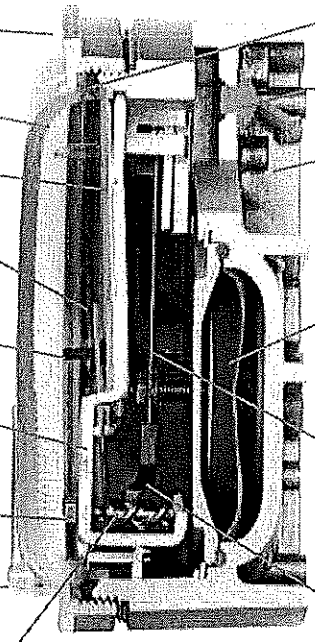
Quality design and construction features



Bezel provides flange for flush mounting in panel.

Clear plastic face is highly resistant to breakage. Provides undistorted viewing of pointer and scale.

Precision litho-printed scale is accurate and easy to read.

Red tipped pointer of heat treated aluminum tubing is easy to see. It is rigidly mounted on the helix shaft.

Pointer stops of molded rubber prevent pointer over-travel without damage.

"Wishbone" assembly provides mounting for helix, helix bearings and pointer shaft.

Jeweled bearings are shock-resistant mounted; provide virtually friction-free motion for helix. Motion damped with high viscosity silicone fluid.

Zero adjustment screw is conveniently located in the plastic cover, and is accessible without removing cover. O-ring seal provides pressure tightness.

O-ring seal for cover assures pressure integrity of case.

Blowout plug of silicone rubber protects against overpressure on 15 psig rated models. Opens at approximately 25 psig.

Die cast aluminum case is precision made and iridite-dipped to withstand 168 hour salt spray corrosion test. Exterior finished in baked dark gray hammerloid. One case size is used for all standard pressure options, and for both surface and flush mounting.

Silicone rubber diaphragm with integrally molded O-ring is supported by front and rear plates. It is locked and sealed in position with a sealing plate and retaining ring. Diaphragm motion is restricted to prevent damage due to overpressures.

Calibrated range spring is flat spring steel. Small amplitude of motion assures consistency and long life. It reacts to pressure on diaphragm. Live length adjustable for calibration.

Samarium Cobalt magnet mounted at one end of range spring rotates helix without mechanical linkages.

Helix is precision made from an alloy of high magnetic permeability. Mounted in jeweled bearings, it turns freely, following the magnetic field to move the pointer across the scale.

Dual Scale English/Metric Models		
Model Number	Range, In. W.C.	Range, Pa or kPa
2000-0D	0-0.5	0-125 Pa
2001D	0-1.0	0-250 Pa
2002D	0-2.0	0-500 Pa
2003D	0-3.0	0-750 Pa
2004D	0-4.0	0-1.0 kPa
2006D	0-6.0	0-1.5 kPa
2008D	0-8.0	0-2.0 kPa
2010D	0-10	0-2.5 kPa

SERIES 2000 MAGNEHELIC® GAGE — MODELS AND RANGES

The models below will fulfill most requirements. Page V also shows examples of special models built for OEM customers. For special scales furnished in ounces per square inch, inches of mercury, metric units, etc., contact the factory.

Model Number	Range Inches of Water
2000-00N†••	.05-0-.2
2000-00†••	0-.25
2000-0†•	0-.50
2001	0-1.0
2002	0-2.0
2003	0-3.0
2004	0-4.0
2005	0-5.0
2006	0-6.0
2008	0-8.0
2010	0-10
2015	0-15
2020	0-20
2025	0-25
2030	0-30
2040	0-40
2050	0-50
2060	0-60
2080	0-80
2100	0-100
2150	0-150

Model Number	Range Zero Center Inches of Water
2300-0†•	.25-0-.25
2301	.5-0-.5
2302	1-0-1
2304	2-0-2
2310	5-0-5
2320	10-0-10
2330	15-0-15

Model Number	Range PSI
2201	0-1
2202	0-2
2203	0-3
2204	0-4
2205	0-5
2210*	0-10
2215*	0-15
2220*	0-20
2230**	0-30

*MP option standard
**HP option standard

Dual Scale Air Velocity Units

Model Number	Range in W.C. Velocity, F.P.M.
2000-00AV†••	0-.25/300-2000
2000-0AV†•	0-.50/500-2800
2001AV	0-1.0/500-4000
2002AV	0-2.0/1000-5600
2010AV	0-10/2000-12500

For use with pitot tube.

Model Number	Range MM of Water
2000-6MM†••	0-6
2000-10MM†•	0-10
2000-25MM	0-25
2000-50MM	0-50
2000-80MM	0-80
2000-100MM	0-100
Zero Center Ranges	
2300-20MM†	10-0-10

Model Number	Range, CM of Water
2000-15CM	0-15
2000-20CM	0-20
2000-25CM	0-25
2000-50CM	0-50
2000-80CM	0-80
2000-100CM	0-100
2000-150CM	0-150
2000-200CM	0-200
2000-250CM	0-250
2000-300CM	0-300
Zero Center Ranges	
2300-4CM	2-0-2
2300-10CM	5-0-5
2300-30CM	15-0-15

Model Number	Range, Pascals
2000-60PA†••	0-60
2000-100PA†•	0-100
2000-125PA†•	0-125
2000-250PA	0-250
2000-300PA	0-300
2000-500PA	0-500
2000-750PA	0-750

Model Number	Range, Pascals
Zero Center Ranges	
2300-60PA	30-0-30
2300-100PA	50-0-50
2300-120PA	60-0-60
2300-250PA	125-0-125
2300-500PA	250-0-250

Model Number	Range, Kilopascals
2000-1KPA	0-1
2000-1.5KPA	0-1.5
2000-2KPA	0-2
2000-3KPA	0-3
2000-4KPA	0-4
2000-5KPA	0-5
2000-8KPA	0-8
2000-10KPA	0-10
2000-15KPA	0-15
2000-20KPA	0-20
2000-25KPA	0-25
2000-30KPA	0-30
Zero Center Ranges	
2300-1KPA	.5-0-.5
2300-3KPA	1.5-0-1.5

Accessories

A-299, Surface Mounting Bracket
A-300, Flat Flush Mounting Bracket
A-310A, 3-Way Vent Valve
A-321, Safety Relief Valve
A-432, Portable Kit
A-605, Air Filter Kit
A-610, Pipe Mount Kit

Options — To order, add suffix: I.E. 2001-ASF
ASF (Adjustable Signal Flag)
HP (High Pressure Option)
LT (Low Temperatures to -20°F)
MP (Med. Pressure Option)
SP (Setpoint Indicator)

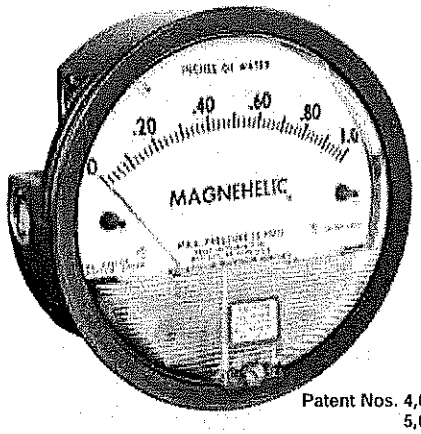
Scale Overlays — Red, Green, Mirrored or Combination, Specify Locations

†These ranges calibrated for vertical scale position.
• Accuracy +/-3%. •• Accuracy +/-4%

1011R01-0299P

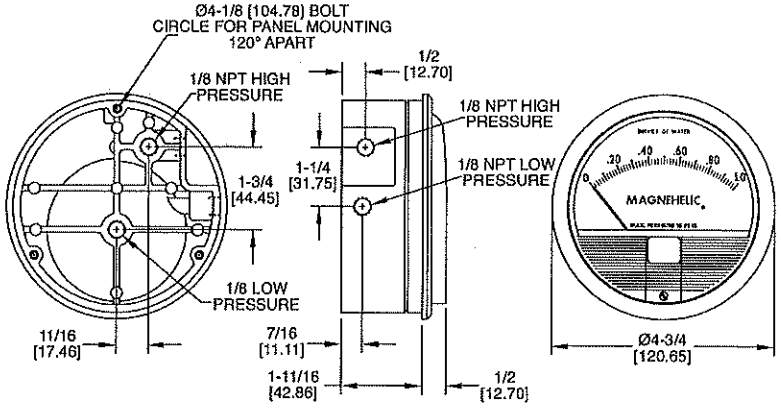
Series 2000 Magnehelic® Differential Pressure Gages

Indicate Positive, Negative or Differential, Accurate within 2%



Patent Nos. 4,030,365
5,012,678

Standard Magnehelic® Pressure Gage has a large, easy-to-read 4" dial.



Dimensions, Standard Series 2000 Magnehelic® Pressure Gages. (Slightly different on medium and high pressure models)

Select the Dwyer® Magnehelic® gage for high accuracy – guaranteed within 2% of full scale – and for the wide choice of 81 models available to suit your needs precisely. Using Dwyer's simple, frictionless Magnehelic® gage movement, it quickly indicates low air or non-corrosive gas pressures – either positive, negative (vacuum) or differential. The design resists shock, vibration and over-pressures. No manometer fluid to evaporate, freeze or cause toxic or leveling problems. It's inexpensive, too.

The Magnehelic® gage is the industry standard to measure fan and blower pressures, filter resistance, air velocity, furnace draft, pressure drop across orifice plates, liquid levels with bubbler systems and pressures in fluid amplifier or fluidic systems. It also checks gas-air ratio controls and automatic valves, and monitors blood and respiratory pressures in medical care equipment.

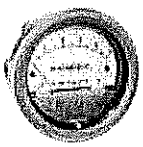
Note: May be used with Hydrogen. When ordering a Buna-N diaphragm pressures must be less than 35 psi.

Flush ...Surface...or Pipe Mounted

MOUNTING. A single case size is used for most models of Magnehelic® gages. They can be flush or surface mounted with standard hardware supplied. With the optional A-610 Pipe Mounting Kit they may be conveniently installed on horizontal or vertical 1¼" - 2" pipe. Although calibrated for vertical position, many ranges above 1" may be used at any angle by simply re-zeroing. However, for maximum accuracy, they must be calibrated in the same position in which they are used. These characteristics make Magnehelic® gages ideal for both stationary and portable applications. A 4⅛" hole is required for flush panel mounting. Complete mounting and connection fittings plus instructions are furnished with each instrument.

VENT VALVES

In applications where pressure is continuous and the Magnehelic® gage is connected by metal or plastic tubing which cannot be easily removed, we suggest using Dwyer A-310A vent valves to connect gage. Pressure can then be removed to check or re-zero the gage.



HIGH AND MEDIUM PRESSURE MODELS

Installation is similar to standard gages except that a 4⅛" hole is needed for flush mounting. The medium pressure construction is rated for internal pressures up to 35 psig and the high pressure up to 80 psig. Available for all models. Because of larger case, the medium pressure and high pressure models will not fit in a portable case size. Installation of the A-321 safety relief valve on standard Magnehelic® gages often provides adequate protection against infrequent overpressure.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)
Wetted Materials: Consult factory.
Housing: Die cast aluminum case and bezel, with acrylic cover. Exterior finish is coated gray to withstand 168 hour salt spray corrosion test.
Accuracy: ±2% of full scale (±3% on - 0, -100 Pa, -125 Pa, 10MM and ±4% on - 00, -60 Pa, -6MM ranges), throughout range at 70°F (21.1°C).
Pressure Limits: -20" Hg, to 15 psig.† (-0.677 bar to 1.034 bar); MP option: 35 psig (2.41 bar), HP option: 80 psig (5.52 bar).
Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only.
Temperature Limits: 20 to 140°F.* (-6.67 to 60°C).
Size: 4" (101.6 mm) Diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: 1/8" female NPT duplicate high and low pressure taps - one pair side and one pair back.
Weight: 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g).
Standard Accessories: Two 1/8" NPT plugs for duplicate pressure taps, two 1/8" pipe thread to rubber tubing adapter and three flush mounting adapters with screws. (Mounting and snap ring retainer substituted for 3 adapters in MP & HP gage accessories.)
*Low temperature models available as special option.
†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options at lower left.

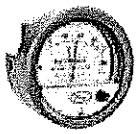
OPTIONS AND ACCESSORIES

Transparent Overlays

Furnished in red and green to highlight and emphasize critical pressures.

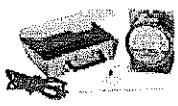
Adjustable Signal Flag

Integral with plastic gage cover. Available for most models except those with medium or high pressure construction. Can be ordered with gage or separate.



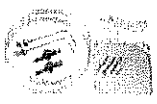
LED Setpoint Indicator

Bright red LED on right of scale shows when setpoint is reached. Field adjustable from gage face, unit operates on 12-24 VDC. Requires MP or HP style cover and bezel.



Portable Units

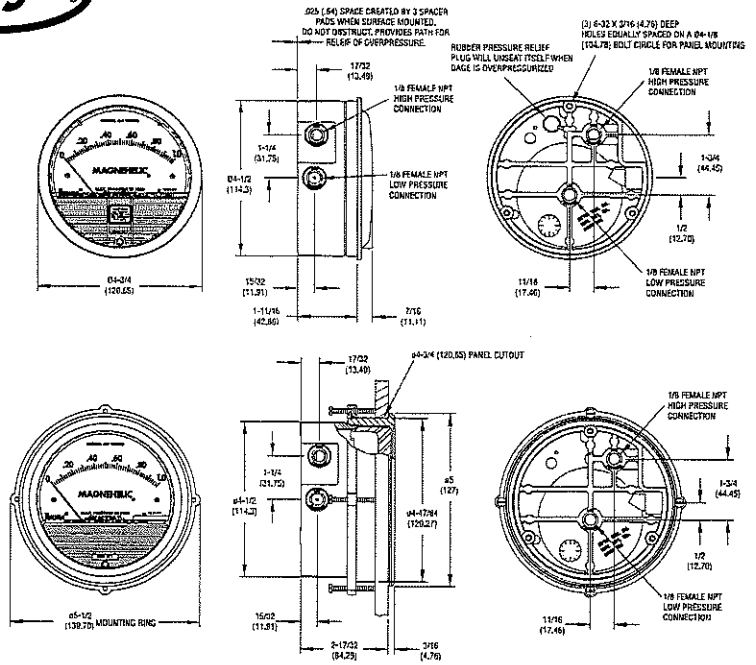
Combine carrying case with any Magnehelic® gage of standard range, except high pressure connection. Includes 9 ft. (2.7 m) of ⅛" I.D. rubber tubing, standhang bracket and terminal tube with holder.



Air Filter Gage Accessory Package

Adapts any standard Magnehelic® gage for use as an air filter gage. Includes aluminum surface mounting bracket with screws, two 5 ft. (1.5 m) lengths of ¼" aluminum tubing two static pressure tips and two molded plastic vent valves, integral compression fittings on both tips and valves.

Magnehelic® Differential Pressure Gage



**The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.*

STANDARD GAGE ACCESSORIES: Two 1/8" NPT plugs for duplicate pressure taps, two 1/8" pipe thread to rubber tubing adapters and three flush mounting adapters with screws.

MP AND HP GAGE ACCESSORIES: Mounting ring and snap ring retainer substituted for 3 adaptors, 1/4" compression fittings replace 1/8" pipe thread to rubber tubing adaptors.

OVERPRESSURE PROTECTION: Standard Magnehelic® Differential Pressure Gages are rated for a maximum pressure of 15 psig and should not be used where that limit could be exceeded. Models employ a rubber plug on the rear which functions as a relief valve by unseating and venting the gage interior when over pressure reaches approximately 25 psig (excludes MP and HP models). To provide a free path for pressure relief, there are four spacer pads which maintain .023" clearance when gage is surface mounted. Do not obstruct the gap created by these pads.

SPECIFICATIONS

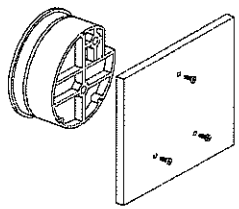
Service: Air and non-combustible, compatible gases. (Natural Gas option available.)
Wetted Materials: Consult factory.
Housing: Die cast aluminum case and bezel, with acrylic cover. (MP model has polycarbonate cover).
Accuracy: ±2% of full scale (±3% on - 0, -100 Pa, -125 Pa, 10MM and ±4% on -00, - 00N, -60 Pa, -6MM ranges), throughout range at 70°F (21,1°C).
Pressure Limits: -20" Hg to 15 psig.† (-0.677 bar to 1.034 bar); MP option: 35 psig (2.41 bar), HP option: 80 psig (5.52 bar).
Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only. The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.
Temperature Limits: 20 to 140°F (-6.67 to 60°C). *Low temperature models available as special option.
Size: 4" (101.6 mm) diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: 1/8" female NPT duplicate high and low pressure taps - one pair side and one pair back.
Weight: 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g).

†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options.
Note: May be used with hydrogen when ordering Buna-N diaphragm. Pressure must be less than 35 psi.

INSTALLATION

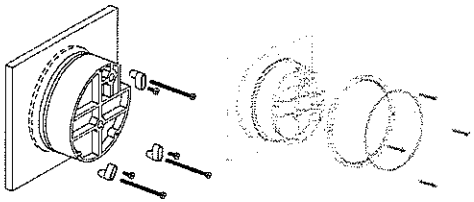
Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F (60°C). Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines may be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.
All standard Magnehelic® Differential Pressure Gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only rezeroing. Low range models of 0.5" w.c. plus 0.25" w.c. and metric equivalents must be used in the vertical position only.

SURFACE MOUNTING



Locate mounting holes, 120° apart on a 4-1/8" dia. circle. Use No. 6-32 machine screws of appropriate length.

FLUSH MOUNTING



Provide a 4-9/16" dia. (116 mm) opening in panel. Provide a 4-3/4" dia. (120 mm) opening for MP and HP models. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adapters, firmly secured in place.

PIPE MOUNTING

To mount gage on 1-1/4" - 2" pipe, order optional A-610 pipe mounting kit.

TO ZERO GAGE AFTER INSTALLATION

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

OPERATION

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.
Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.
Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.
When one side of the gage is vented in dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

A. For portable use of temporary installation use 1/8" pipe thread to rubber tubing adapter and connect to source of pressure with flexible rubber or vinyl tubing.
B. For permanent installation, 1/4" O.D., or larger, copper or aluminum tubing is recommended.

MAINTENANCE

No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves should be used in permanent installations. The Series 2000 is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

WARNING

Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended.

TROUBLE SHOOTING TIPS

Gage won't indicate or is sluggish.

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O"ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F (-7°C), order gage with low temperature, (LT) option.

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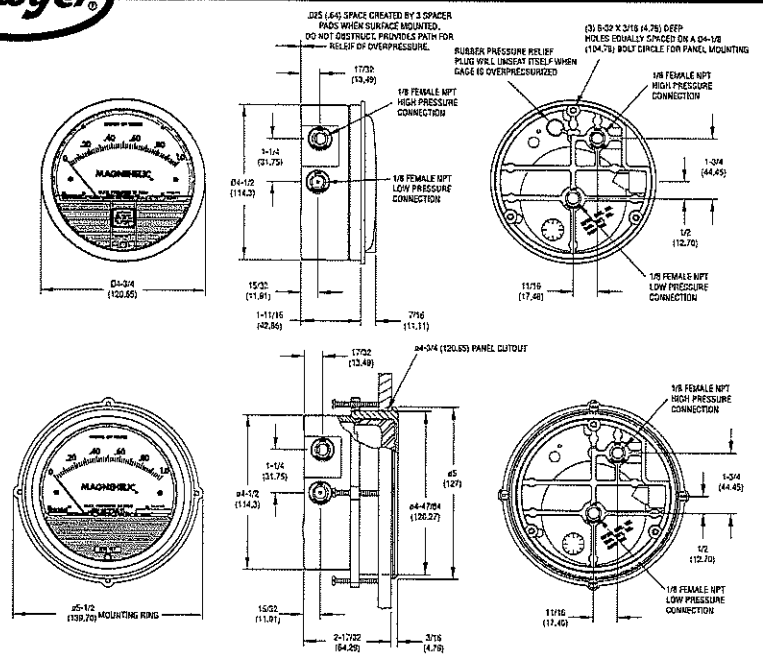
Bulletin A-27

Magnehelic® Differential Pressure Gage

INSTRUCCIONES Y LISTA DE PARTES



(El tapón de goma no es usado en los modelos sobre 180 pulgadas de presión de agua, modelos de presión media o alta, o en instrumentos que requieren un elastizado en cualquier otro material que no sea silicona para el diafragma.)

Accesorios: Tapones 1/8" NPT para las conexiones duplicadas, dos adaptadores de rosca 1/8" NPT a tubo de goma; y tres adaptadores para montaje al ras y tornillos.

Accesorios para Los Modelos MP y HP: El anillo de montaje y el retensor del anillo de presión son substituidos por 3 adaptadores, accesorios de compresión de 1/4" remplazan a los adaptadores de rosca 1/8" a tubo de goma.

Protección Para Sobrepresión: Los Manómetros Diferenciales Magnehelic Estándar están clasificados para una presión máxima de 15 psi y no se deberían de usar donde el límite puede excederse. Los modelos emplean un tapón de goma en el trasero que funciona como una válvula de alivio desmontándose y ventilando el interior del instrumento cuando la sobrepresión alcanza aproximadamente 25 psig. (Los modelos MP y HP son excluidos) Para proveer un camino libre para el alivio de presión, el instrumento viene con rodilleras que mantienen un espacio de .023" cuando el instrumento es montado en superficie. No bloque el espacio creado por estas rodilleras.

ESPECIFICACIONES

Servicio: aire y gases no combustibles, gases compatibles. (opcion disponible para uso con gas natural).
Materiales Mojados: Consulte con la fábrica.
Carcasa: Caja y anillo de retención de aluminio fundido a presión con tapadera de acrílico. (El modelo MP tiene la tapadera de policarbonato.)
Exactitud: ±2% de fondo de escala a 21 °C
Mod. 2000-0 ±3%; Mod. 2000-00 ±4%
Límite de Presión: -20 Hg. a 15 psig. † (-0.677 bar a 1,034 bar); opción MP: 35 psig (2.41 bar), opción HP: 80 psig (5.52 bar).
Sobrepresión: El tapón de alivio se abre aproximadamente a los 25 psig, modelos estandard únicamente. El tapón de goma no es usado en los modelos sobre 180 pulgadas de presión de agua, modelos de presión media o alta, o en instrumentos que requieren un elastizado en cualquier otro material que no sea silicio para el diafragma.
Límite de Temperatura: -6.67 a 60°C. * Modelos de baja temperatura disponibles como opción especial.
Dimensiones: diám. 120,65 mm x 55,6 prof.
Orientación de Montaje: El diafragma debe ser usado solo en posición vertical. Consulte con la fábrica para otras orientaciones de posición.
Conexiones: 1/8" NPT para alta y baja presión, duplicadas (atrás, a los lados).
Peso: 510 g, MP y HP 963 g.

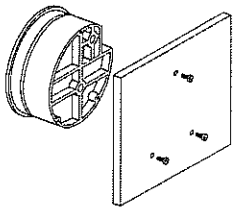
† Para aplicaciones con alto ciclo de velocidad dentro de la clasificación de presión total del instrumento, la próxima clasificación mas alta es recomendada. Vea las opciones de media y alta presión.

El instrumento puede ser usado con hidrogeno cuando se ordena con diafragma de Buna-N. La presion tiene que ser menos de 35 psi.

Instalacion

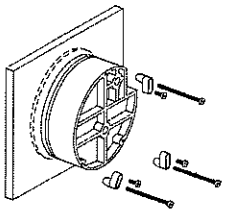
Seleccione un lugar libe de exceso de vibraciones, y donde la temperatura ambiente no supere los 60°C. Evite luz solar directa, para evitar decoloración de la cubierta plástica. Las conexiones de proceso pueden tener cualquier longitud sin afectar la exactitud, pero pueden extender el tiempo de respuesta del instrumento. Si hay pulsación de presión o vibración, consulte a fábrica sobre medios de amortiguación.
Los MAGNEHELIC han sido calibrados con el diafragma vertical, y deben ser usados en esas condiciones. Para otras posiciones, se debe especificar en la orden de provisión. Los de rango elevado pueden ser usados en diversas posiciones, pero se debe reajustar el cero. Los modelos de la serie 2000-00 y equivalentes métricos deben ser usados solo verticalmente.

Montaje en Superficie



Perfore tres orificios separados 120° sobre una circunferencia de 105 mm de diám. y sostenga el instrumento con tres tornillos 6-32 de long. apropiada.

Montaje alineado



Perfore un circulo de 115 mm de diám. en el panel, y sostenga el instrumento mediante los.

Montaje Sobre Pipa

Para montar el instrumento sobre pipas de 32 a 50 mm de diám., ordene el adaptador opcional A-610.

Puesta a Cero Después de Instalar

Deje las conexiones de presión abiertas a atmósfera y ajuste a cero desde tornillo del panel frontal.

Operacion

Presión Positiva: Conecte la tubería desde la fuente de presión a cualquiera de las dos conexiones de alta presión (HIGH), bloqueando la no usada; Las conexiones de baja (LOW) presión pueden dejarse uno o los dos abiertos a la atmósfera.
Presión Negativa: Repita el procedimiento anterior, conectado en este caso las conexiones de baja presión (LOW). Deje las otras conexiones abiertas.
Presión diferencial: Conecte el tubo correspondiente a la presión más positiva al cualquiera de los conectores de alta presión (HIGH) bloqueando el no usado, y la más baja presión o presión negativa (vacio) al conector de baja presión (LOW). Puede usarse cualquier conector de cada par, dejando siempre uno bloqueado. Si se deja una conexión abierta a la atmósfera, se recomienda el uso de un filtro tipo A-331 en el lugar correspondiente para mantener limpio el interior del instrumento. Para uso portable, o instalación temporaria, uso adapta dores para rosca de tubo de 1/89 a tubo flexible, y conecte a proceso mediante una tubería de goma, o equivalente. Para instalación permanente, se recomienda el uso de tubo de cobre o aluminio de por lo menos 1/4" de diám. exterior.

No se requiere mantenimiento específico alguno, ni lubricación. Periódicamente, desconecte el instrumento, ventee la presión acumulada, y reajuste el cero. Para instalaciones permanentes, se debe usar un juego de válvulas de montaje permanente para el venteo.
El instrumento de Serie 2000 no puede ser re parado en el campo y debería de ser regresado si reparos son necesarios (Reparos en el campo no deben de ser intentados y pueden cancelar la garantía.). Asegurarse de incluir una descripción breve del problema más cualquier notas pertinentes a la aplicación para devolución de productos antes de enviar el instrumento.

Cuidado! : La recalibración en campo puede invalidar la garantía. No se recomienda la recalibracion por parte del usuario. En caso necesario envie el instrumento con transporte pago a:

Localización De Fallas

• *El instrumento no indica, o es lento en reacción.*
1. Conexión duplicada abierta.
2. Diafragma roto por sobrepresión.
3. Tubería de conexión perforada, con pérdidas o pinchazos.
4. Anillo de retención flojo, u "O " ring dañado.
5. Conexión a proceso indebida o inadecuada.
6. Temperatura muy baja. Para este caso ordene tipos LT (baja temperatura).

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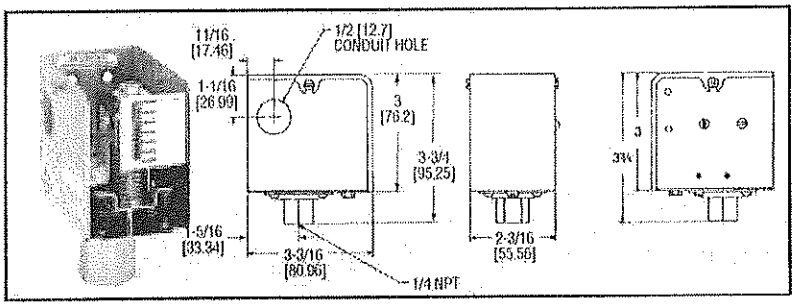
Mercoid®

Series
CS, CD

Low Cost Diaphragm Pressure Switches

Visible Set Points, Fixed or Adjustable Deadband



Series CS, CD combines advanced design and precision construction with small size and low price. Unit is ideal for instrument panels, small compressors and general industrial applications. Visible set point and easy to wire SPDT snap switch reduce installation time. Operates in any position and is vibration resistant.

STOCKED MODELS in bold

Model No.	Adjustable Operating Range	Deadband	Deadband Value
CS-1	1-30" Hg. Vac. (25.4-762 mm Hg)	Fixed	1.5" Hg. (38 mm Hg)
CS-3	1-100" w.c. (.25-24.9 kPa)	Fixed	7" w.c. (1.74 kPa)
CS-10	1-10 psig (.07-.69 bar)	Fixed	0.4 psig (0.03 bar)
CS-30	1-30 psig (.07-2.1 bar)	Fixed	1.0 psig (0.07 bar)
CS-150	10-150 psig (.69-10.3 bar)	Fixed	5 psig (0.35 bar)
CD-10	1-10 psig (.07-.69 bar)	Adjustable	Min: 1.5 psig (.1 bar), Max: 11.5 psig (.79 bar)
CD-30	1-30 psig (.07-2.1 bar)	Adjustable	Min: 2 psig (.14 bar), Max: 12 psig (.83 bar)
CD-150	10-150 psig (.69-10.3 bar)	Adjustable	Min: 14 psig (.97 bar), Max: 24 psig (1.7 bar)

SPECIFICATIONS

Wetted Materials: Nylon reinforced Buna-N and steel.
Temperature Limits: -30 to 150°F (-35 to 66°C).
Pressure Limit: 30 psig (2.1 bar) for ranges 1, 3, and 10. 50 psig (3.5 bar) for range 30. 175 psig (12.1 bar) for range 150.
Enclosure Rating: General purpose.
Switch Type: SPDT snap switch.
Electrical Rating: 15A @ 120 VAC, 8A @ 240 VAC.
Electrical Connections: Screw terminal.
Conduit Connection: 1/2" hole for conduit hub.
Process Connection: 1/4" female NPT.
Mounting Orientation: Any position.
Set Point Adjustment: Internal screw.
Weight: .5 lb (0.23 kg).
Deadband: See model chart.
Agency Approvals: CE, UL.

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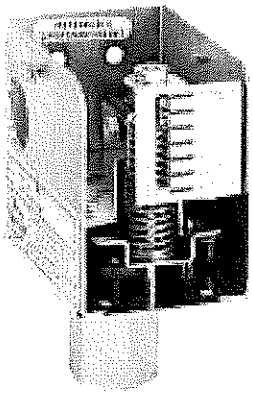
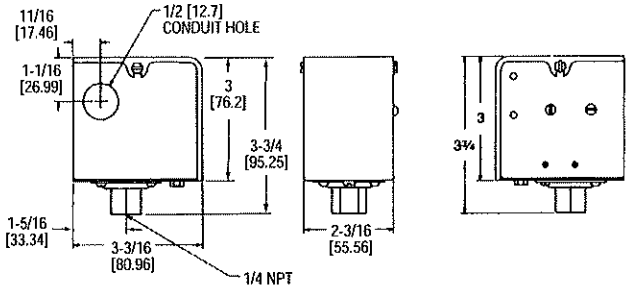
Mercoid® Series CS Low Cost Diaphragm Pressure Switches

Specifications – Installation and Operating Instructions





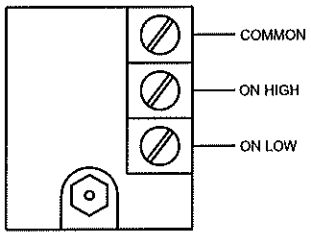
The Series CS Low Cost Diaphragm Pressure Switch is ideal for instrument panels, small compressors and general industrial applications. Visible set point and easy-to-wire SPDT snap switch reduce installation time. This switch operates in any position and is vibration resistant.

INSTALLATION/MOUNTING

The control can be pipe mounted. Do not twist the case when installing. Use wrench on the pressure connection flats.

WIRING

All wiring must conform to the National Electrical code and local regulations. Do not install control to handle loads in excess of electrical rating shown in specifications or as indicated on instructions inside control cover. Connect wiring to screw terminals depending on the action required. Common and High contacts will close and Common and Low contacts will open when increasing pressure (or vacuum) reaches set point. The reverse will occur when pressure (or vacuum) drops below the set point less the deadband.



WIRING DIAGRAM
TOP VIEW

CAUTIONS: Do not oil any parts. Mount control securely. Never exceed electrical rating for switch. Use only with compatible.

WARNING

A failure resulting in injury or damage can be caused by over-pressure, excessive vibration or pressure pulsation, excessive temperature, corrosion of pressure containing parts and movement assembly, electrical overload or other misuse.

PHYSICAL DATA

Temperature Limits: -30 to 150°F (-34.4 to 65.6°C)
Pressure Connections: ¼" NPT(F)
Electrical Ratings: 12 A @ 120 VAC; 8 A @ 240 VAC; 7A @ 277 VAC; ⅛HP @ 120 VAC; ¼ HP @ 240 VAC
Switch Type: SPDT snap acting
Conduit Opening: ½"
Wiring Connections: Three screw type, common, N.O., N.C.
Set Point Adjustment: Screw type, inside cover
Housing: Galvanized steel, NEMA 1
Diaphragm: Buna-N/Nylon
Calibration Spring: Plated steel
Installation: Any position
Weight: ½ lb. (0.23 kg)

Model No.	Adjustable Operating Range	Fixed Deadband		Max. Pressure
		Maximum	Minimum	
CS-1	1-30" Hg. Vac. 2.5-75 cm Hg.Vac	1.5" Hg. 3.8 cm Hg. Vac	1" Hg. VAC 2.5 cm Hg. Vac	30 psig
CS-3	10-100" w.c. 2.5-250 cm w.c.	7" w.c. 17.8 cm w.c.	5" w.c. 12.7 cm w.c.	30 psig
CS-10	1-10 psig 0.07-0.7 kg/cm²	0.4 psig 0.03 kg/cm²	0.25 psig 0.02 kg/cm²	30 psig
CS-30	1-30 psig 0.07-2.1 kg/cm²	1.0 psig 0.07 kg/cm²	0.5 psig 0.035 kg/cm²	50 psig
CS-150	10-150 psig 0.07-10.5 kg/cm²	5 psig 0.35 kg/cm²	1.5 psig 0.1 kg/cm²	175 psig

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