HI-Q **Environmental Products Co.**
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Air Sampling & Radiation Monitoring Equipment, Systems & Accessories

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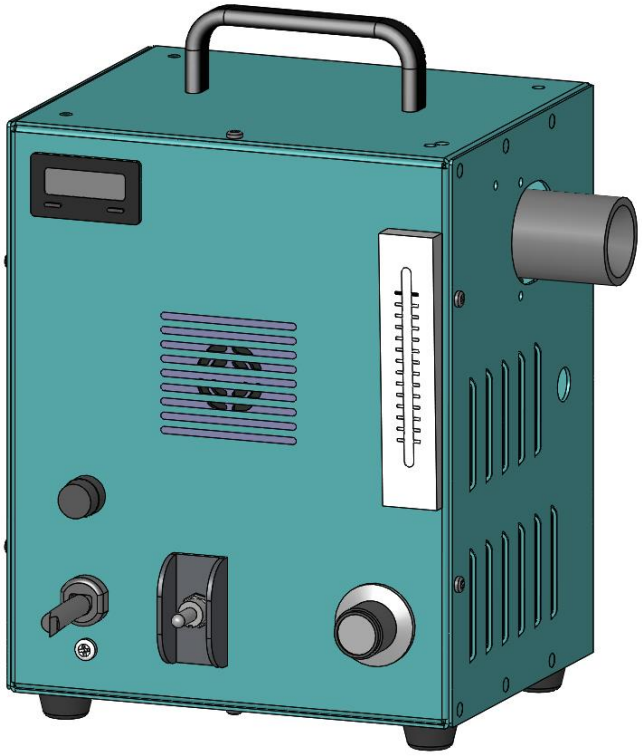
CF-1000BRL SERIES

Portable Air Particle Sampler

BRUSHLESS 2 STAGE BLOWER, MANUAL FLOW CONTROL



Rev C.S. 11/15

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INTRODUCTION

GENERAL DESCRIPTION:

This Portable, Maintenance-Free, High Volume Air Sampling System is ideal for continuous or intermittent sampling. The two stage brushless blower can be adjusted to any flow rate up to the capacity of the pump. The CF-1000BRL series high volume air samplers are designed for the sampling of airborne particulate and/or radioiodine in the environment.

The CF-1001BRL, comes standard with a 1½" female straight pipe threaded (FSPT) intake which accepts all HI-Q CF-Series holders (excluding 8" x 10"). The models CF-1002BRL and CF-1003BRL have a 4" diameter threaded ring installed on the air intake to allow for 4" diameter paper only sampling. From the 4" diameter ring an operator has the option of either adapting up to an 8" X 10" paper only holder (CFPH-810), or adapting down to a 47mm or 2" diameter combination style or paper only filter holder (CFPH-XX). Upon ordering the CFPH-810 it is recommended that an additional CF-1000BRL Series base extension stabilizer plate adapter (used to balance the unit P/N CFBOX-STABILIZER KIT) be purchased as well. Adapting down from a CFPH-810 to any of the CF-Series paper only or combination holders requires the use of an FHA-4CF, 4" diameter ring to 1½" FSPT Adapter.

Each unit has a label indicating the designed power requirements. Either 115VAC, 60Hz, or the 230VAC, 50/60Hz.

The main components of the CF-1000BRL Series Air Sampling Systems are: A two stage brushless blower, a motor speed controller, a 3 wire grounded power cord, motor fuse protection, an electronic elapsed, resettable timer (9 programmable time ranges) and a precision rotameter. All of which are housed in a 2-component, polyurethane primed and painted aluminum cabinet housing.

NOTE: THIS UNIT IS NOT RATED EXPLOSION PROOF. IT SHOULD NOT BE USED IN ANY POTENTIALLY EXPLOSIVE ATMOSPHERES.

UNPACKING THE UNIT:

Each unit is cushion packed to reduce the possibility of damage in transit. If the carton or unit shows any damage, report it immediately to the shipping carrier and file a damage claim. Each unit is tested, calibrated, and fully operative when it leaves the factory. If there is a problem call the factory immediately.

SYSTEM DESCRIPTION

INPUT POWER:

The CF-1000BRL series air samplers are available in two different voltage ranges: 115 VAC and 230 VAC.

The electrical disconnect for this unit is the power cord. Always unplug the power cord from the electrical outlet before performing any service to the unit.

For 115 VAC units, the power requirements are as follows:

Voltage:	115 V~, 50/60 Hz
Current:	5 A
Power:	250 W

For 230 VAC units, the power requirements are as follows:

Voltage:	230 V~, 50/60 Hz
Current:	5 A
Power:	400 W

Explanation of Electrical Symbols:

V~:	Volts Alternating Current (VAC)
Hz:	Hertz
A:	Amps
W:	Watts
Φ:	Protective Earth Ground
$\dashv$:	Shock Hazard

FUSE:

The CF-1000BRL series are available in two different voltage ranges: 115 VAC and 230 VAC. Fuses used are as follows:

For 115 VAC operation: 7 A, T, 250V
For 230 VAC operation: 5 A, T, 250V

The fuse is located directly above the power cord in a bayonet style holder. To check the fuse or change it, unplug the external power cord from the unit. Then, push in and rotate the fuse holder cap in a counter-clockwise direction. The fuse will come out with the fuse holder cap.

If the fuse needs to be replaced, use a 7 Amp, Slo-Blo, fuse for a 120VAC model or a 5 Amp, Slo-Blo, fuse for a 230VAC model. Remove the old fuse from fuse holder cap and replace with the appropriately rated fuse. Insert the fuse holder cap with fuse into the socket, push in and rotate clockwise until closed and locked.

ENVIRONMENTAL CONDITIONS:

Operating Temperature Range:	0 to 50°C
Storage Temperature Range:	-40 to 60°C
Operating and Storage Humidity:	0 to 85% maximum non-condensing

ELAPSED TIMER:

The electronic, re-settable timer indicates elapsed sampling time on an LCD display in 9 time ranges/units. The timer is wired in series with the blower and starts when the unit is turned on. The timer holds the total elapsed sample time until reset. The timer is re-set to zero by pressing the re-set button on the timer. The timer operates from 3.6 Volts supplied by a non-replaceable internal 7-year lithium battery that makes it independent from the supply voltage and the cyclic rate. All running time readings are maintained even after the unit is turned off either deliberately, or due to loss of power. This feature eliminates the need to install an event meter or chart recorder. The total volume of air sampled may be verified (to the displayed value) by multiplying the flow rate setting by the minutes of running time. Battery life is dependent upon usage and operating/storage conditions. Signal and reset contacts that remain closed for long periods of time reduce battery life.

FLOW METER:

The flow is measured using a direct reading precision rotameter. It is made of shatter-proof polycarbonate plastic. The rotameter is calibrated at the factory and does not require any maintenance other than annual re-calibration as required. The flow meter is sensitive to changes in upstream pressure and should be calibrated with the same filter media that will be used in the field. Using a different size or type of filter media will change the upstream pressure drop that the flow meter was originally calibrated with and will affect the indicated flow in proportion to the change in pressure drop between the calibrated filter media and the new filter media.

SELECTION OF FILTER HEAD:

A wide variety of filter heads will fit the CF-1000BRL series sampler units. The CF-1001BRL, comes standard with a 1½" female straight pipe threaded (FSPT) intake which accepts all HI-Q, CF-Series holders (excluding 8 x 10). Models CF-1002BRL and CF-1003BRL come standard with a 4" diameter threaded ring, which can be used immediately as a 4" diameter paper only holder, or adapted down with HI-Q's FHA-4CF to fit CF-Series type holders. From the standard 4" diameter ring an operator can also adapt up to an 8" x 10" paper only holder, using HI-Q's CFPH-810. For operation of this unit

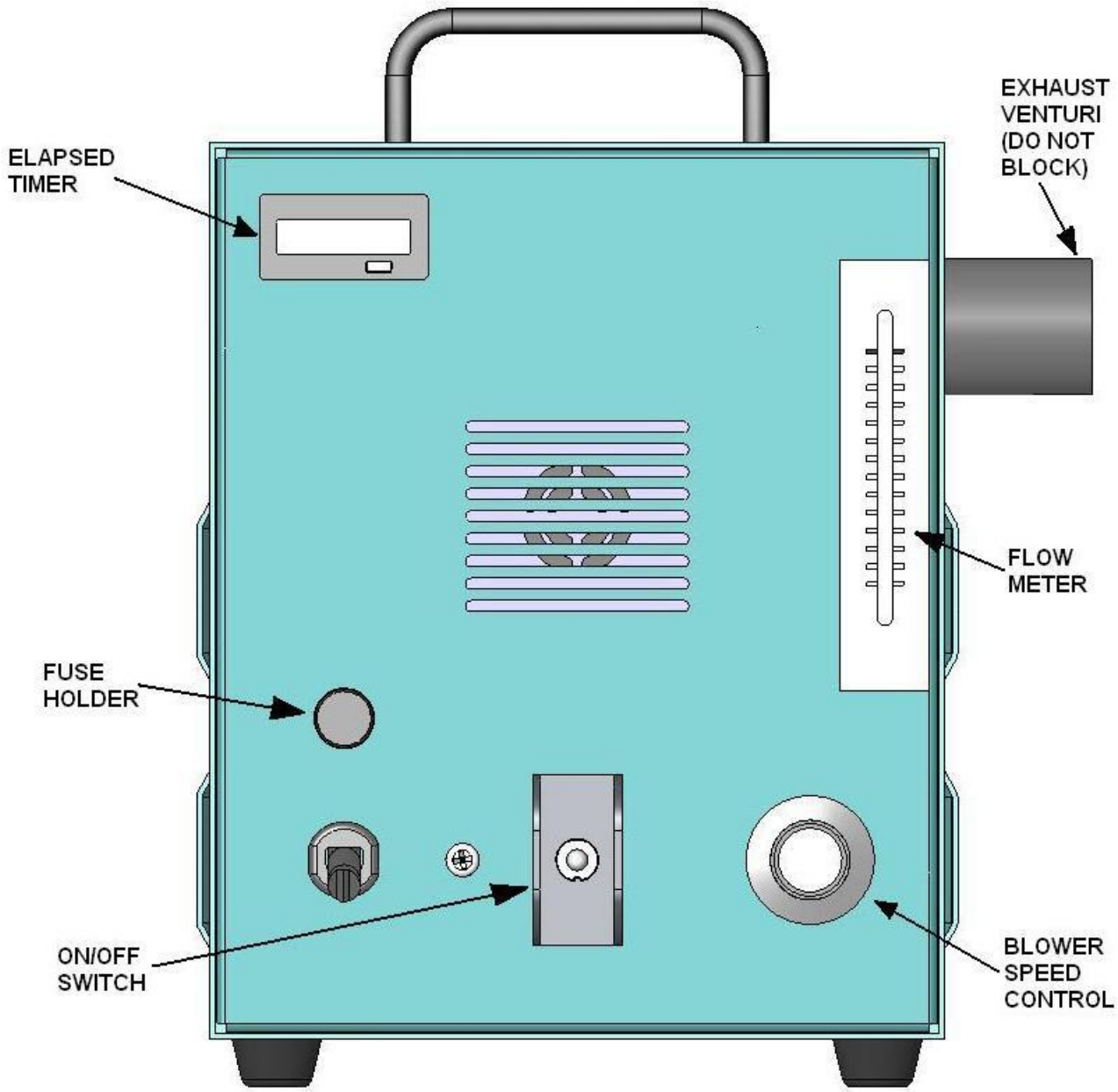
with the 8" X 10" paper only holder, a base plate extender is recommended for added stability P/N: CFBOX-STABILIZER KIT (included w/ CF-1003BRL).

FLOW RATE:

The flow rate is adjusted using the blower speed control knob. The maximum flow rate of the CF-1000BRL Series air sampler is dependent upon the pressure drop across the filter media and the size as shown below:

Model	Filter Paper	Filter Size	Max. Flow Rate *
CF-1001BRL	FP2063-20	2” diameter (51mm)	8.0 CFM
CF-1001BRL	FP5211-20	2” diameter (51 mm)	4.5 CFM
CF-1002BRL	FP2063-102	4” diameter (102 mm)	28 CFM
CF-1002BRL	FP5211-102	4” diameter (102 mm)	17 CFM
CF-1003BRL	FP2063-810	8” x 10” (203mm x 254mm)	50 CFM
CF-1003BRL	FP5211-810	8” x 10” (203mm x 254mm)	45 CFM

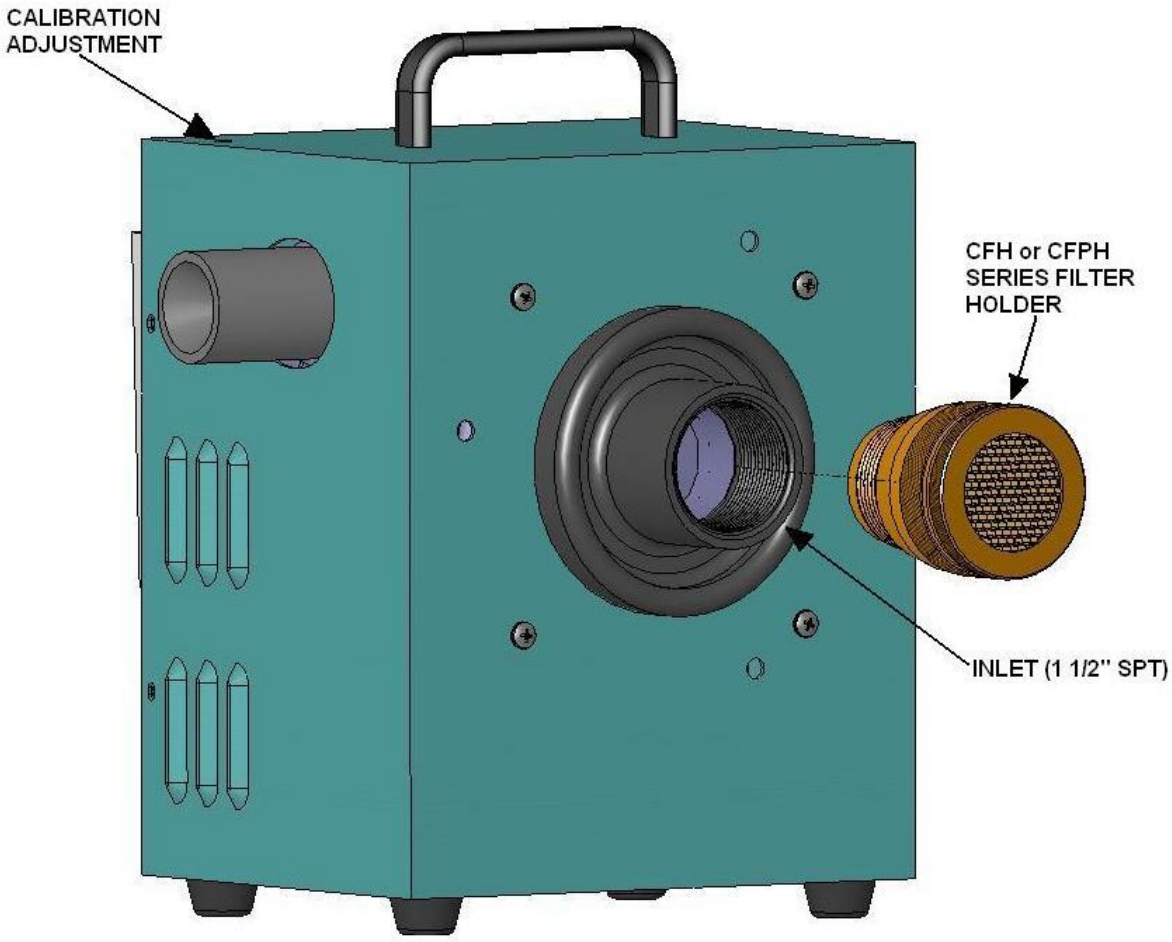
*Approximate Values



CF-100XBRL SERIES

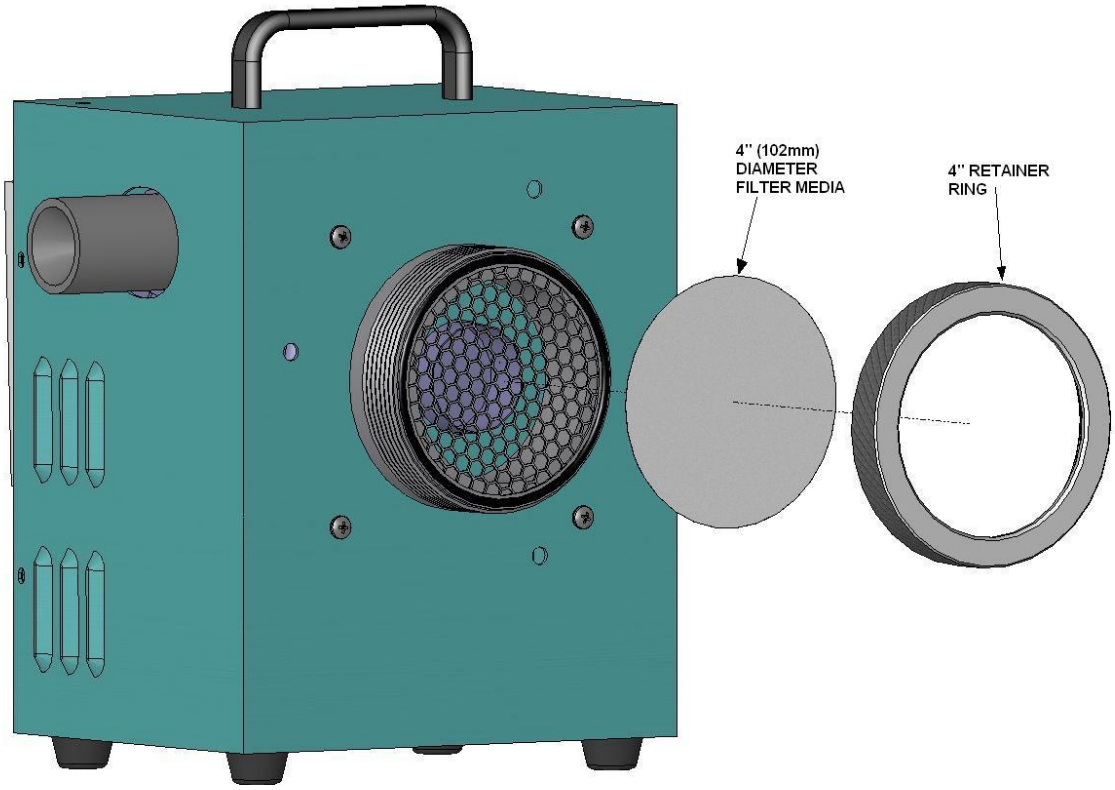
FILTER HOLDERS:

The CF-1001BRL inlet has 1½" female straight pipe thread (FSPT) that accepts any of HI-Q's CFH or CFPH series holders as well as accepting any 1½" male straight pipe thread (MSPT).



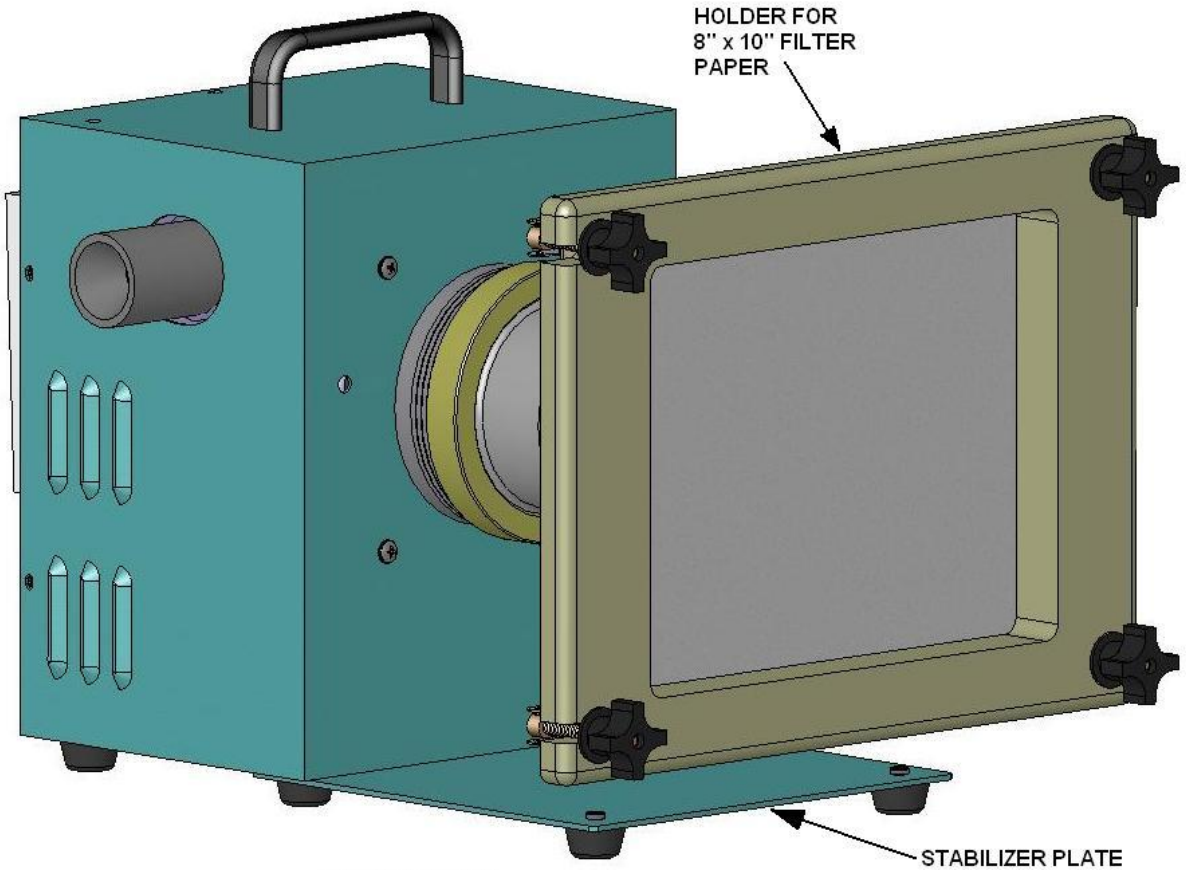
CF1001BRL

The CF-1002BRL comes with a 4” diameter (paper only) holder.



CF-1002BRL

The CF-1003BRL is calibrated for use with the CFPH-810, 8”x10” paper only holder which attaches to the 4” filter paper holder.



CF-1003BRL

The CF-1002BRL and CF-1003BRL may also use any of HI-Q’s CFPH or CFH series filter holders by incorporating HI-Q’s FHA-4CF 4” diameter paper ring to a 1½” female straight pipe thread adapter. Note that changing to a different size filter media will affect the flow calibration of the sampler.

OPERATION

After affixing the appropriate filter head, plug unit into a 3 wire grounded outlet. Note the timers starting number, or reset the timer to zero by pushing the timer's reset button. Load the appropriate filter media and start the unit and adjust the rotameter reading with the motor speed control pot to the desired flow rate. This high volume pump is intended for use as a continuous or intermittent grab air sampling pump.

NOTE: Like all devices designed to move a high volume of air, the CF-1000BRL series is rather loud. Operators should use hearing protection when using the CF-1000BRL series air samplers.

OPERATING THE CF-1000BRL:

1. Install filter holder on CF-1000BRL Series Sampler. Use an adapter if needed.
2. Install desired filter media in filter holder.
3. Plug unit into standard wall receptacle.
4. Turn power switch on.
5. Adjust flow rate control knob to desired sample rate.
6. Reset sample timer to begin sample.
7. When sample time is complete, turn unit off and remove sample media.
8. The filter media can now be scanned with a detector or removed and placed into a polybag for transport to the lab/testing facility.

CALIBRATION:

Before being shipped out, each CF-1000BRL series Air Samplers are individually calibrated against a NIST traceable standard at sea level and ambient temperature. It is good practice however, to occasionally check the rotameter calibration against a secondary source such as a calibrated HFC-SIDE-XX series air flow calibrator. Upon ordering choose the correct (HFC-SIDE-XX) unit for your flow range and flow measurement units. The correct inline adapter must also be selected to connect to the inlet of the sampling filter holder. For the most accurate calibration results, calibration must be performed with the intended filter media in the holder.

With a small flat head screwdriver and the correct flow range HFC-SIDE-XX unit, fine adjustments to incorrect flow rate readings can be made in the field by tightening or loosening the brass needle valve in the back of the rotameter. For "quick-fix" changes stick a piece of masking tape over the rotameter scale and mark according to in-line Air Flow Calibrator unit.

The following procedure is for verifying the flow rate or re-calibration.

Equipment Required:

1. Air Flow Calibrator:

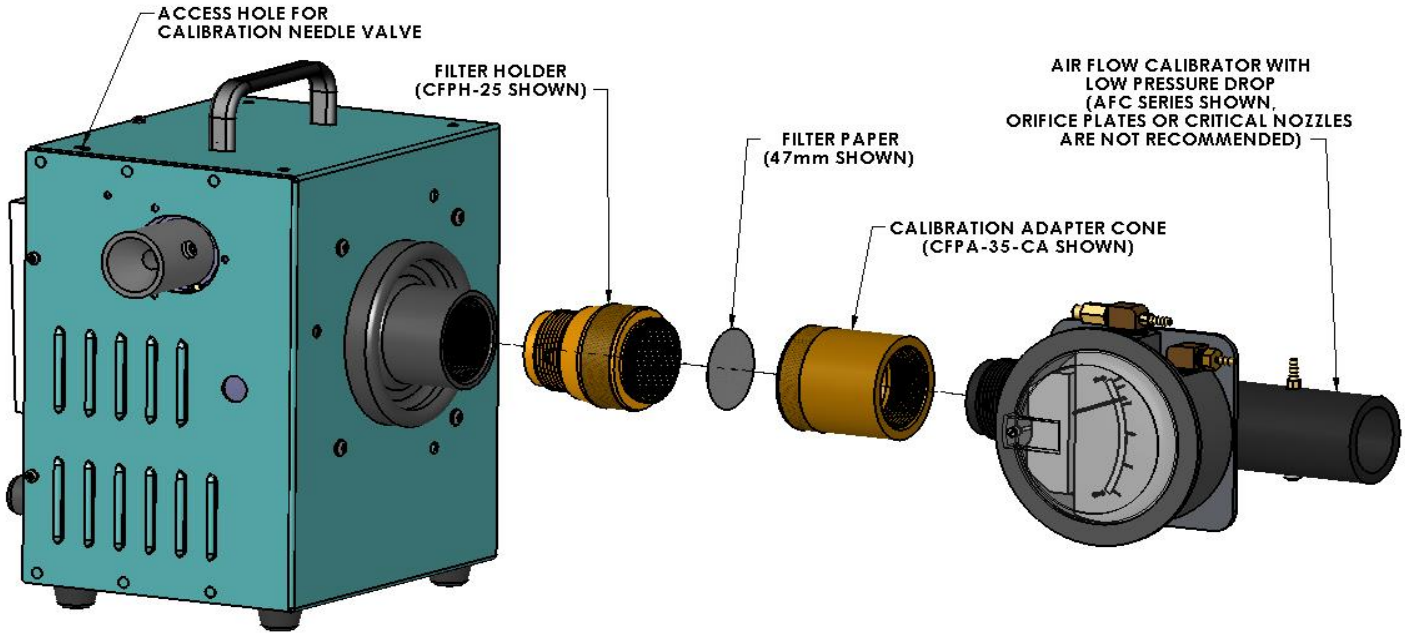
   HFC-SIDE-8 for a CF-1001BRL.
   HFC-SIDE-30 for a CF-1002BRL.
   HFC-SIDE-50 for a CF-1003BRL.

   A laminar flow element/water manometer type calibrator may also be used.

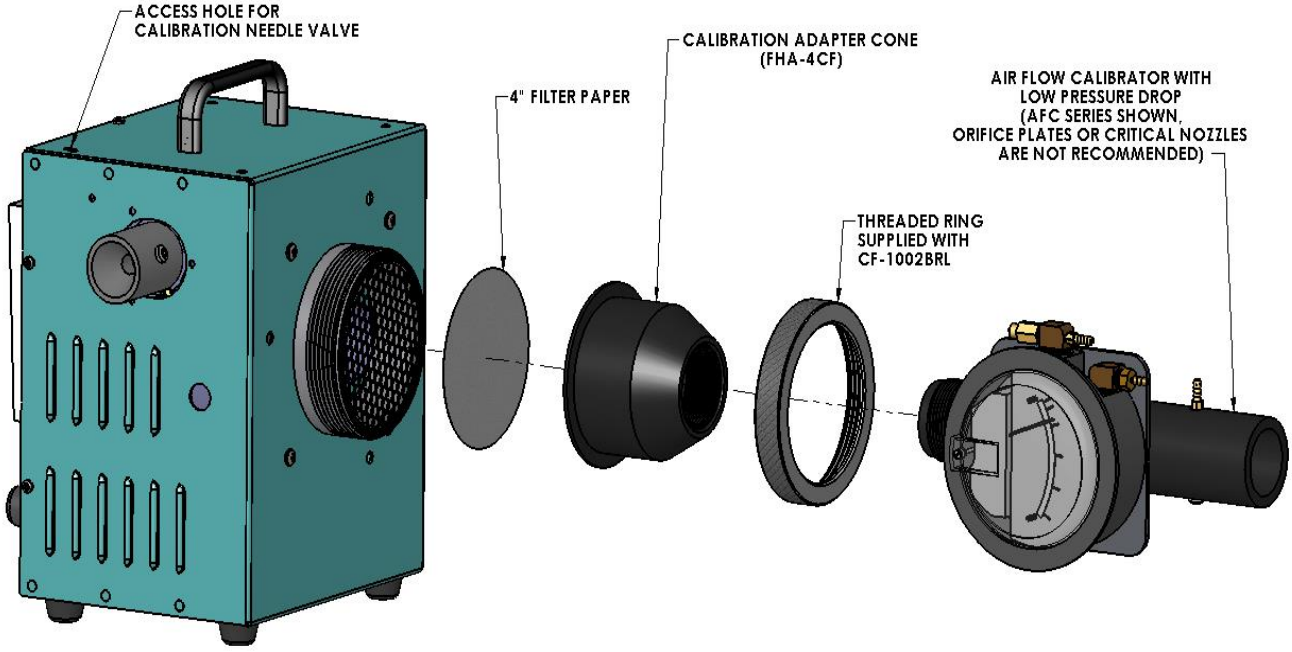
   Note: Orifice plates or other calibrators that generate a high pressure drop will cause the calibration conditions to differ too much compared to operational conditions and should not be used.

2. Filter holder adapter for connecting calibrator to filter media holder. Contact HI-Q to select the correct in-line adaptor fittings.

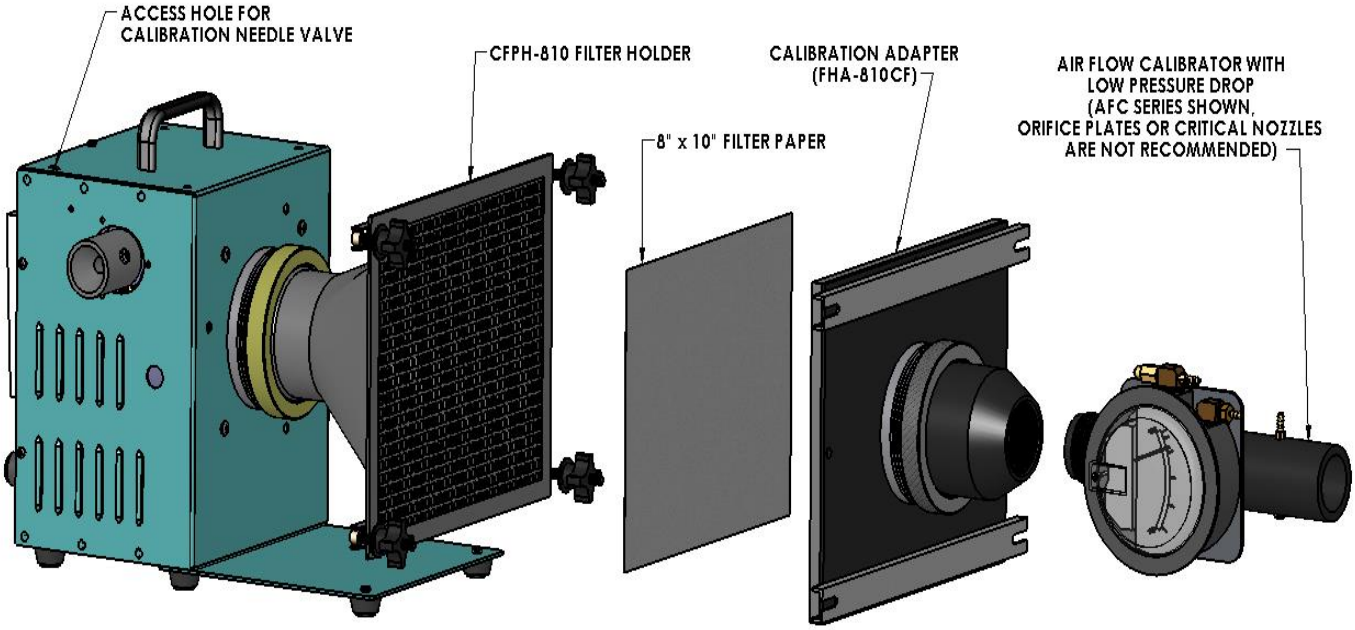
Note that all flow connections must be leak tight. Since the flow connections must be leak tight, HI-Q recommends against the use of the Munro filter holders.



CF-1001BRL CALIBRATION CONFIGURATION



CF-1002BRL CALIBRATION CONFIGURATION



CF-1003BRL CALIBRATION CONFIGURATION

RE-CALIBRATION PROCEDURE:

1. Install filter media holder, new collection filter media, and filter holder in-line adapter into the pump intake. It is essential that one recalibrates the CF-1000BRL Series with the same collection filter media as that which will be used for sampling in the field. Varying the maximum pressure drop (caused by the collection filter media) at calibration will affect the overall accuracy of the calibration during use.
2. Connect air flow calibrator to the inlet of the in-line filter holder adapter.
3. Unplug power cord from outlet.
4. Remove the front panel screws and separate the front panel from the housing to expose the rotameter needle valve which has a red dust cover over it. Remove the dust cover.
5. Support face panel securely in a vertical position for proper operation of the rotameter.
6. Plug in power cord and turn on power.
7. Adjust flow rate for a calibrator flow rate near the normal operating rate.
8. Read the flow rate on the rotameter. It should be the same as the calibrator flow rate within +/- 5% full scale. If not, proceed to step #9.
9. Re-calibrate flow meter by adjusting the small, brass needle valve located near the top of the rotameter. Adjust until rotameter indicates the same flow rate as the calibrator. If matching the flow rate is not possible it may be necessary to re-mark the existing scale or purchase a blank scale and re-mark it.

MAINTENANCE

The Timer, Blower and Rotameter are all maintenance free and must be replaced if defective.

SPEED CONTROLLER:

On rare occasions, the speed controller can malfunction. The symptoms are a fluctuating or stuttering speed. If this happens, the controller must be replaced with #CF10-028 (115V) or #CF10-030 (230V).

TIMER:

The timer is maintenance free. The 115 VAC & 230 VAC CF-1000BRL Series Air samplers all use the same programmable minute or hour timers. Timers will actuate with a constant voltage between 10 v and 300 v (AC 50/60 Hz or DC). Input current 0.5 mA max. The timer operates from 3.6 Volts supplied by a non-replaceable lithium battery. Nominal battery life is 7 years. Battery life is dependent upon usage. Signal and reset contacts that remain closed for long periods of time reduce battery life.

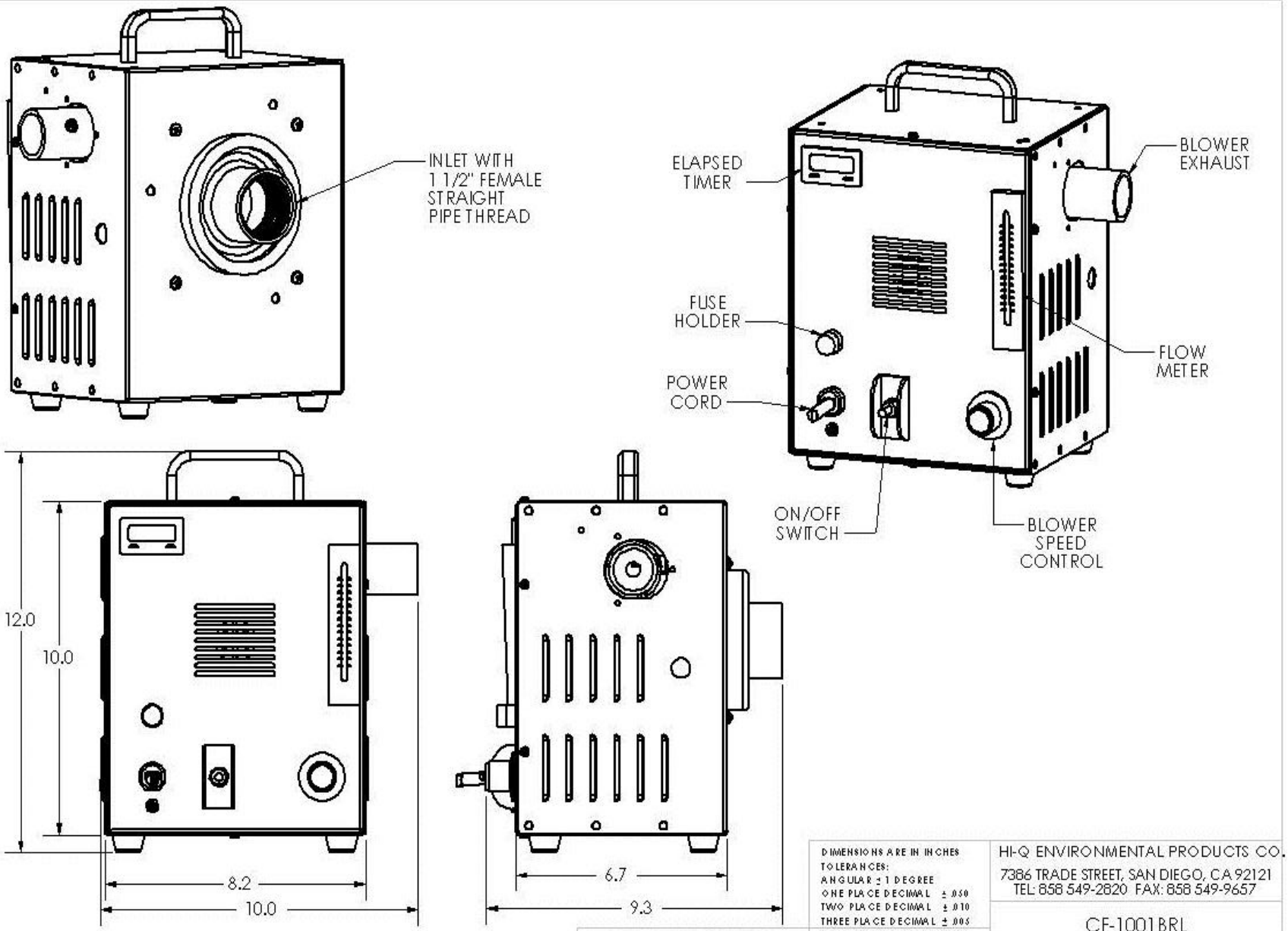
CLEANING:

If the CF-1000BRL series high volume air sampler requires cleaning, clean only with a clean, damp cloth. Do not spray with cleaners or water as this may create a shock hazard.

NOTE: If the CF-1000BRL series high volume air sampler is used in a manner inconsistent with this manual, the protection features provided with this equipment may be impaired.

HI-Q CF-1000BRL SERIES
SPARE PARTS LIST

PART NUMBER	PART DESCRIPTION
CF10-001	2 STAGE 115 VOLT BRUSHLESS BLOWER
CF10-002	2 STAGE 230 VOLT BRUSHLESS BLOWER
CF10-003	4" THREADED RING
CF10-004	"O-RING" FOR 4" DIA. PAPER HOLDER
CF10-005	4" DIA. PAPER RETAINER RING
CF10-006	4" DIA. PAPER SUPPORT SCREEN
CF10-007	MOTOR SUPPORT RING GASKET
CF10-008	ELAPSED ELECTRONIC TIMER, MINUTES
CF10-009	RESET PUSH BUTTON FOR TIMER
CF10-010	POWER CORD 14/3 8 FOOT
CF10-011	POTENTIOMETER (115 VOLT) FOR UNITS BUILT PRIOR TO JANUARY 3RD, 2002. SN'S 10022 AND LOWER.
CF10-012	POTENTIOMETER (230 VOLT) FOR UNITS BUILT PRIOR TO JANUARY 3RD, 2002. SN'S 10022 AND LOWER.
CF10-013	SPEED CONTROL KNOB. FOR UNITS BUILT PRIOR TO JANUARY 3RD, 2002. SN'S 10022 AND LOWER.
CF10-014	ROTAMETER (UNCALIBRATED)
CF10-015	NEEDLE VALVE ASSEMBLY, INCLUDING 2EACH BARBS FOR ROTAMETER
CF10-016	SLO-BLOW FUSE FOR 115 VOLT UNIT
CF10-017	SLO-BLOW FUSE FOR 230 VOLT UNIT
CF10-018	FUSE HOLDER
CF10-019	TOGGLE SWITCH, WITH ON/OFF PLATE
CF10-020	SWITCH GUARD
CF10-021	VISU FILTER
CF10-022	VENTURI LOW FLOW (CF-1001BRL)
CF10-023	VENTURI MED FLOW (CF-1002BRL)
CF10-024	VENTURI HIGH FLOW (CF1003BRL)
CF10-025	HANDLE
CF10-026	RUBBER FOOT (4 FEET REQ.'D PER UNIT)
CF10-027	ELAPSED ELECTRONIC TIMER, HOURS & TENTHS INCLUDES PUSH BUTTON RESET.
CF10-028	115 VAC SPEED CONTROLLER ASSEMBLIES INCLUDING BUILT IN POTENTIOMETER. FOR UNITS BUILT AFTER TO JANUARY 3RD, 2002. SN'S 10022 & HIGHER.
CF10-029	BLANK SCALE FOR ROTAMETER
CF10-030	230 VAC SPEED CONTROLLER ASSEMBLY INCLUDING BUILT IN POTENTIOMETER. FOR UNITS BUILT AFTER TO JANUARY 3RD, 2002. SN'S 10022 & HIGHER.



DIMENSIONS ARE IN INCHES
TOLERANCES:
ANGULAR ± 1 DEGREE
ONE PLACE DECIMAL ± .050
TWO PLACE DECIMAL ± .010
THREE PLACE DECIMAL ± .005

DO NOT SCALE DRAWING

MATERIAL: N/A

FINISH: N/A

DRAWN BY: S.A. OWEN

DATE: 11/4/14

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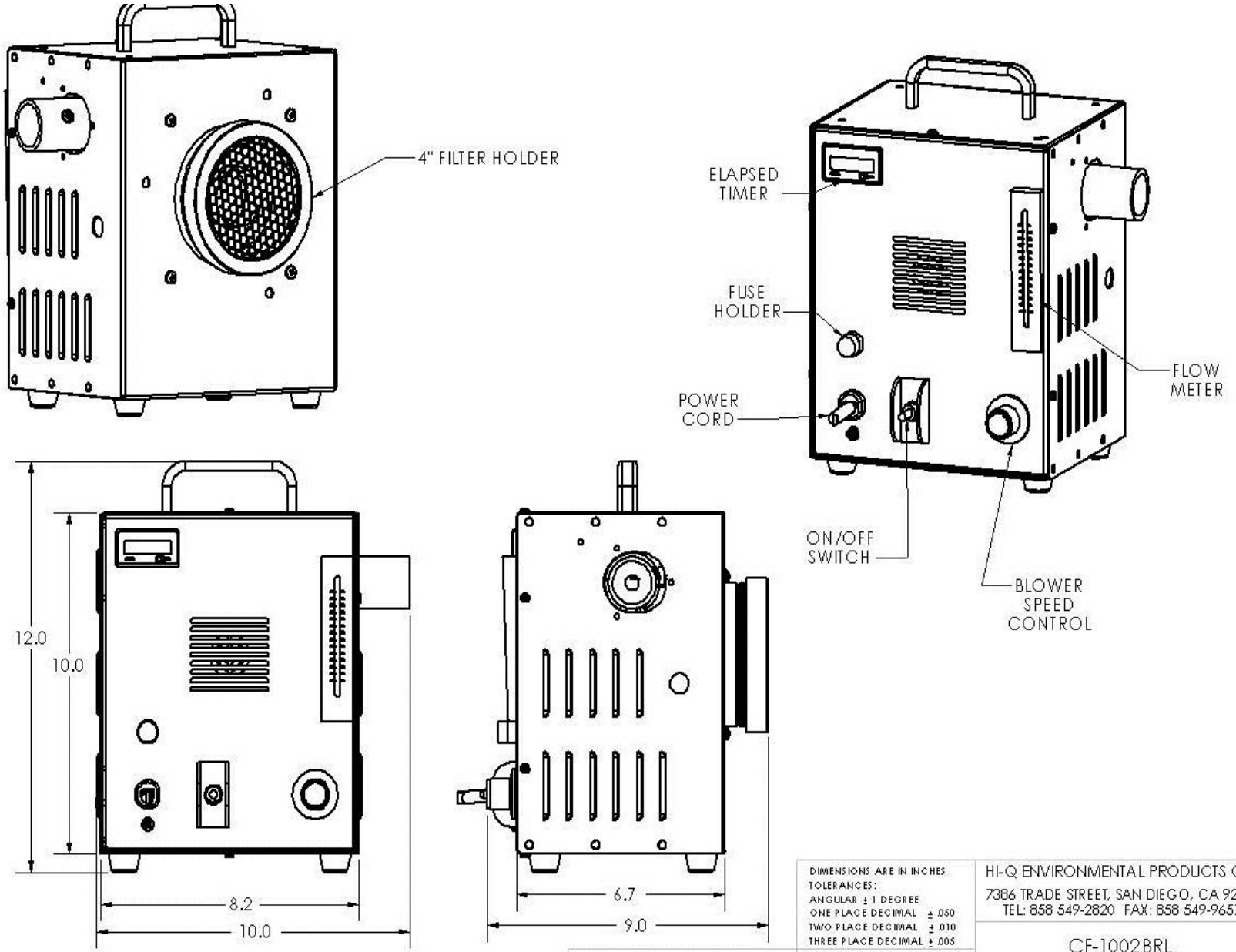
7386 TRADE STREET, SAN DIEGO, CA 92121
TEL: 858 549-2820 FAX: 858 549-9657

CF-1001BRL
DIMENSIONS

SIZE: A
DWG. NO.: CF-1001 DIMS
REV.: H

CAD FILE: CF1001 DIMS.sldprt

SHEET 1 OF 1



DIMENSIONS ARE IN INCHES
TOLERANCES:
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ONE PLACE DECIMAL ± .050
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THREE PLACE DECIMAL ± .005

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MATERIAL: N/A

FINISH: N/A

DRAWN BY: S.A. OWEN

DATE: 11/4/14

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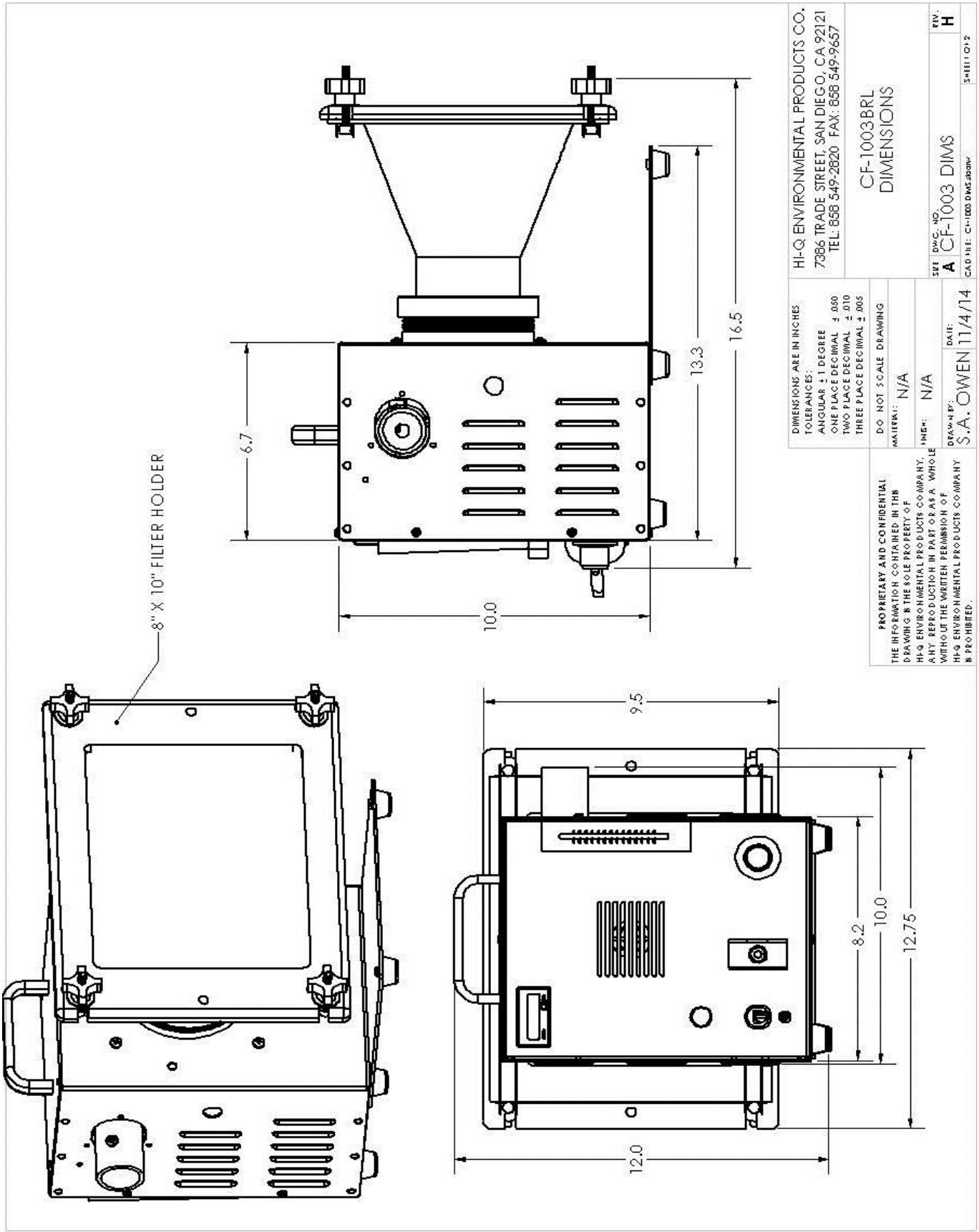
TEL: 858 549-2820 FAX: 858 549-9657

CF-1002BRL
DIMENSIONS

SIZE A | DWG. NO. CF-1002 DIMS | REV. H

CAD FILE: CF-1002 DIMS.sldprw

SHEET 1 OF 1


8" X 10" FILTER HOLDER
6.7
13.3
16.5
10.0
9.5
8.2
10.0
12.75
12.0
HI-Q ENVIRONMENTAL PRODUCTS CO.
7386 TRADE STREET, SAN DIEGO, CA 92121
TEL: 858 549-2820 FAX: 858 549-9657
CF-1003BRL
DIMENSIONS
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ANGULAR ± 1 DEGREE
ONE PLACE DECIMAL ± .050
TWO PLACE DECIMAL ± .010
THREE PLACE DECIMAL ± .005
DO NOT SCALE DRAWING
MATERIAL: N/A
FINISH: N/A
DRAWN BY: S.A. OWEN
DATE: 11/4/14
SIZE A
DWG. NO. CF-1003 DIMS
REV. H
CAD FILE: CF-1003 DIMS.dwg
SHEET 1 OF 2
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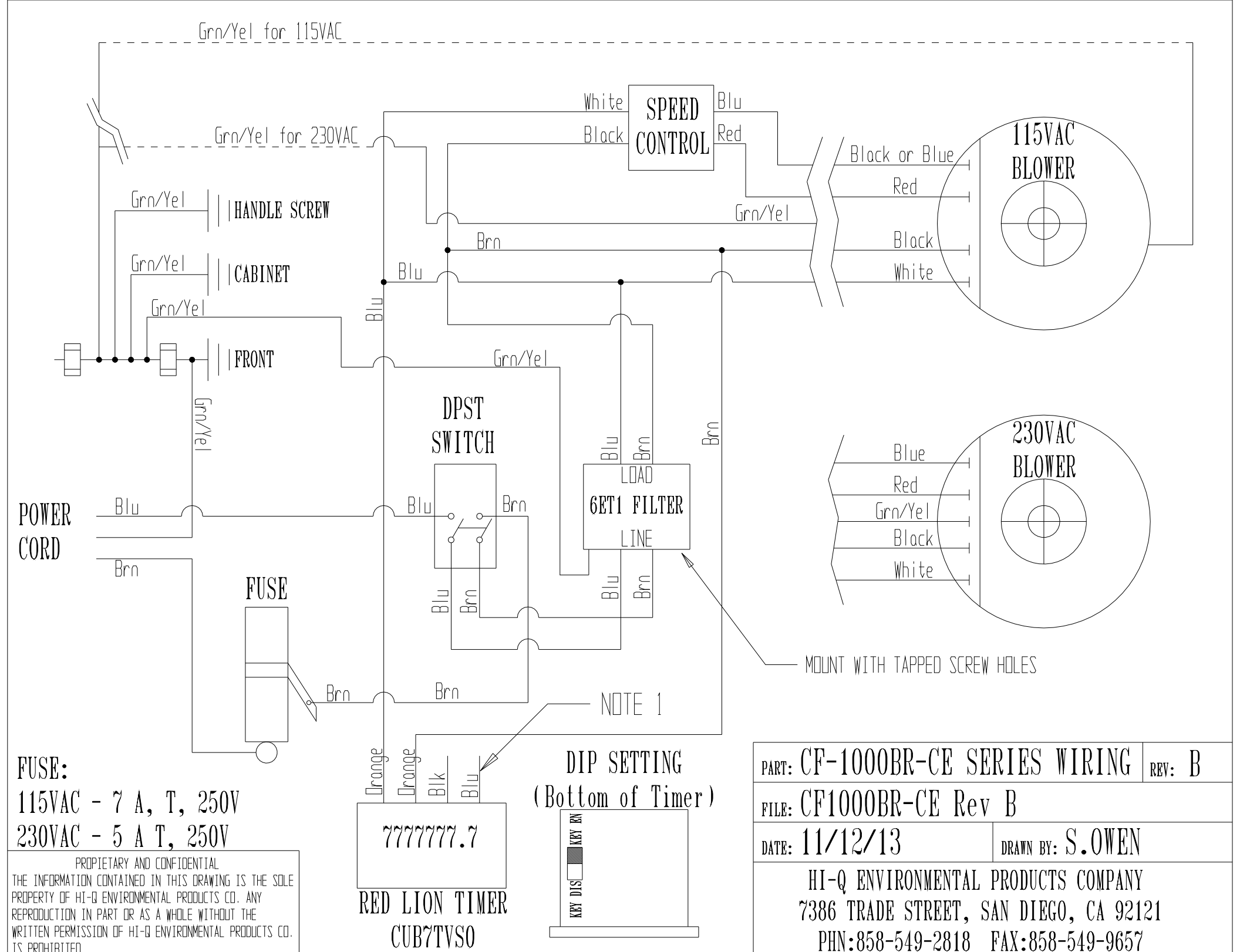
Appendix A

Wiring Diagram



FUSE:
115VAC - 7 A, T, 250V
230VAC - 5 A T, 250V

PART: CF-1000BR-CE SERIES WIRING	REV: B
FILE: CF1000BR-CE Rev B	
DATE: 11/12/13	DRAWN BY: S.OWEN

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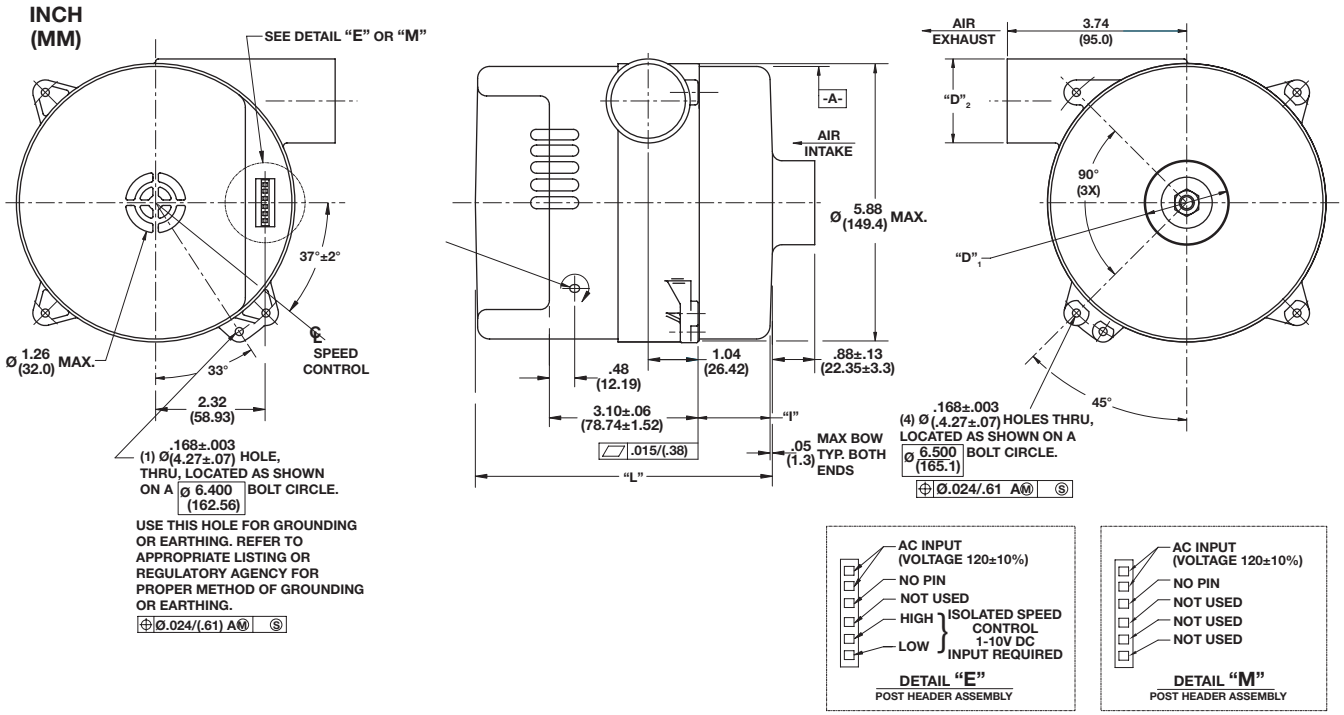
Appendix B

Vacuum Pump Specifications

5.7” (145mm) BLDC Bypass Blower

250 Watt, 120 Volt High Flow



Blower Data	Unit of Measure	Part Number		
		High Flow		
		116637 M* / 116643 E*	116636 M* / 116642 E*	116635 M / 116641 E
Stages	—	1	2	3
Vacuum, Maximum (Sealed Vacuum)	in. H_2O	25.2	49.7	67.2
	mBar	62.8	123.6	167.3
Pressure, Maximum (Sealed Pressure)	in. H_2O	26.0	51.2	69.3
	mBar	64.5	127.0	171.8
Flow Rate, Maximum (Open Flow)	CFM	130.5	103.9	82.3
	m^3/hr	221.8	176.6	139.9
Inlet/Outlet Diameter (Dimension “D” above)	inches	1.75	1.75	1.75
	mm	44.45	44.45	44.45
Length (Dimension “I” above)	inches	0.47	1.53	2.53
	mm	11.94	38.86	64.26
Length (Dimension “L” above)	inches	5.22	6.27	7.28
	mm	132.59	159.26	184.91

** These part numbers are available through AMETEK Technical & Industrial Products’ distributors.*

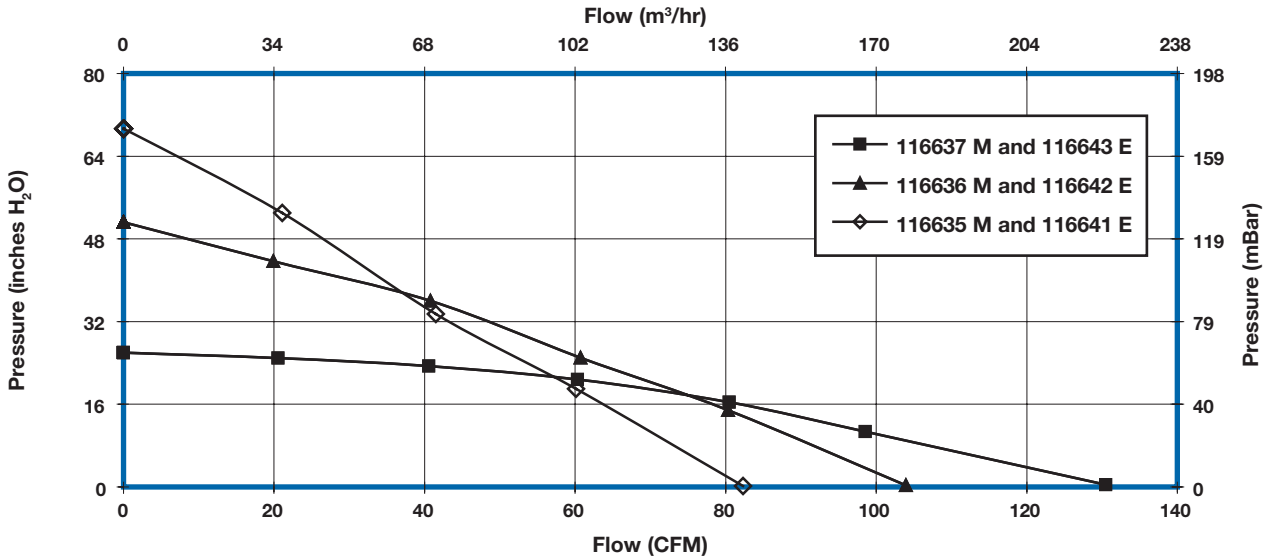
NOTES:

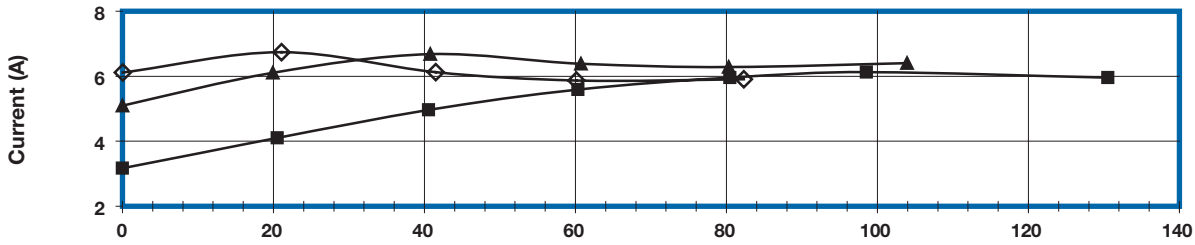
- ***Nominal Input Voltage:*** *120 Volts AC RMS ±10%, 50/60Hz.*
- ***Input Current:*** *5 amps AC RMS maximum.*
- ***Temperature:*** *Working Air: 0°C to 50°C; Ambient Air: 0°C to 50°C; Storage Air: -40°C to 85°C.*
- ***Dielectric Testing:*** *1500 volts AC RMS 60Hz applied for one second between input pins and ground, 3mA leakage maximum.*
- ***Speed Control:*** *E (Electrical): Pulse Width Modulation or Analog input voltage (user supplied), 0 to 10 Volts DC nominal, 10mA maximum, 3 to 15 volts DC maximum. Access to sensitivity adjustment for 0 to 10 VDC speed control. (Ref. pin connection).*
  M (Mechanical): A potentiometer is available for speed control of the blower. The potentiometer can be preset for a specific speed. Access to speed adjustment.
- ***Maximum Approximate Weight:*** *6 lbs.*
- ***Regulatory Agency Certification:*** *Underwriters Laboratories, Inc. is qualified per UL507 under File E-94403; Canadian Standards Association is qualified per C22.2#113 under File LR 43448.*
- ***Miscellaneous:*** *Intake and exhaust tubes, all cooling ducts, and vents must not be obstructed. Intake and exhaust are free of grease, oil, or foreign particles. Amp housing #640250-6 (to be supplied by customer), mates with post header assembly.*
- *Mating harness available upon request. Refer to page 136 for specific part numbers.*
- ***Optional –*** *Universal AC input version available with IntelliGen™ control (120-240 VAC input).*
- ***Optional –*** *Tachometer output card available with IntelliGen™ controller.*

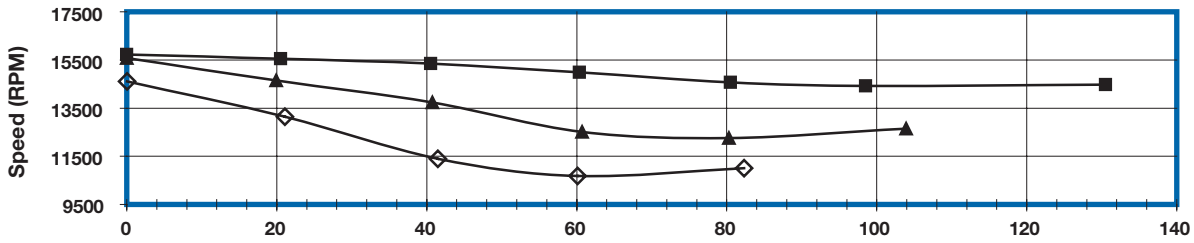
5.7” (145mm) BLDC Bypass Blower

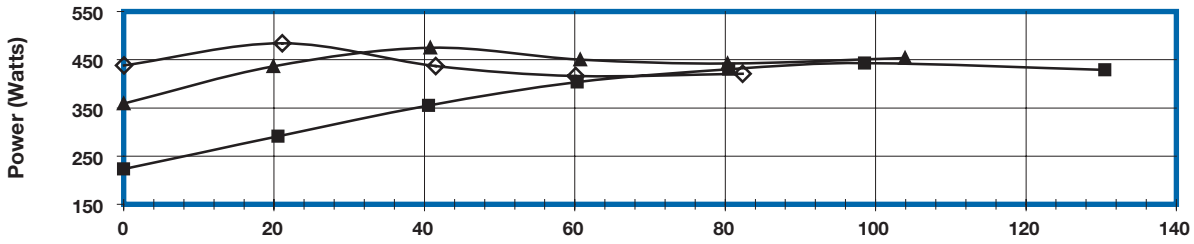
250 Watt, 120 Volt High Flow

TYPICAL PERFORMANCE









HIGH-VOLTAGE BLDC BLOWERS

This document is for informational purposes only and should not be considered as a binding description of the products or their performance in all applications. The performance data on this page depicts typical performance under controlled laboratory conditions using AMETEK BLDC motor controllers. Actual performance will vary depending on the operating environment and application. AMETEK products are not designed for and should not be used in medical life support applications. AMETEK reserves the right to revise its products without notification. The above characteristics represent standard products. For product designed to meet specific applications, contact AMETEK Technical & Industrial Products Marketing and Sales.

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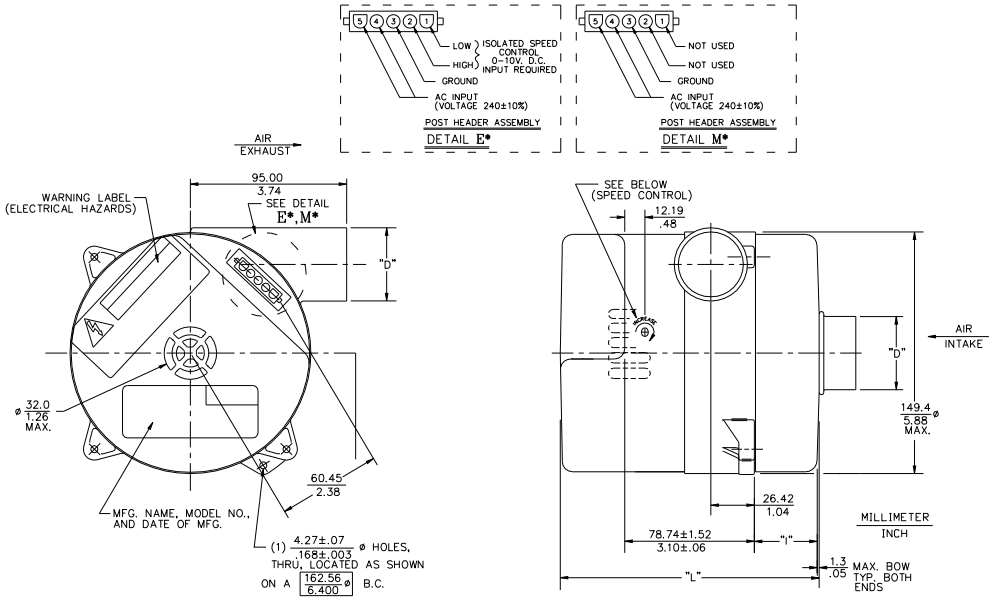
Tech Bulletin

5.7” (145mm) BLDC Bypass Blower 400 WATT, 240 VOLT



Blower Data	Unit of Measure	Part Number					
		Standard Flow			High Flow		
		117634 M*	117633 M	117632 M*	117637 M*	117636 M*	117635 M*
		117640 E*	117639 E	117638 E*	117643 E*	117642 E*	117641 E*
Stages		1	2	3	1	2	3
Vacuum, Max. (Sealed Vacuum)	in. H_2O	28	45	60	23	39	53
	mBar	69	112	149	57	97	131
Pressure, Max. (Sealed Pressure)	n. H_2O	30	51	70	25	45	61
	mBar	74	126	174	62	112	151
Flow Rate, Max. (Open Flow)	CFM	69	62	58	114	97	86
	L/sec	33	29	27	54	46	41
Inlet/Outlet Diameter	inches	1.25	1.25	1.25	1.75	1.75	1.75
(Dimension “D” above)	mm	31.75	31.75	31.75	44.45	44.45	44.45
Length (Dimension “I” above)	inches	2.53	1.25	2.14	.47	1.53	2.53
	mm	64.26	31.75	54.36	11.94	38.86	64.26
Length (Dimension “L” above)	inches	5.08	5.99	6.89	5.22	6.27	7.28
	mm	129.03	152.15	175.01	132.59	159.26	184.91

Typical Performance Points

Air Flow	Pressure						
0 CFM	in. H_2O	30.3	51.0	69.9	24.8	44.6	61.5
10 CFM	in. H_2O	27.9	44.2	59.9	23.6	41.0	55.8
20 CFM	in. H_2O	26.2	41.8	52.8	22.6	39.8	51.5
30 CFM	in. H_2O	23.6	35.9	44.1	21.5	35.8	46.0
40 CFM	in. H_2O	19.0	27.8	32.1	19.5	32.0	40.1
50 CFM	in. H_2O	13.3	16.6	18.1	17.9	28.0	34.2
60 CFM	in. H_2O	7.0	3.7		16.1	23.9	28.2
70 CFM	in. H_2O	3.7			13.8	17.9	19.6
80 CFM	in. H_2O				12.0	12.1	8.1
90 CFM	in. H_2O				8.7	0	
100 CFM	in. H_2O				6.7		
110 CFM	in. H_2O				0		

*These part numbers are available through AMETEK Rotron distributors.

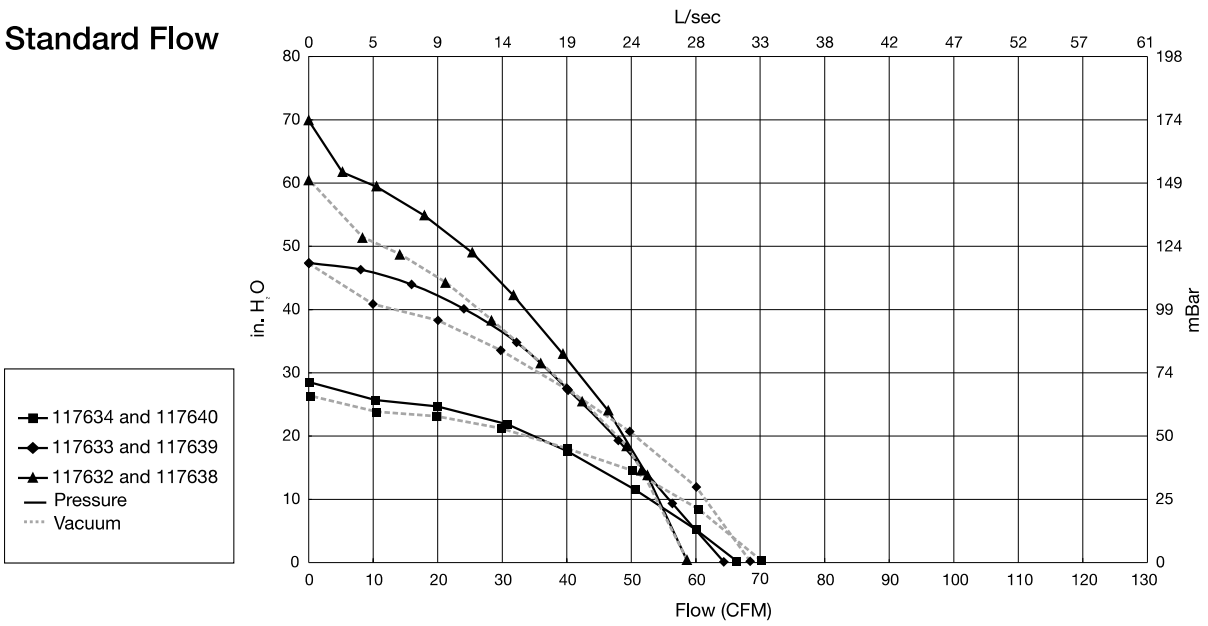
NOTES:
- Nominal input voltage: 240 Volts AC RMS +/- 10%, 50/60Hz
- Input current: 5 amps AC RMS maximum
- Temperature: Working Air: 0°C to 50°C, Ambient Air: 0°C to 50°C, Storage Air: -40°C to 85°C
- Dielectric Testing: 1500 volts AC RMS 60Hz applied for one second between input pins and ground, 3mA leakage max.
- Speed Control: E (Electrical): Pulse Width Modulation or Analog input voltage (User Supplied), 0 to 10 Volts DC Nominal, 10mA Maximum, 3 to 15 volts DC Maximum. Access to sensitivity adjustment for 0-10 VDC speed control. (Ref. pin connection)
  M (Mechanical): A potentiometer is available for speed control of the blower. The potentiometer can be preset for a specific speed. Access to speed adjustment.

AMETEK
ROTRON
TECHNICAL & INDUSTRIAL PRODUCTS

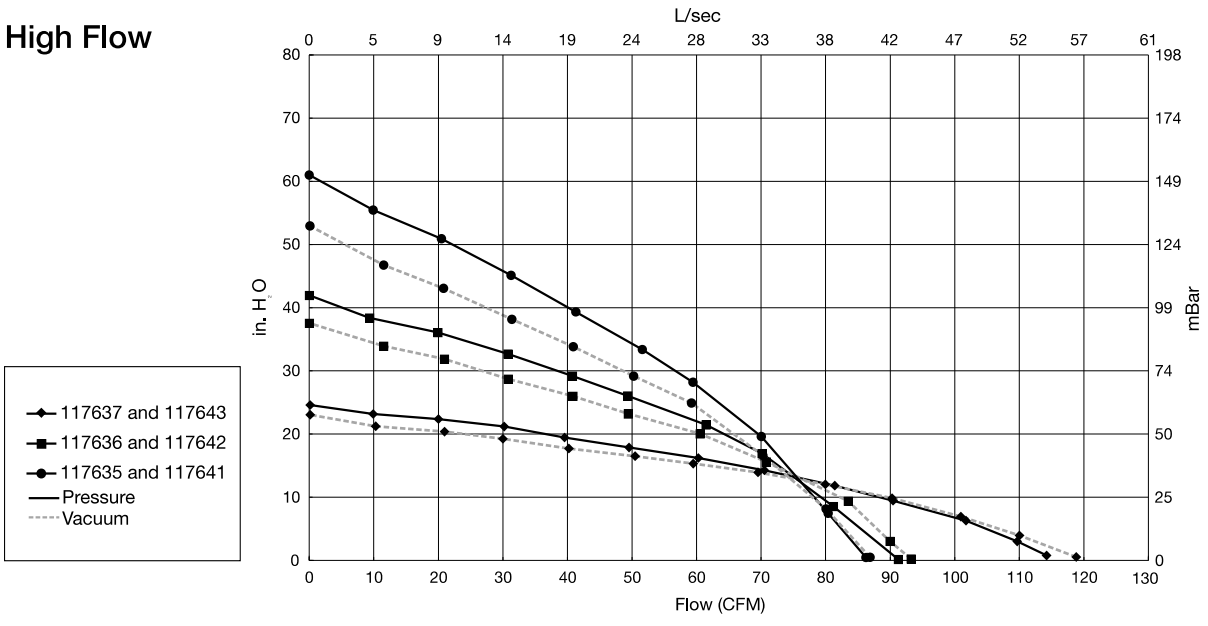
Windjammer BRUSHLESS BLOWERS

5.7" (145mm) BLDC Bypass Blower — 400 WATT, 240 VOLT

Standard Flow



High Flow



- Maximum Approximate Weight: 6 lbs.
- Regulatory Agency Certification: T.U.V. Rheinland Bauart Certification* is qualified per EN60950 under License No. R0097184. Underwriters Laboratories, Inc. Qualified per UL507 under File E-94403. Canadian Standards Association Qualified per C22.2#113 under File LR 43448.
- Miscellaneous: Intake & exhaust tubes, all cooling ducts and vents must not be obstructed. Intake and exhaust are free of grease, oil, or foreign particles. Amp housing #1-480763-0 (to be supplied by customer), mates with post header assembly.

IEC 801 testing has been completed, and specific data can be provided upon request.

Mating harness available upon request. Refer to (page 84) for specific part numbers.

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Appendix C

Flow Meter Specifications

Series RM Rate-Master® Flowmeters

Specifications - Installation and Operating Instructions

RMC RMB-SSV RMA-TMV

Fig. 1

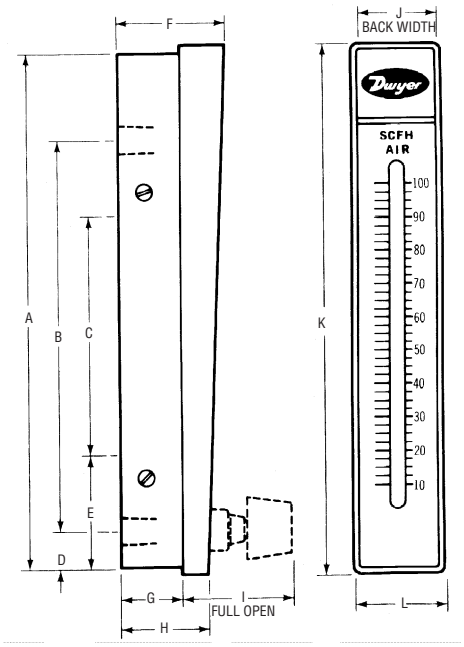


Fig. 2

Dimensions in Inches (Centimeters)			
	Model RMA	Model RMB	Model RMC
A	4 -9/16 (11.59)	8-1/2 (21.59)	15 -1/8 (38.42)
B	3 (7.62) 1/8 NPT CONN.	6-7/16 (16.35) 1/4 NPT CONN.	12 -1/4 (31.12) 1/2 NPT CONN.
C	1-5/8 (4.13) 10 - 32 Thds.	3-15/16 (10.00) 1/4 - 20 Thds.	8-3/4 (22.23) 3/8 - 24 Thds.
D	3/8 (.95)	5/8 (1.59)	1 (2.54)
E	1-1/16 (2.70)	1-7/8 (4.76)	2-3/4 (6.99)
F	1-3/16 (3.02)	1-3/4 (4.45)	2-1/2 (6.35)
G	11/16 (1.75)	1 (2.54)	1-7/16 (3.65)
H	61/64 (2.42)	1-7/16 (3.65)	1-31/32 (5.00)
I (OPEN)	1-3/8 (3.49)	1-13/16 (4.60)	2-1/2 (6.35)
J	3/4 (1.91)	1-1/4 (3.18)	2 (5.08)
K	4-13/16 (12.22)	8-3/4 (22.23)	15-3/8 (39.05)
L	1 (2.54)	1-1/2 (3.81)	2-1/4 (5.72)

Panel Cutout For Flush Mounting			
High	4-5/8 (11.75)	8-9/16 (21.75)	15 -3/16 (38.58)
Wide	7/8 (2.22)	1-5/16 (3.33)	2-1/16 (5.24)
Panel Hole Sizes for Surface Mounting			
Pipe	7/16 (1.11)	5/8 (1.59)	15/16 (2.38)
Bolt	1/4 (0.64)	9/32 (0.71)	13/32 (1.03)

The Series RM Rate-Master® Flowmeters are furnished in three models (see Fig. 2), each available in a broad array of flow ranges with direct reading scales for air, gas or water. Installation, operation and maintenance are very simple. Only a few common-sense precautions must be observed to assure long, trouble-free service.

CAUTION: Rate-Master® Flowmeters are designed to provide satisfactory long-term service when used with air, water or other compatible media. Refer to factory for information on questionable gases or liquids. Avoid solutions of acids, bases or salts having a pH below 5.0 or above 8.5. Caustic solutions, antifreeze (ethylene glycol) and aromatic solvents should definitely not be used.

Calibration
Each Rate-Master® Flowmeter is calibrated at the factory. If at any time during the meter's life, you wish to re-check its calibration, do so only with devices of certified accuracy. DO NOT attempt to check a Rate-Master® Flowmeter with a similar flowmeter, as seemingly unimportant variations in piping and back pressure may cause noticeable differences in the indicated reading. If in doubt, return your Rate-Master® Flowmeter to the factory. Before proceeding with installation, check to be sure you have the Rate-Master® flowmeter model and flow range you require.

LOCATION: Temperature, Pressure, Atmosphere and Vibration: Rate-Master® Flowmeters are exceptionally tough and strong. They are designed for use at pressures up to 100 psi (6.89 bar) and temperatures up to 130°F (54°C).

DO NOT EXCEED THESE LIMITS! The installation should not be exposed to strong chlorine atmospheres or solvents such as benzene, acetone, carbon tetrachloride, etc. The mounting panel should be free of excessive vibration, as it may prevent the unit from operating properly.

Inlet Piping Run: It is good practice to approach the flowmeter inlet with as few elbows and restrictions as possible. In every case, the inlet piping should be at least as large as the connection to the flowmeter; i.e.,1/8″ Iron Pipe Size for RMA models 1/4″ IPS for RMB models,1/2″ IPS for RMC models. Length of inlet piping makes little difference for normal pressure-fed flowmeters.

For flowmeters on vacuum air service, the inlet piping should be as short and open as possible. This will allow operation near atmospheric pressure and thereby insure the accuracy of the device. (**Note:** for vacuum air service, the flow control valve, if any, should be on the discharge side of the flowmeter. Either the TMV unit or a separate in-line valve may be applied.).

Discharge Piping: As on the inlet, discharge piping should be at least as large as the flowmeter connection. Also, for pressure-fed flowmeters on air or gas service, the discharge piping should be as short and open as possible. This will allow operation of the flow tube at near atmospheric pressure and insure the accuracy of the device. This is of less importance on water or liquid flowmeters, as the flowing medium is generally incompressible and moderate back pressure will not affect the accuracy of the instrument as calibrated.

POSITIONING AND MOUNTING
All Rate-Master® Flowmeters must be mounted in a vertical position with inlet connection at the bottom rear and outlet at the top rear.

Bezel or Through-Panel Mounting: Make panel cutout using appropriate dimensions from Fig. 2. Flowmeter must fit into panel freely without forcing or squeezing. Insert the flowmeter from the front of the panel and install the mounting clamps from the rear. Insert and tighten the clamp bolts in the locations shown in Fig. 3. Do not exceed 5 in./lbs. Make connections to inlet and outlet ports using pipe thread sealant tape to avoid leakage. Avoid excess torque, which may damage the flowmeter body.

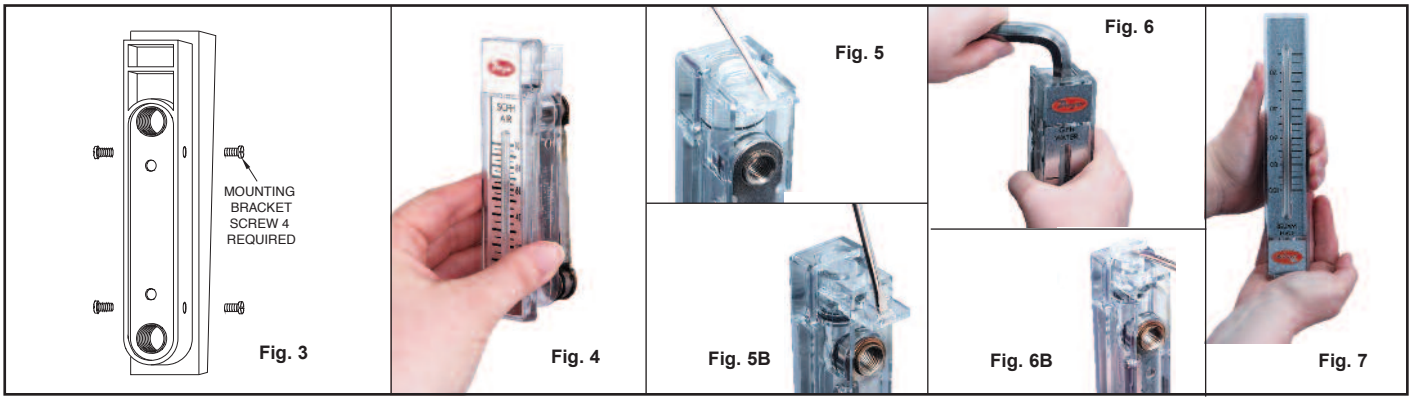


Fig. 3 Fig. 4 Fig. 5 Fig. 5B Fig. 6 Fig. 6B Fig. 7

Surface Mounting: Drill appropriate holes in panel, using the dimensions shown in Fig. 2. Hold the flowmeter in position in front of the panel and install the clamp bolts from the rear. (The mounting clamps may be used as washers, if desired, by installing them backwards or straightening them out.) Pipe up inlet and discharge following the directions in the previous sections.

Surface Mounting on Piping Only: An alternate method of surface mounting, omitting the clamp bolts and supporting the flowmeter solely on the connecting piping, is possible. For this method, extra-long or straight pipe threads should be used so that nuts may be run onto the pipe and later tightened against the back of the panel to retain the unit in proper position. Use appropriate hole layout in formation from Fig. 2, but omit the small holes.

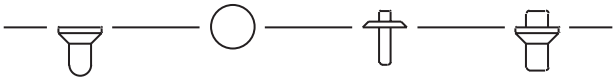
Surface Mounting on Piping Only Without Panel: For a temporary or laboratory type installation, the panel may be omitted altogether and the flowmeter installed directly in rigid piping. Its light weight permits this without difficulty.

OPERATION

To start system, open valve slowly to avoid possible damage. Control valves on BV and SSV models are turned clockwise to reduce flow, counter-clockwise to increase flow (valve is designed for flow adjustment only, not intended to be used as an open/shut-off valve). A nylon insert is provided in the threaded section of the valve stem to give a firm touch to valve and to prevent change of setting due to vibration.

The performance of low range units used in air or gas applications may be affected by static electricity. Excessive static charge may cause the ball float to behave erratically or provide a false reading. To ensure the proper function of the unit, the application should be designed to minimize or dispel static electricity.

The standard technique for reading a Variable Area Flowmeter is to locate the highest point of greatest diameter on the float, and then align that with the theoretical center of the scale graduation. In the event that the float is not aligned with a grad, an extrapolation of the float location must be made by the operator as to its location between the two closest grads. The following are some sample floats shown with reference to the proper location to read the float.



Variable Area Flowmeters used for gases are typically labeled with the prefix “S” or “N”, which represents “Standard” for English units or “Normal” for metric units. Use of this prefix designates that the flowmeter is calibrated to operate at a specific set of conditions, and deviation from those standard conditions will require correction for the calibration to be valid. In practice, the reading taken from the flowmeter scale must be corrected back to standard conditions to be used with the scale units. The correct location to measure the actual pressure and temperature is at the exit of the flowmeter, except when using the Top Mounted Valve under vacuum applications, where they should be measured at the flowmeter inlet. The equation to correct for nonstandard operating conditions is as follows:

$$Q_2 = Q_1 \times \sqrt{\frac{P_1 \times T_2}{P_2 \times T_1}}$$

Where: Q_1 = Actual or Observed Flowmeter Reading
Q_2 = Standard Flow Corrected for Pressure and Temperature
P_1 = Actual Pressure (14.7 psia + Gage Pressure)
P_2 = Standard Pressure (14.7 psia, which is 0 psig)
T_1 = Actual Temperature (460 R + Temp °F)
T_2 = Standard Temperature (530 R, which is 70°F)

Example: A flowmeter with a scale of 10-100 SCFH Air. The float is sitting at the 60 grad on the flowmeter scale. Actual Pressure is measured at the exit of the meter as 5 psig. Actual Temperature is measured at the exit of the meter as 85°F.

$$Q_2 = 60.0 \times \sqrt{\frac{(14.7 + 5) \times 530}{14.7 \times (460 + 85)}}$$

Q_2 = 68.5 SCFH Air

CAUTION: Do not completely unscrew valve stem unless the flowmeter is unpressurized and drained of any liquid. Removal while in service will allow gas or liquid to flow out the front of the valve body and could result in serious personal injury. For applications involving high pressure and/or toxic gases or fluids, please contact factory for details.

MAINTENANCE

The only maintenance normally required is occasional cleaning to assure reliable operation and good float visibility.

Disassembly: The flowmeter can be disassembled for cleaning simply as follows:

1. Remove valve knob from RMB or RMC -BV or -SSV units by pulling the knob forward. It is retained by spring pressure on the stem half-shaft so that a gentle pull will remove it. On RMA-BV or -SSV models, turn the valve knob counter-clockwise until the threads are disengaged. Then withdraw the stem from the valve by gently pulling on the knob.

2. Remove the four mounting bracket screws located in the sides of the flowmeter. See Fig. 3. Pull the flowmeter body gently forward away from the back plate to avoid undue strain on the body. Leave the piping connections intact. There is no need to disturb them. See Fig. 4.

3. Threaded body style flowmeters - Remove the slip cap with a push on a screwdriver as shown in Fig. 5. Remove the plug ball stop as shown in Fig. 6 using allen wrench sizes as follows: Model RMA - 1/4″, Model RMB - 1/2″ and Model RMC - 3/4″ Threadless body style flowmeters - Release the plastic retaining clip with a screw driver (Figure 5B), it will unclip from the valve body (TMV Option) or the plug ball stop, slide the clip back until the valve body or ball stop can be removed. The clip will remain in the body for convenience. Using a screwdriver gently lift up on the plug in the groove as shown in Figure 6B until the o-ring seal is released and remove the plug. For the TMV option gently pull up on the valve knob to release the valve body seals and remove the valve.

4. Take out the ball or float by inverting the body and allowing the float to fall into your hand, as shown in Fig. 7. (Note: It is best to cover the discharge port to avoid losing the float through that opening.)

Cleaning: The flow tube and flowmeter body can best be cleaned with a little pure soap and water. Use of a bottle brush or other soft brush will aid the cleaning. Avoid benzene, acetone, carbon tetrachloride, alkaline detergents, caustic soda, liquid soaps (which may contain chlorinated solvents), etc. Also, avoid prolonged immersion, which may harm or loosen the scale.

Reassembly: Simply reverse steps 1 through 4 and place the flowmeter back in service. A little stopcock grease or petroleum jelly on the “O” rings will help maintain a good seal as well as facilitate assembly. No other special care is required.

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Appendix D

Elapsed Timer Specifications

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Appendix E

Calibration Documentation