ENVIRO-EQUIPMENT, INC.
10120 Industrial Drive
PINEVILLE, NC 28134
704-556-7723 - Phone
704-556-7228 - Fax
www.enviroequipment.com

SYSTEM MANUAL

STOCK# 301 Air Sparge Skid

Enviro-Equipment, Inc.

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10120 Industrial Drive
PINEVILLE, NC 28134
704-556-7723 - Phone
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SHIPPING NOTICE – PLEASE READ!

Inspect Contents For Breakage! Verify Equipment Order!

SAVE ALL PACKAGING AND PACKING MATERIAL

Renter is responsible for damage due to improper packaging.
Clean & decontaminate equipment prior to return shipment.
Return **ALL** accessories and operating manuals. You will be charged a $30 fee if the operating manual is not returned.

The rental period for the enclosed item(s) starts the morning after the item(s) arrive by freight and ends when customer notifies Enviro-Equipment the item(s) are ready for pickup by freight.

Enviro-Equipment, Inc.
10120 Industrial Drive
Pineville, NC 28134
Phone: (704) 556-7723
Fax: (704) 556-7228

IN CASE OF EQUIPMENT DAMAGE OR FAILURE TO OPERATE: NOTIFY ENVIRO-EQUIPMENT, INC. AS SOON AS POSSIBLE.

We will attempt to solve the problem by phone. If the problem cannot be solved by phone, our only remedy is replacement of the item(s) as soon as possible. If no replacement is available, a credit will be issued if:

1. Enviro-Equipment, Inc. (EEI) is notified as soon as possible.
2. The failure of rental item(s) is not due to misuse or abuse.
3. EEI personnel inspect the rental item(s) and confirm the failure was due to malfunction.
4. The renter is responsible for replacement shipping charges if malfunction is found to be due to misuse or abuse.

EEI STOCK # 301 Air Sparge Skid - Operation and Maintenance Manual

General

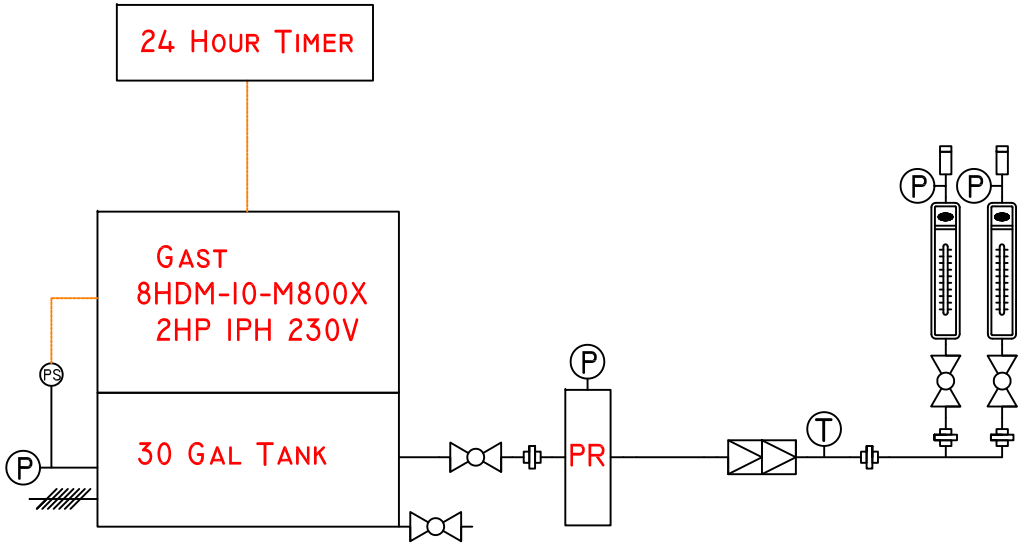
- FIRST - Review all manufacturer documentation.
- Perform and document routine maintenance at manufacturer recommended intervals. Documentation of routine maintenance performed at manufacturer recommended intervals must be provided when making a warranty claim. Failure to perform and document routine maintenance at manufacturer recommended intervals will void any warranty claims.
- Only qualified individuals should connect, start up, operate, maintain and decommission this system.

System Control Panel

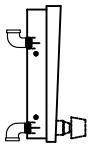
- FIRST – Review all control panel documentation.
- This system includes a 20 amp, 230V, 1 phase, 4 wire (2 hots, 1 ground, 1 neutral) plug and power cable. If not utilizing the provided plug and power cable, a licensed electrician should bring power from the electrical service into the main system control panel.
- Check all wiring connections for proper tightness and torque before powering the system. Verify proper grounding at the control panel. Verify all selector switches are in the OFF position. Verify all valve settings on each system component are set properly for startup.
- Verify proper voltage at the top of disconnect or main terminal block in the main system control panel enclosure.
- Close and secure the enclosure then turn power on to the system.
- Turn all switches to the auto position. Operating in hand mode is for testing purposes only. Damage to the system may result from continuously operating in hand mode which will void the warranty.

Air Sparge Equipment

- FIRST – Review all Air Sparge Equipment documentation.
- Compressor operates off of a pressure switch that's located on the air tank. This pressure switch turns the compressor on at about 65 PSIG and back off at around 90 PSIG. This pressure switch should remain in the AUTO position.
- Do not operate beyond maximum pressure capacity of the compressor. Pressure relief valve should be set at maximum pressure threshold to protect the compressor.
- Check air filters per manufacturer's recommendation or at least once a month. Clean and replace as necessary.
- Compressor is oil and grease free and does not require any oil or grease changes. Compressor does require periodic replacement of air filters and compressor head gaskets if/when leaks occur or performance declines. Refer to the Gast compressor O&M manual.
- Air receiver tank has a drain valve on the bottom. This needs to be periodically drained to make sure condensation doesn't build up.
- Compressor needs to be covered from the elements. Do not subject to direct rainfall. Freezing conditions maybe an issue for frozen condensation in the air receiver tank.
- Upon shutdown, drain receiver tank allowing all condensation and air pressure to leave the system.



1/2" GALVANIZED STEEL PIPING THROUGHOUT



1-10 CFM ROTAMETER

SYMBOL	DESCRIPTION
SP	SAMPLE PORT
VS	VACUUM SWITCH
V	VACUUM GAUGE
TS	TEMPERATURE SWITCH
PS	PRESSURE SWITCH
P	PRESSURE GAUGE
T	TEMPERATURE GAUGE
	RELIEF VALVE
SV	SOLENOID VALVE
	WYE STRAINER
	CHECK VALVE
	GATE VALVE
	BALL VALVE
VACUUM FILTER	VACUUM FILTER
FILTER SILENCER	FILTER SILENCER
	EXHAUST MUFFLER
	FLOW METER
	TRANSFER PUMP
	VACUUM BLOWER
	AIR COMPRESSOR
	MOISTURE SEPARATOR
	HEAT EXCHANGER
	INTRINSICALY SAFE WIRING
	POWER WIRING

DATE	REVISION	BY	CH'D

ENVIRO-EQUIPMENT, INC.
10120 Industrial Drive
Pineville, N.C. 28134
PHONE 704-556-7723
FAX 704-556-7728

TOLERANCES (UNLESS OTHERWISE SPECIFIED)

CUSTOMER: N/A

TITLE: P&ID
SPARGE SKID

SCALE:	DRAWN BY:	CHECKED BY:	APP'D BY:
NTS	Evan Chew	EC	EC

DATE:	SHEET	OF SHEETS	DRAWING NO.
11-16-22	1	1	STOCK #301

GAST MANUFACTURING, INC.
A Unit of IDEX Corporation
Post Office Box 97
Benton Harbor, Michigan 49023
Ph: 269/926-6171
Fax: 269/925-8288

PART NUMBER: RTD384

REV. D

Product Specifications

Model Number	Motor	RPM		HP	kW	Net Wt.	
		60 cycle	50 cycle			lbs.	kg
8HDM-10-M850X	115/230-1 110/220-1	1725	1425	2	1,5	80.5	36,50

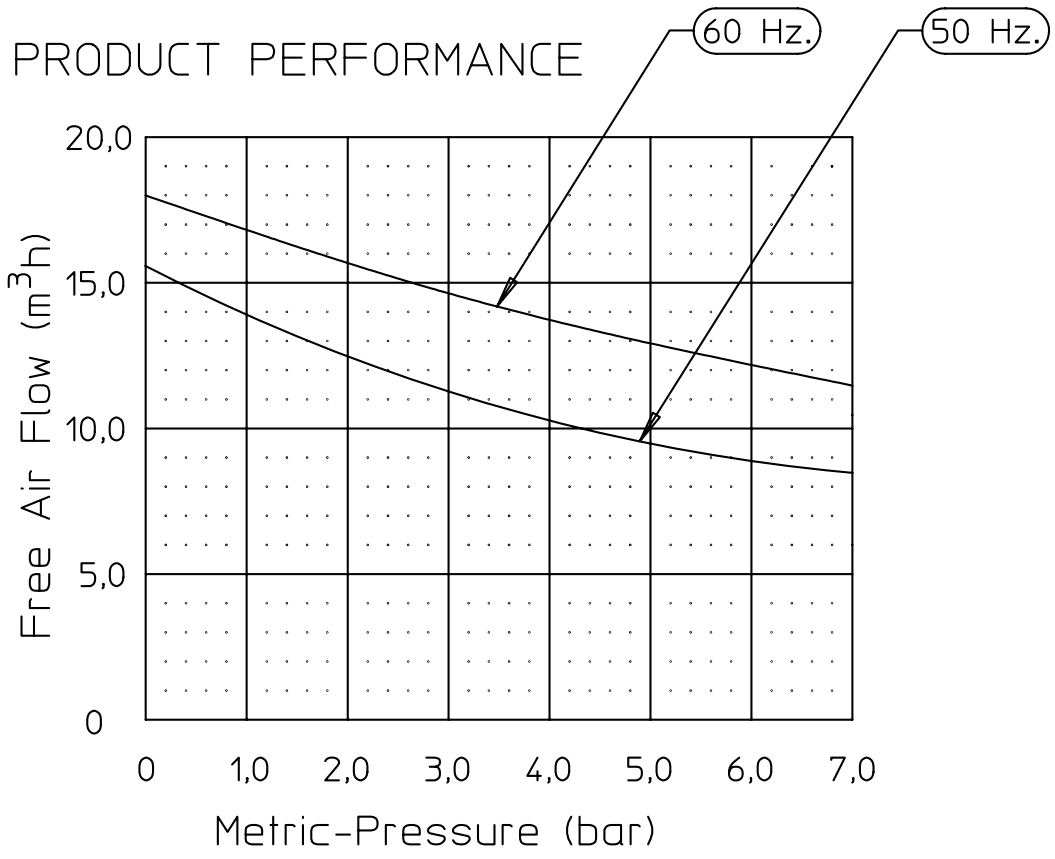
SOUND LEVEL: 84 dB(A)

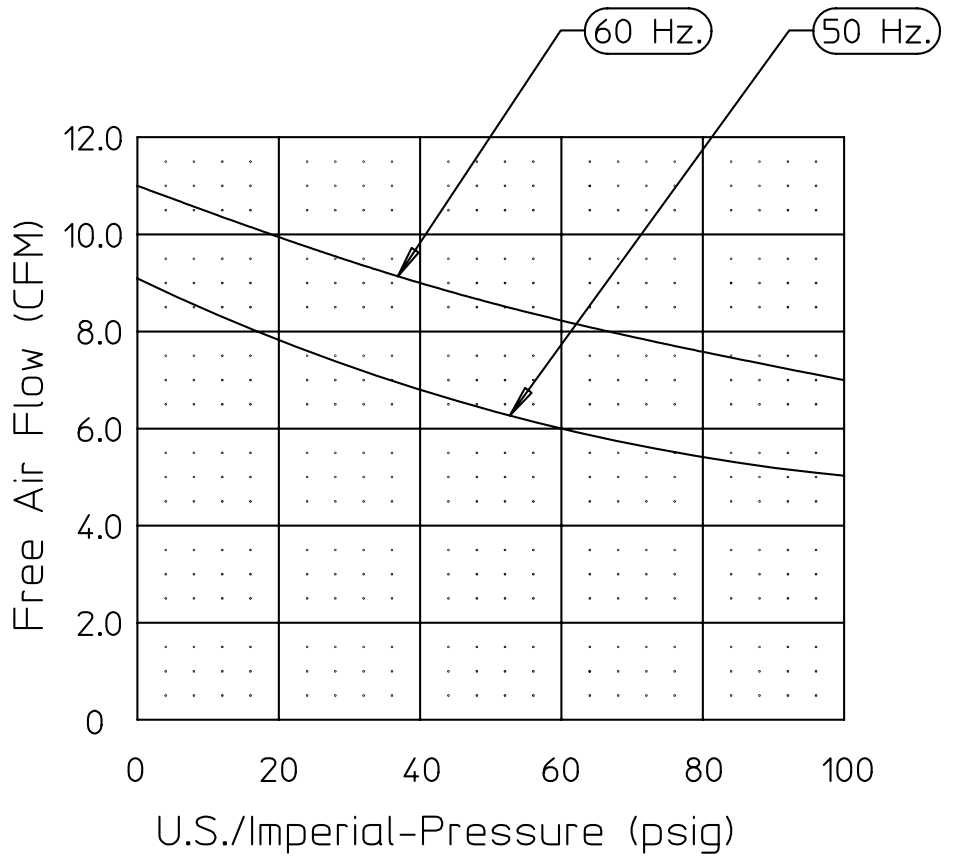
NORMAL AMBIENT: +5 degC - +40 degC

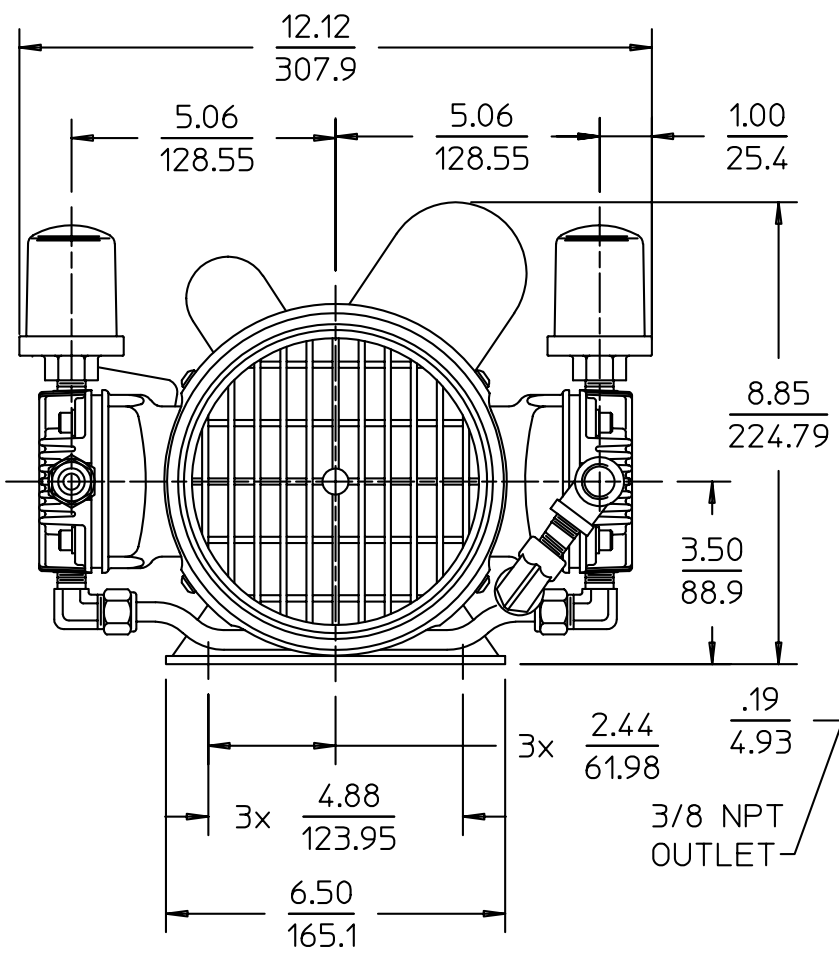
RELATIVE HUMIDITY: 20% - 80%

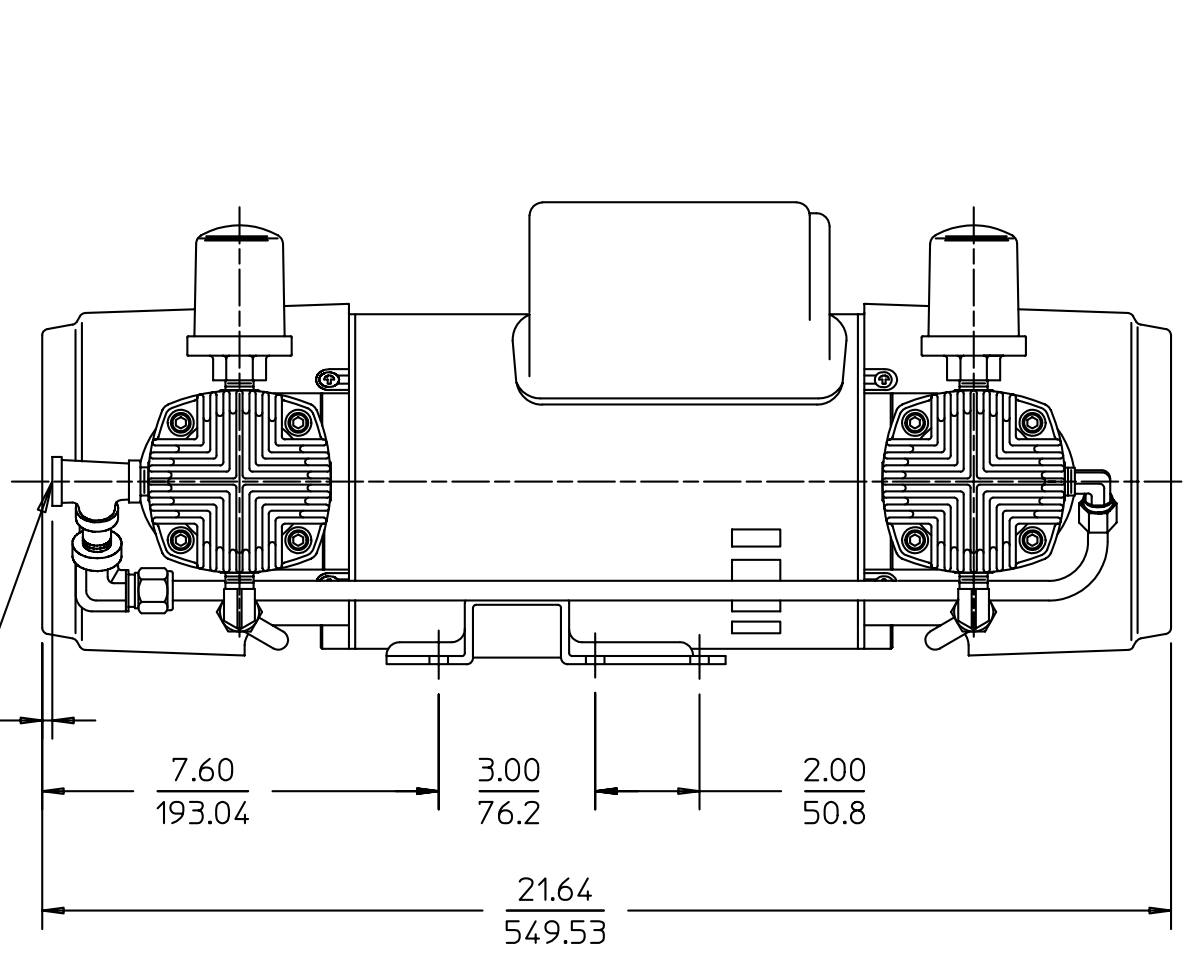
ENVIRONMENT: Clean Dust Free

PRODUCT PERFORMANCE









NOTES:
1. ALL DIMENSIONS ARE IN U.S. IMPERIAL (inches), METRIC (mm).
2. ALL DIMENSIONS ARE REFERENCE USE ONLY.
3. TECHNICAL DATA SUBJECT TO CHANGE WITHOUT NOTICE.

OIL-LESS PISTON VACUUM PUMPS & COMPRESSORS

OPERATION & MAINTENANCE MANUAL

Model 1HAB Shown

Model 3HBB Shown

Model 3HEB Shown

Model PCD Shown

Thank you for purchasing this Gast product. It is manufactured to the highest standards using quality materials. Please follow all recommended maintenance, operational and safety instructions and you will receive years of trouble free service.

IMPORTANT: PLEASE READ THIS MANUAL AND SAVE FOR FUTURE REFERENCE.

Product Use Criteria:

- Pump only clean, dry air.
- Operate at 32ºF - 104ºF (0ºC - 40ºC).
- Protect unit from dirt & moisture.
- Do not pump flammable or explosive gases or use in an atmosphere that contains such gases.
- Protect all surrounding items from exhaust air. This exhaust air can become very hot.
- Corrosive gases and particulate material will damage unit. Water vapor, oil-based contaminants or other liquids must be filtered out.
- Consult your Gast Distributor/Representative before using at high altitudes.
- These pumps are oil-less and require NO lubrication. The Teflon-filled rings are self-lubricating and require no oil.
- The motor bearings are grease-packed for the lifetime of the bearings.

GAST
A Unit of IDEX Corporation

ISO 9001 & 14001 CERTIFIED

www.gastmfg.com

Your safety and the safety of others is extremely important.

We have provided many important safety messages in this manual and on your product. Always read and obey all safety messages.

This is the safety alert symbol. This symbol alerts you to hazards that can kill or hurt you and others. The safety alert symbol and the words "DANGER" and "WARNING" will precede all safety messages. These words mean:

DANGER

You will be killed or seriously injured if you don't follow instructions.

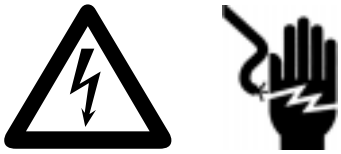
WARNING

You can be killed or seriously injured if you don't follow instructions.

All safety messages will identify the hazard, tell you how to reduce the chance of injury, and tell you what can happen if the safety instructions are not followed.

INSTALLATION

WARNING



Electrical Shock Hazard

Disconnect electrical power at the circuit breaker or fuse box before installing this product.

Install this product where it will not come into contact with water or other liquids.

Install this product where it will be weather protected.

Electrically ground this product.

Failure to follow these instructions can result in death, fire or electrical shock.

Correct installation is your responsibility. Make sure you have the proper installation conditions and that installation clearances do not block air flow.

Lift the unit by the motor shell, motor foot or flywheel (depending upon model design). Do Not lift unit by shroud, filters or mufflers. These parts are not designed to support the weight of the unit.

Blocking air flow over the product in any way can cause the product to overheat.

Install safety guards as required to prevent potential injury hazards or damage to surrounding objects.

Mounting
This product can be installed in any orientation. Mounting the product to a stable, rigid operation surface and using shock mounts will reduce noise and vibration.

Plumbing
Remove plugs from the IN and OUT ports. Connect with pipe and fittings that are the same size or larger than the product's threaded ports. Be sure to connect the intake and exhaust plumbing to the correct inlet and outlet ports. Ports will not support plumbing.

Accessories
If unit will be used in a system where it will be required to start against any system of back pressure, a positive sealing, one-way check valve should be installed in the air line between system and unit. This check valve is included with all tank mounted compressor units.

The product's intake and exhaust filters will provide adequate filtration in most applications. Check filters periodically and replace when necessary. Please consult your Gast Distributor/Representative for additional filter recommendations.

Install relief valves and gauges at inlet or outlet, or both, to monitor performance. Check valves may be required to prevent back streaming through the unit.

Motor Control
It is your responsibility to contact a qualified electrician and assure that the electrical installation is adequate and in conformance with all national and local codes and ordinances. Grounding is required.

Determine the correct overload setting required to protect the motor (see motor starter manufacturer's recommendations). Select fuses, motor protective switches or thermal protective switches to provide protection. Fuses act as short circuit protection for the motor, not as protection against overload. Incoming line fuses must be able to withstand the motor's starting current. Motor starters with thermal magnetic overload or circuit breakers protect motor from overload or reduced voltage conditions.

The wiring diagram supplied with the product provides required electrical information. Check that power source is correct to properly operate the dual-voltage motors.

Electrical Connection

WARNING

Electrical Shock Hazard

This product must be properly grounded.

Do not modify the plug provided. If it will not fit the outlet, have the proper outlet installed by a qualified electrician.

If repair or replacement of the cord or plug is necessary, do not connect the grounding wire to either flat blade terminal. The wire with insulation that is green or green with yellow stripes is the grounding wire.

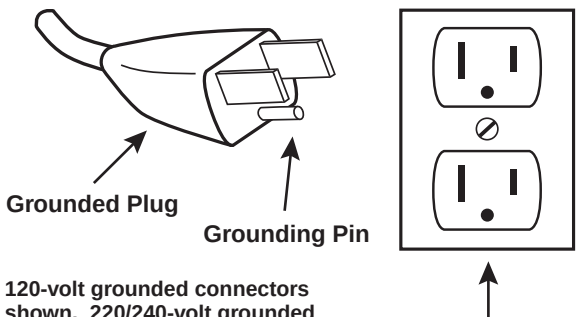
Check the condition of the power supply wiring. Do not permanently connect this product to wiring that is not in good condition or is inadequate for the requirements of this product.

Failure to follow these instructions can result in death, fire or electrical shock.

Model with a power supply cord:
This product must be grounded. For either 120-volt or 220/240-volt circuits connect power supply cord grounding plug to a matching grounded outlet. Do not use an adapter. (See diagram.)

In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This product may be equipped with a power supply cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

Check with a qualified electrician or serviceman if the grounding instructions are not completely understood, or if you are not sure whether the product is properly grounded. Do not modify the plug provided. If it will not fit the outlet, have the proper outlet installed by a qualified electrician.



120-volt grounded connectors shown. 220/240-volt grounded connectors will differ in shape.

Model that is permanently wired:
This product must be connected to a grounded, metallic, permanent wiring system, or an equipment grounding terminal or lead on the product.

Power supply wiring must conform to all required safety codes and be installed by a qualified person. Check that supply voltage agrees with that listed on product nameplate.

Extension cords:
Use only a 3-wire extension cord that has a 3-blade grounding plug. Connect extension cord plug to a matching 3-slot receptacle. Do not use an adapter. Make sure your extension cord is in good condition. Check that the gage wire of the extension cord is the correct size wire to carry the current this product will draw.

An undersized cord is a potential fire hazard, and will cause a drop in line voltage resulting in loss of power causing the product to overheat. The following table indicates the correct size cord for length required and the ampere rating listed on the product nameplate. **If in doubt, use the next heavier gage cord. The smaller the gage number, the heavier the wire gage.**

Minimum gage for extension cords

Amps	Volts	Length of cord in feet								
	120v	25	50	100	150	200	250	300	400	500
	240v	50	100	200	300	400	500	600	800	1000
0-2		18	18	18	16	16	14	14	12	12
2-3		18	18	16	14	14	12	12	10	10
3-4		18	18	16	14	12	12	10	10	8
4-5		18	18	14	12	12	10	10	8	8
5-6		18	16	14	12	10	10	8	8	8
6-8		18	16	12	10	10	8	6	6	6
8-10		18	14	12	10	8	8	6	6	4
10-12		16	14	10	8	8	6	6	4	4
12-14		16	12	10	8	6	6	6	4	2
14-16		16	12	10	8	6	6	4	4	2
16-18		14	12	8	8	6	4	4	2	2
18-20		14	12	8	6	6	4	4	2	2

OPERATION

WARNING

Injury Hazard

Install proper safety guards as needed.

Keep fingers and objects away from openings and rotating parts.

When provided, motor terminal covers must be in place for safe operation.

Product surfaces become very hot during operation, allow product surfaces to cool before handling.

Air stream from product may contain solid or liquid material that can result in eye or skin damage, wear proper eye protection.

Wear hearing protection. Sound level from motor may exceed 70 dBA.

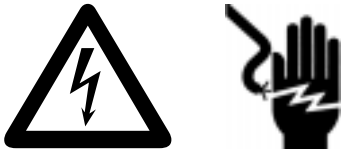
Failure to follow these instructions can result in burns, eye injury or other serious injury.

It is your responsibility to operate this product at recommended pressures or vacuum duties and room ambient temperatures. Do not start against a vacuum or pressure load. Do not remove relief valve head while unit is operating.

Start Up
If motor fail to start or slows down significantly under load, shut off and disconnect from power supply. Check that voltage is correct for motor and that motor is turning in the proper direction. If the motor is turning in the wrong direction, it will overheat.

MAINTENANCE

WARNING



Electrical Shock Hazard

Disconnect electrical power supply cord before performing maintenance on this product.

If product is hard wired into system, disconnect electrical power at the circuit breaker or fuse box before performing maintenance on this product.

Failure to follow these instructions can result in death, fire or electrical shock.

WARNING

Injury Hazard

Product surfaces become very hot during operation, allow product surfaces to cool before handling.

Air stream from product may contain solid or liquid material that can result in eye or skin damage, wear proper eye protection.

Failure to follow these instructions can result in burns, eye injury or other serious injury.

It is your responsibility to:
- **Regularly inspect and make necessary repairs to product in order to maintain proper operation.**
- **Make sure that pressure and vacuum is released from product before starting maintenance.**

If unit is operated at maximum duties in a fairly clean, 65ºF - 75ºF (18ºC - 24ºC) ambient environment with 35% relative humidity, complete first inspection and maintenance after 4000 hours of operation. Earlier maintenance may be required depending upon the environment.

Check intake and exhaust filters after first 500 hours of operation. Clean filters and determine how frequently filters should be checked during future operation. This one procedure will help assure the product's performance and service life.

Check the thickness of the rider ring. It should measure greater than .055". Change all rings if thickness measures .055" or less.

1. Disconnect electrical power supply to unit.
2. Vent all air lines.
3. Remove filter cover.
4. Check filter felt. Replace felt if it is covered with contamination or shows signs of increasing differential pressure.
5. Reinstall felt and filter cover.

Check that all external accessories such as relief valves and gauges are attached and are not damaged before re-operating product.

Pressure or Vacuum Tank Systems
Check the air filter cartridge. A dirty filter restricts air flow and causes unit to run hotter resulting in longer operating cycles.

Check the air receiver for moisture regularly. The humidity in the environment will determine how quickly moisture will accumulate and need to be drained.

Clean the pump and motor regularly. Dirt and film buildup on the outer shell affects the unit's ability to dissipate heat.

SHUTDOWN PROCEDURES

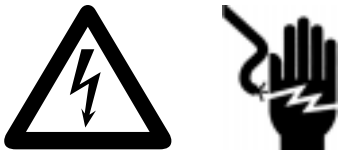
It is your responsibility to follow proper shutdown procedures to prevent product damage.
NEVER ADD OIL TO THIS OIL-LESS PUMP.

Proper shutdown procedures must be followed to prevent pump damage. Failure to do so may result in premature pump failure. Gast Manufacturing Oil-Less Piston Vacuum Pumps and Compressors are constructed of ferrous metals or aluminum which are subject to rust and corrosion when pumping condensable vapors such as water. Follow the steps below to assure correct storage and shutdown between operating periods.

1. Disconnect plumbing.
2. Operate product for at least 5 minutes without plumbing.
3. Run at maximum vacuum for 10 - 15 minutes.
4. Repeat step 2.
5. Disconnect power supply.
6. Plug open ports to prevent dirt or other contaminants from entering product.

SERVICE KIT INSTALLATION

WARNING



Electrical Shock Hazard

Disconnect electrical power supply cord before installing Service Kit.

If product is hard wired into system, disconnect electrical power at the circuit breaker or fuse box before installing Service Kit.

Vent all air lines to release pressure or vacuum.

Failure to follow these instructions can result in death, fire or electrical shock.

Gast will NOT guarantee field-rebuilt product performance. For performance guarantee, the product must be returned to a Gast Authorized Service Facility.

Service Kit contents vary. Most contain head and cylinder gaskets, valves, piston rings and seals, rider rings and felt filters.

1. Disconnect electrical power to pump.
2. Disconnect air supply and vent all air lines to release pressure or vacuum.
3. Remove shroud, cylinder head and valve components.
4. Remove cylinder and rings.
5. Clean all parts with water or non-petroleum based solvent such as Gast AH255B Solvent. Do Not use kerosene or ANY other combustible solvents.
6. Install piston seals, piston rings and rider rings on piston. Locate ring joints approximately opposite each other.
7. Use cylinder screws with washers to attach cylinder to bracket. Tighten screws only until they are finger tight.
8. Move pistons to top dead center position. Adjust each cylinder flush with top of piston.
9. Torque cylinder screws to 150-160 in. lbs.
10. Replace valve components in original order.
11. Install cylinder head and head screws. The exhaust ports have been marked on the cylinder heads by omitting the ends of two of the fins. Do not tighten screws at this time.
12 Install manifold nuts and seals on manifold. Insert into cylinder head and manifold.
13. Torque head screws to 150-160 in. lbs.
14. Turn fan by hand to check that rod assembly is not hitting head. If rod hits head, loosen cylinders and adjust.
15. Install manifold and tighten manifold nut one-quarter to one-half turn beyond finger tight.
16. Operate unit for 10 minutes. Tighten screws again.
17. Install fan shroud.

Check that all external accessories such as relief valves and gauges are attached to cover and are not damaged before re-operating product.

If pump still does not produce proper vacuum or pressure, send unit to a Gast Authorized Service Facility for repair.

SPECIFIC PROBLEMS AND REMEDIES

Unit stalls after vacuum or pressure starts building up in receiver:

1. Disconnect electrical power supply from unit.
2. Check that voltage from power source matches that listed on nameplate.
3. Check wiring connections against diagram on nameplate. Single voltage motors will operate only at designated voltage.

Motor will not start:

1. Disconnect electrical power supply from unit.
2. Check that voltage from power source matches that listed on nameplate.
3. Check wiring connections against diagram on nameplate. Single voltage motors will operate only at designated voltage.
4. Reconnect electrical supply to unit. Check that power is on. If extension cord is used, check that it is the correct size and length to adequately supply power to the unit.
5. If unit will still not operate, contact your Gast Distributor/Representative or a Gast Authorized Service Facility.

Motor starts at 0 PSI but will not start under pressure:

1. Replace the check valve.
2. Wait for the thermal overload switch to reset before attempting to operate.
3. If unit will not restart, the thermal overload switch may need to be replaced. If there isn't a thermal overload switch, the motor may be damaged and requires service.

Motor starts intermittently:

1. Disconnect electrical power supply from unit.
2. Check points in the pressure or vacuum switch for wear or dirt.
3. Check for dirt buildup or uneven wear.
4. Replace parts as required.

Unit cycles On-Off more often than when first installed:

1. Check air receiver and drain water that has accumulated.

Unit or motor is running more often than when first installed:

1. Check system for air leaks. If new or different pneumatic equipment has been added, the air requirements may have changed.
2. Check and clean filters.
3. Check for buildup of foreign material on head.
4. Check valves and rings for wear and damage.

Air receiver loses pressure:

1. Check for system leaks through pipes, fittings and seals.
2. Inspect the check valve to see if it is allowing air pressure to leak back into unit.
3. Pressure pumps will have bubbles around head assembly during operation. Stop operating the pump for a few minutes and check for air leaks at pump.
4. Vacuum systems should have the check valve removed and inspected for dirt buildup. It may be necessary to need an AV460 filter installed prior to tank to eliminate contaminants.

A leak is located at the unit:

1. Vent all pressure from inside the air receiver until gauge reads 0 PSI.
2. Inspect check valve for dirt buildup, wear and proper operation.
3. Replace check valve if necessary.

PARTS & ORDERING INFORMATION

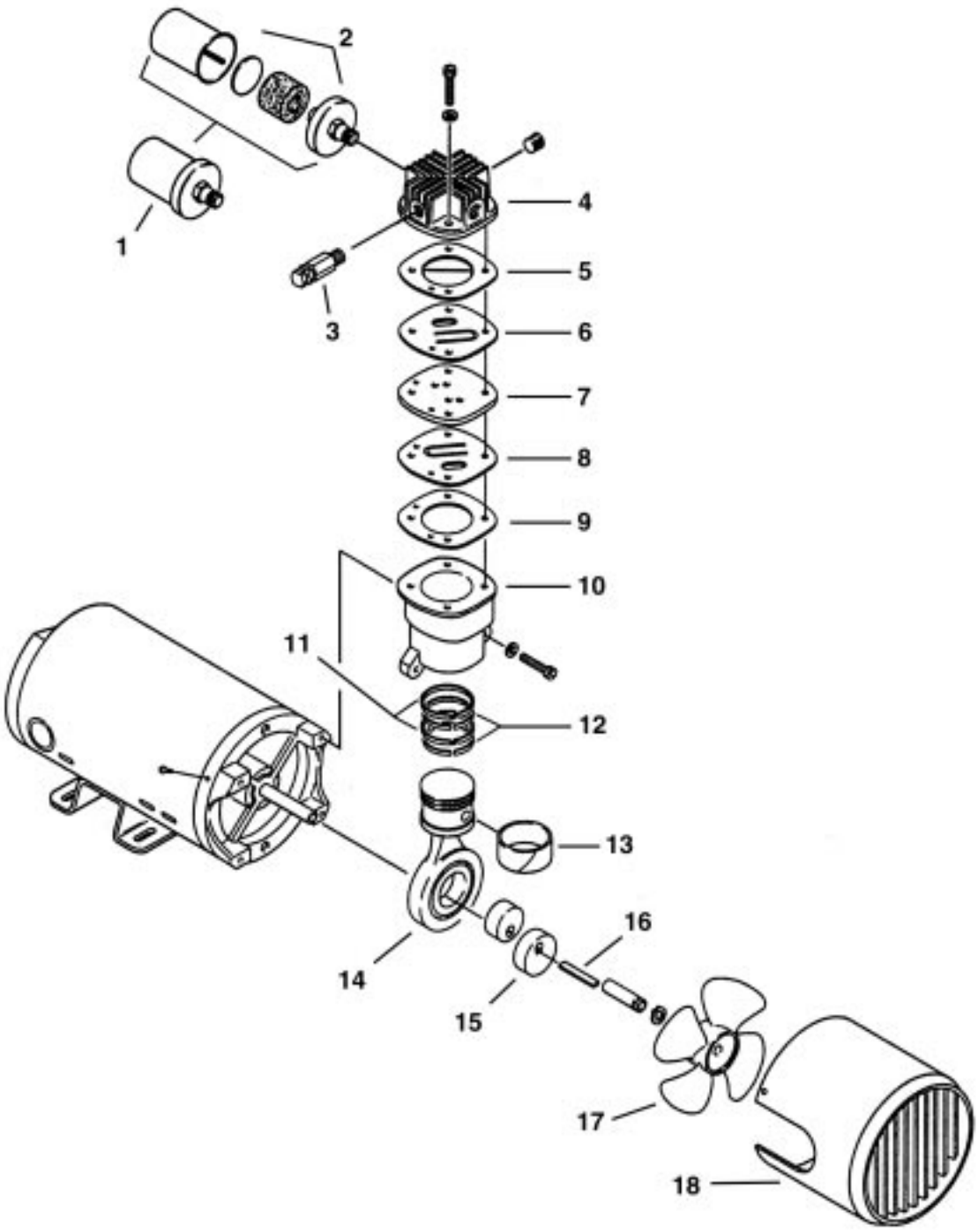
Please reference the exploded view on the opposite page for the following model and parts table.

1HAA / 1HAB SERIES

REF	DESCRIPTION	QTY	1HAA	1HAB	1HAE	1LAA	1VAF	2HAH	2LAF	3HEB	3HEE	3LEM
1	INLET FILTER ASSEMBLY	1	B300A	B300A	B300A	B300A	B300A	B300A	B300F	B300F	B300F	B300F
2 Δ	FELT	1	B344A	B344A	B344A	B344A	B344A	B344A	B344A	B344A	B344A	B344A
3	SAFETY VALVE	1	AS100E	AS100G	AS100G	AS100C	–	AS100G	AS100C	AS100G	AS100G	AS100C
4	CYLINDER HEAD	1	AF508	AF508	AF508	AF508	AF508	AF508	AF508	AH691	AH691	AH691
5 Δ	HEAD GASKET	1	AF518	AF518	AF518	AF518	AF518	AF518	AF518	AF520A	AF520A	AF520A
6 Δ	OUTLET VALVE	1	AF531	AF531	AF531	AF531	AF531	AF531	AF531	AF545	AF545	AF545
7	PLATE VALVE	1	AF529	AF529	AF529	AF529	AF529	AF529	AF529	AK779	AK779	AK779
8 Δ	INLET VALVE	1	AF530	AF530	AF530	AF530	AF530	AF530	AF530	AF544	AF544	AF544
9 Δ	CYLINDER GASKET	1	AF519A	AF519A	AF519A	AF519A	AF519A	AF519A	AF519A	AF521	AF521	AF521
10	CYLINDER	1	AF510	AF510	AF510	AF510	AF510	AF510	AF510	AF509	AF509	AF509
11 Δ	PISTON RING	2	AF527	AF527	AF527	AF527	AF527	AF527	AF527	AF541	AF541	AF541
12 Δ	PISTON SEAL	2	AF526	AF526	AF526	AF526	AF526	AF526	AF526	AF540	AF540	AF540
13 Δ	RIDER RING	1	AF594	AF594	AF594	AF594	AF594	AF594	AF594	AF595	AF595	AF595
14	PISTON ROD ASSEMBLY	1	AF560A	AF560B	AF560E	AF560A	AF560F	AF560H	AF560F	AK893B	AK893E	AK893M
15	COUNTER WEIGHT	1	AF517A	AF517B	AF517E	AF517A	AF517D	AF517C	AF517D	AT780B	AK780E	AK780A
16	FLAT KEY	1	AF524	AF524	AF524	AF524	AF524	AF524	AF524	AB136	AB136	AB136
17	FAN	1	AF533	AF533	AF533	AF533	AF533	AF547	AF547	AF547	AF547	AF547
18	SHROUD	1	AF534	AF534	AF534	AF534	AF534	AF534	AF534	AT343	AT343	AT343
***	TANK ASSEMBLY	1	–	AF599	–	AF599AA-1	–	AF599	–	–	–	–
***	SERVICE KIT	1	K264	K264	K264	K264	K264	K264	K264	K514A	K514A	K514A

Model 1HAB shown.
*** Item not shown.
Δ Denotes parts included in the Service Kit.
Parts listed are for stock models. For specific OEM models, please consult the factory.
When corresponding or ordering parts, please give complete model and serial numbers.

EXPLODED PRODUCT VIEW – MODEL 1HAB



PARTS & ORDERING INFORMATION

Please reference the exploded view on the opposite page for the following model and parts tables.

1VBF – 3LBD SERIES

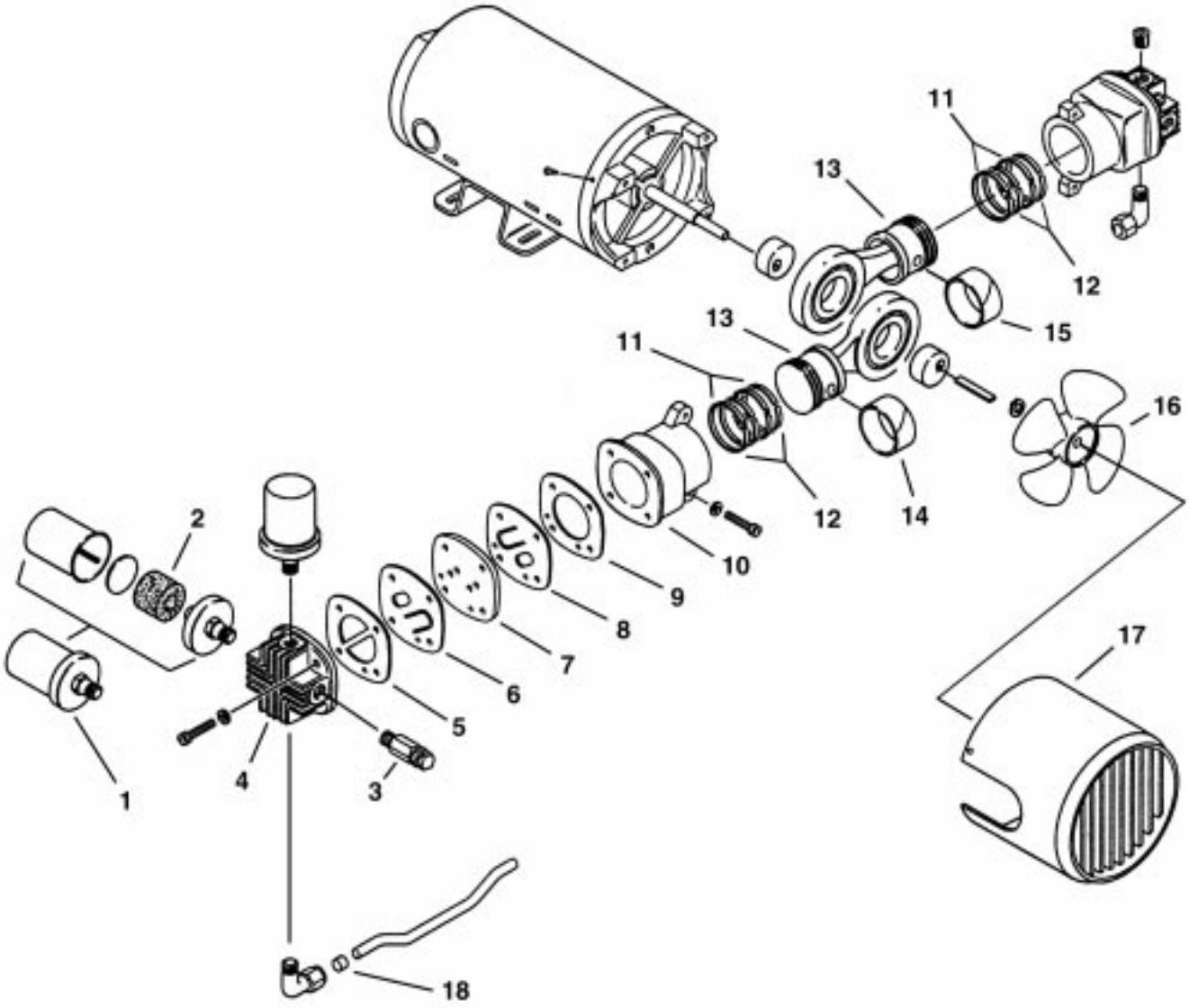
REF	DESCRIPTION	QTY	1VBF	1VSF	2LBB	2HBB	2HBC	3HBB	3HBE	3LBA	3LBD
1	INLET FILTER ASSEMBLY	1		B300A							
		2	B300A		B300A	B300A	B300A	B300A	B300A	B300A	B300A
2 Δ	FELT	2	B344A	B344A	B344A	B344A	B344A	B344A	B344A	B344A	B344A
3	SAFETY VALVE	1	–	–	AS100C	AS100G	AS100G	AS100G	AS100G	AS100C	AS100C
4	CYLINDER HEAD	2	AF508	AF508	AF508	AF508	AF508	AF508	AF508	AF508	AF508
5 Δ	HEAD GASKET	2	AF518	AF518	AF518	AF518	AF518	AF518	AF518	AF518	AF518
6 Δ	OUTLET VALVE	2	AF531	AF531	AF531	AF531	AF531	AF531	AF531	AF531	AF531
7	PLATE VALVE	2	AF529	AF529	AF529	AF529	AF529	AF529	AF529	AF529	AF529
8 Δ	INLET VALVE	2	AF530	AF530	AF530	AF530	AF530	AF530	AF530	AF530	AF530
9 Δ	CYLINDER GASKET	2	AF519A	AF519A	AF519A	AF519A	AF519A	AF519A	AF519A	AF519A	AF519A
10	CYLINDER	2	AF510	AF510	AF510	AF510	AF510	AF510	AF510	AF510	AF510
11 Δ	PISTON RING	4	AF527	AF527	AF527	AF527	AF527	AF527	AF527	AF527	AF527
12 Δ	PISTON SEAL	4	AF526	AF526	AF526	AF526	AF526	AF526	AF526	AF526	AF526
13	PISTON ROD ASSEMBLY	2	AF560F	AF560F	AF560B	AF560B	AF560C	AF560B	AF560E	AF560A	AF560D
14 Δ	RIDER RING	2	AF594	AF594	AF594	AF594	AF594	AF594	AF594	AF594	AF594
15	FLAT KEY	1	AF524	AF524	AF524	AF524	AF524	AF524	AH984	AF524	AH984
16	FAN/FAN ASSEMBLY	1	AF533	AF533	AF533	AF533	AF533	AF533	AF547	AF533	AF547
17	SHROUD	1	AF535	AF535	AF535	AF535	AF535	AF535	AF535	AF535	AF535
18 Δ	MANIFOLD SLEEVE	2	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A
***	SERVICE KIT	1	K260	K260	K260	K260	K260	K260	K260	K260	K260

4VCF – 6HCA SERIES

REF	DESCRIPTION	QTY	4VCF	4VSF	4HCJ	4LCB	4HCC	5LCA	5HCD	5HCE	6HCN	6HCA
1	INLET FILTER ASSEMBLY	1		B300F								
		2	B300F		B300A	B300A	B300A	B300F	B300A	B300A	B300F	B300F
2 Δ	FELT	2	B344A	B344A	B344A	B344A	B344A	B344A	B344A	B344A	B344A	B344A
3	SAFETY VALVE	1	–	–	AS100G	AS100D	AS100G	AS100E	AS100H	AS100H	AS100H	AS100H
4	CYLINDER HEAD	2	AF507	AF507	AF507	AF507	AF507	AF507	AF507	AF507	AF507	AF507
5 Δ	HEAD GASKET	2	AF520A	AF520A	AF520A	AF520A	AF520A	AF520A	AF520A	AF520A	AF520A	AF520A
6 Δ	OUTLET VALVE	2	AF545	AF545	AF545	AF545	AF545	AF545	AF545	AF545	AF545	AF545
7	PLATE VALVE	2	AF543	AF543	AF543	AF543	AF543	AF543	AF543	AF543	AF543	AF543
8 Δ	INLET VALVE	2	AF544	AF544	AF544	AF544	AF544	AF544	AF544	AF544	AF544	AF544
9 Δ	CYLINDER GASKET	2	AF521	AF521	AF521	AF521	AF521	AF521	AF521	AF521	AF521	AF521
10	CYLINDER	2	AF509	AF509	AF509	AF509	AF509	AF509	AF509	AF509	AF509	AF509
11 Δ	PISTON RING	4	AF541	AF541	AF541	AF541	AF541	AF541	AF541	AF541	AF541	AF541
12 Δ	PISTON SEAL	4	AF540	AF540	AF540	AF540	AF540	AF540	AF540	AF540	AF540	AF540
13	PISTON ROD ASSEMBLY	2	AF561F	AF561F	AF561J	AF561B	AF561C	AF561A	AF561D	AF561E	AF561N	AF561A
14 Δ	RIDER RING	2	AF595	AF595	AF595	AF595	AF595	AF595	AF595	AF595	AF595	AF595
15	KEY	1	AB136D	AB136D	AB136D	AB136D	AB136D	AB136D	AB136D	AB136D	AB136F	AB136F
16	FAN/FAN ASSEMBLY	1	AF547	AF547	AF547	AF547	AF547	AF547	AF547	AF547	AF747	AF747
17	SHROUD	1	AF549	AF549	AF549	AF549	AF549	AF549	AF549	AF549	AF656	AF656
18 Δ	MANIFOLD SLEEVE	2	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A
***	SERVICE KIT	1	K263	K263	K263	K263	K263	K263	K263	K263	K263	K263

Model 1VBF shown.
*** Item not shown.
Δ Denotes parts included in the Service Kit.
Parts listed are for stock models. For specific OEM models, please consult the factory.
When corresponding or ordering parts, please give complete model and serial numbers.

EXPLODED PRODUCT VIEW – MODEL 1VBF



PARTS & ORDERING INFORMATION

Please reference the exploded views on the next page for the following model and parts tables.

PAB – VAB SERIES

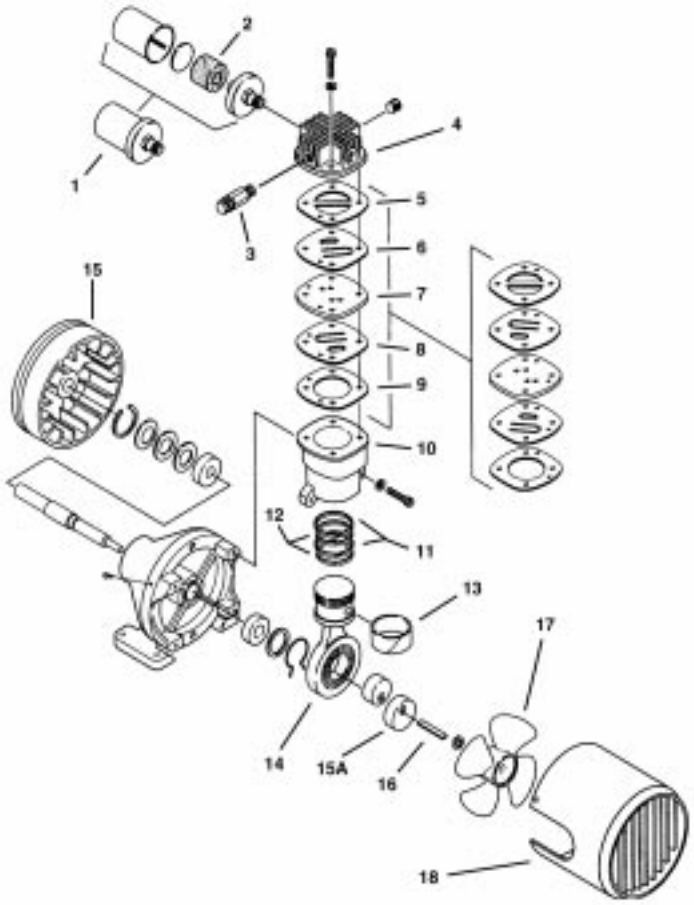
REF	DESCRIPTION	QTY	PAB	VAB
1	FILTER ASSEMBLY	1	B300A	B300A
2 Δ	FELT	1	B344A	B344A
3	SAFETY VALVE	1	AS100G	–
4	CYLINDER HEAD	1	AF508	AF508
5 Δ	HEAD GASKET	1	AF518	AF518
6 Δ	OUTLET VALVE	1	AF531	AF531
7	PLATE VALVE	1	AF529	AF529
8 Δ	INLET VALVE	1	AF530	AF530
9 Δ	CYLINDER GASKET	1	AF519A	AF519A
10	CYLINDER	1	AF510	AF510
11 Δ	PISTON RING	2	AF527	AF527
12 Δ	PISTON SEAL	2	AF526	AF526
13 Δ	RIDER RING	1	AF594	AF594
14	PISTON ROD ASSEMBLY	1	AF560B	AF560B
15	PULLEY	1	AB140C	AB140C
15A	COUNTER WEIGHT	1	AF517B	AF517B
16	FLAT KEY	1	AF524	AF524
17	FAN	1	AF533	AF533
18	SHROUD	1	AF534	AF534
***	SERVICE KIT	1	K264	K264

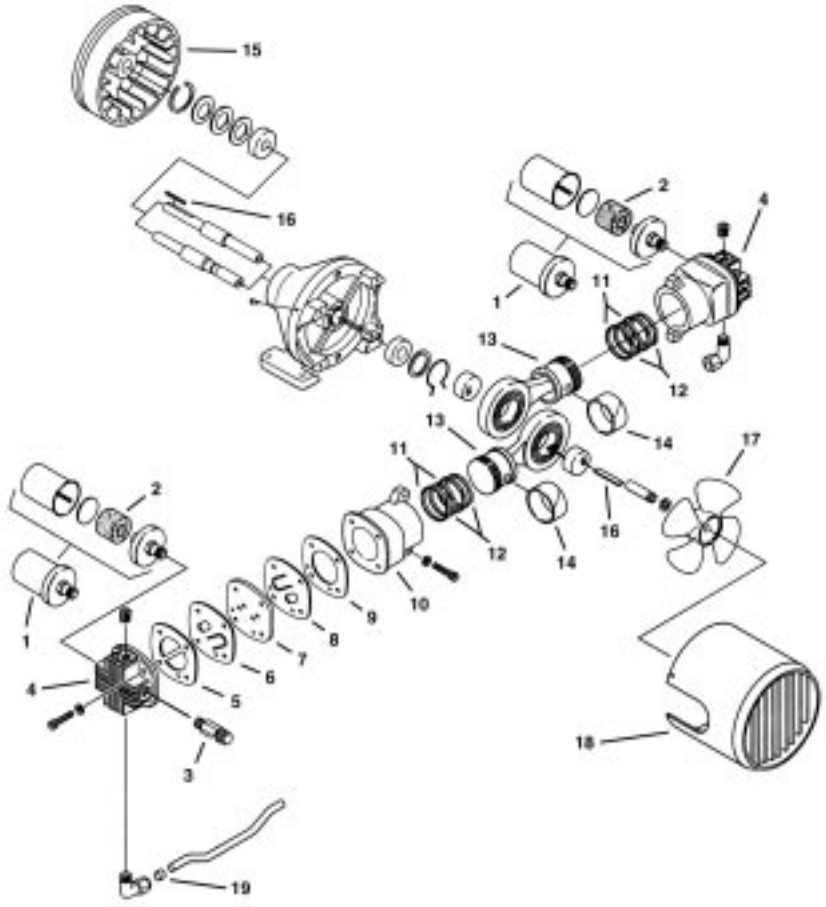
VBB – PCA-10 SERIES

REF	DESCRIPTION	QTY	VBB	VCD	PBB	PCA-10
1	FILTER ASSEMBLY	2	B300A	B300A	B300A	B300F
2 Δ	FELT	2	B344A	B344A	B344A	B344A
3	SAFETY VALVE	1	–	–	AS100G	AS100H
4	CYLINDER HEAD	2	AF508	AF507	AF508	AF507
5 Δ	HEAD GASKET	2	AF518	AF520A	AF518	AF520A
6 Δ	OUTLET VALVE	2	AF531	AF545	AF531	AF545
7	PLATE VALVE	2	AF529	AF543	AF529	AF543
8 Δ	INLET VALVE	2	AF530	AF544	AF530	AF544
9 Δ	CYLINDER GASKET	2	AF519A	AF521	AF519A	AF521
10	CYLINDER	2	AF510	AF509	AF510	AF509
11 Δ	PISTON RING	4	AF527	AF541	AF527	AF541
12 Δ	PISTON SEAL	4	AF526	AF540	AF526	AF540
13	PISTON ROD ASSEMBLY	2	AF560B	AF561D	AF560B	AF561A
14 Δ	RIDER RING	2	AF594	AF595	AF594	AF595
15	PULLEY	1	AB140C	AK670	AB140C	AK670
16	FLAT KEY	1	AF524	AB136	AF524	AB136
17	FAN	1	AF533	AF547	AF533	AF661
18	SHROUD	1	AF535	AF549	AF535	AF656
19	MANIFOLD SLEEVE	2	AF567A	AF567A	AF567A	AF567A
***	SERVICE KIT	1	K260	K263	K260	K263

Models PAB and PBB shown.
** Item not shown.
Δ Denotes parts included in the Service Kit.
Parts listed are for stock models. For specific OEM models, please consult the factory.
When corresponding or ordering parts, please give complete model and serial numbers.

EXPLODED PRODUCT VIEWS – MODEL PAB (TOP) & MODEL PBB (BOTTOM)





PARTS & ORDERING INFORMATION

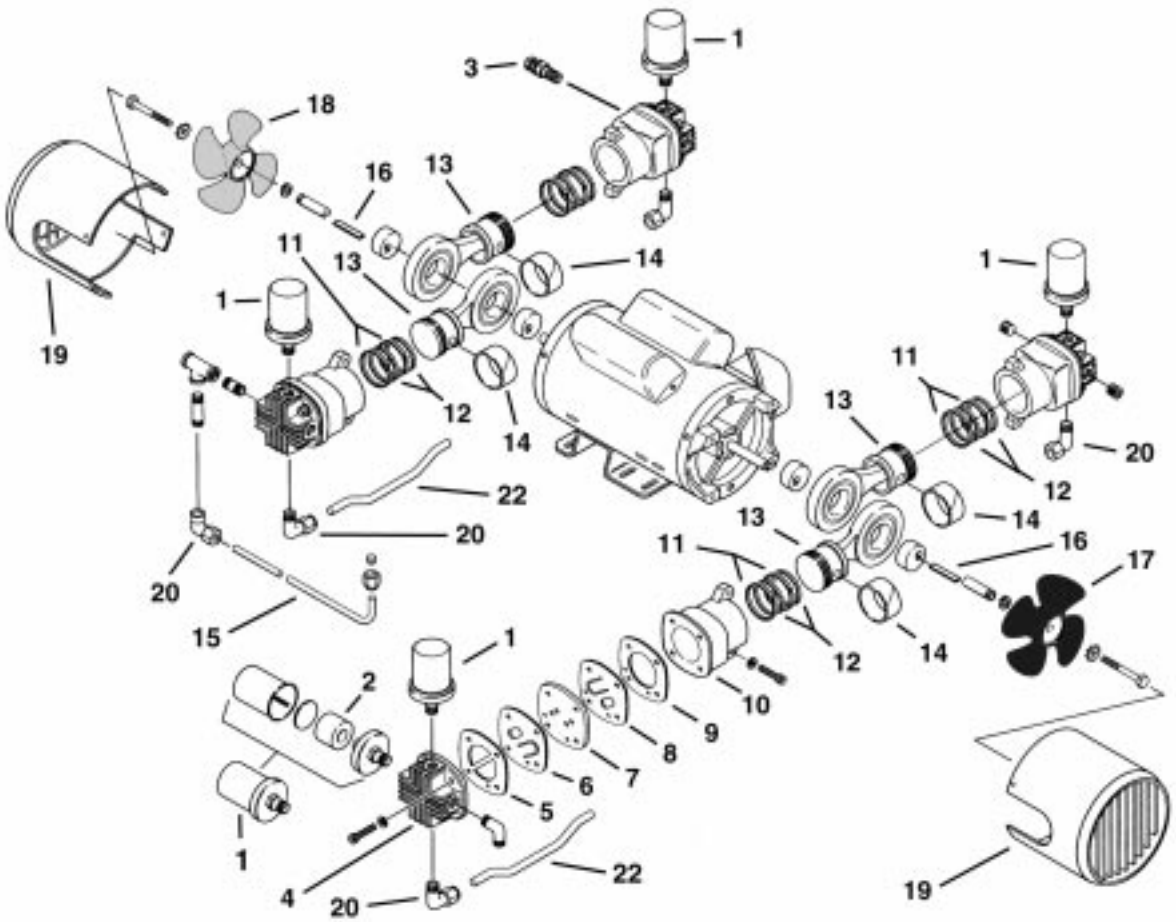
Please reference the exploded view on the next page for the following model and parts table.

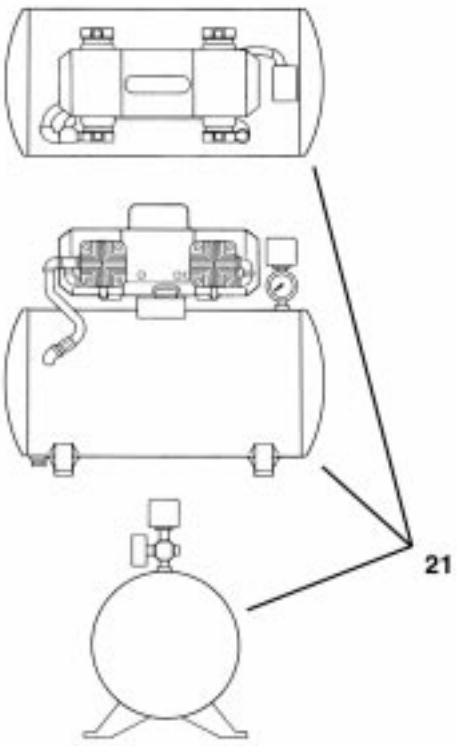
5VDF – 8LDF SERIES

REF	DESCRIPTION	QTY	5VDF	5VSF	6LCF **	6HDK	7LDE	7HDD	7HDE	8HDM	8HDN	8LDF
1	INLET FILTER ASSEMBLY	2		B300F	B300F							
		4	B300F			B300A	B300F	B300A	B300A	B300F	B300F	B300F
2 Δ	FELT	2		B344A	B344A							
		4	B344A			B344A	B344A	B344A	B344A	B344A	B344A	B344A
3	SAFETY VALVE	1	–	–	AS100D	AS100G	AS100D	AS100G	AS100G	AS100F	AS100G	AS100B
4	CYLINDER HEAD	4/2 **	AF507	AF507	AF507	AF507	AF507	AF507	AF507	AF507	AF507	AF507
5 Δ	HEAD GASKET	4/2 **	AF520A	AF520A	AF520A	AF520A	AF520A	AF520A	AF520A	AF520A	AF520A	AF520A
6 Δ	OUTLET VALVE	4/2 **	AF545	AF545	AF545	AF545	AF545	AF545	AF545	AF545	AF545	AF545
7	PLATE VALVE	4/2 **	AF543	AF543	AF543	AF543	AF543	AF543	AF543	AF543	AF543	AF543
8 Δ	INLET VALVE	4/2 **	AF544	AF544	AF544	AF544	AF544	AF544	AF544	AF544	AF544	AF544
9 Δ	CYLINDER GASKET	4/2 **	AF521	AF521	AF521	AF521	AF521	AF521	AF521	AF521	AF521	AF521
10	CYLINDER	4/2 **	AF509	AF509	AF509	AF509	AF509	AF509	AF509	AF509	AF509	AF509
11 Δ	PISTON RING	8/4 **	AF541	AF541	AF541	AF541	AF541	AF541	AF541	AF541	AF541	AF541
12 Δ	PISTON SEAL	8/4 **	AF540	AF540	AF540	AF540	AF540	AF540	AF540	AF540	AF540	AF540
13	PISTON ROD ASSEMBLY	4/2 **	AF561F	AF561F	AF561F	AF561K	AF561E	AF561D	AF561E	AF561M	AF561N	AF561F
14 Δ	RIDER RING	4/2 **	AF595	AF595	AF595	AF595	AF595	AF595	AF595	AF595	AF595	AF595
15	MANIFOLD	1	AF659	AF659	–	AF659	AF659	AF659	AF659	AF659	AF659	AF659
16	SQUARE KEY	2/1 **	AB136F	AB136F	AB136F	AB136F	AB136F	AB136F	AB136F	AB136F	AB136F	AB136F
17	FAN/FAN ASSEMBLY-CCW	1	AF748	AF748	AF748	AF748	AF748	AF748	AF748	AF748	AF748	AF748
18	FAN ASSEMBLY-CW	1	AF747	AF747	AF747	AF747	AF747	AF747	AF747	AF747	AF747	AF747
19	SHROUD	2/1 **	AF656	AF656	AF656	AF656	AF656	AF656	AF656	AF656	AF656	AF656
20	MANIFOLD SLEEVE	2	–	–	AF567A	–	–	–	–	–	–	–
20	MANIFOLD SLEEVE	5	AF567A	AF567A	–	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A	AF567A
21	TANK ASSEMBLY	1	–	–	AF606-1	AF606-1	AF606-1	AF606-1	–	AF606-1	AF606-1	–
22	MANIFOLD	2/1 **	AF550E	AF550E	AF550E	AF550C	AF550D	AF550B	AF550D	AF550A	AF550A	AF550E
***	SERVICE KIT	1	K303	K303	K263	K303	K303	K303	K303	K303	K303	K303

Model 5VDF shown.
** 6LCF is a two-cylinder unit. Other models are four-cylinder units.
*** Item not shown.
Δ Denotes parts included in the Service Kit.
Parts listed are for stock models. For specific OEM models, please consult the factory.
When corresponding or ordering parts, please give complete model and serial numbers.

EXPLODED PRODUCT VIEW – MODEL 5VDF





WARRANTY

Gast finished products, when properly installed and operated under normal conditions of use, are warranted by Gast to be free from defects in material and workmanship for a period of twelve (12) months from the date of purchase from Gast or an authorized Gast Representative or Distributor. In order to obtain performance under this warranty, the buyer must promptly (in no event later than thirty (30) days after discovery of the defect) give written notice of the defect to Gast Manufacturing Incorporated, PO Box 97, Benton Harbor Michigan USA 49023-0097 or an authorized Service Center (unless specifically agreed upon in writing signed by both parties or specified in writing as part of a Gast OEM Quotation). Buyer is responsible for freight charges both to and from Gast in all cases.

This warranty does not apply to electric motors, electrical controls, and gasoline engines not supplied by Gast. Gast's warranties also do not extend to any goods or parts which have been subjected to misuse, lack of maintenance, neglect, damage by accident or transit damage.

THIS EXPRESS WARRANTY EXCLUDES ALL OTHER WARRANTIES OR REPRESENTATIONS EXPRESSED OR IMPLIED BY ANY LITERATURE, DATA, OR PERSON. GAST'S MAXIMUM LIABILITY UNDER THIS EXCLUSIVE REMEDY SHALL NEVER EXCEED THE COST OF THE SUBJECT PRODUCT AND GAST RESERVES THE RIGHT, AT ITS SOLE DISCRETION, TO REFUND THE PURCHASE PRICE IN LIEU OF REPAIR OR REPLACEMENT.

GAST WILL NOT BE RESPONSIBLE OR LIABLE FOR INDIRECT OR CONSEQUENTIAL DAMAGES OF ANY KIND, however arising, including but not limited to those for use of any products, loss of time, inconvenience, lost profit, labor charges, or other incidental or consequential damages with respect to persons, business, or property, whether as a result of breach of warranty, negligence or otherwise. Notwithstanding any other provision of this warranty, BUYER'S REMEDY AGAINST GAST FOR GOODS SUPPLIED OR FOR NON-DELIVERED GOODS OR FAILURE TO FURNISH GOODS, WHETHER OR NOT BASED ON NEGLIGENCE, STRICT LIABILITY OR BREACH OF EXPRESS OR IMPLIED WARRANTY IS LIMITED SOLELY, AT GAST'S OPTION, TO REPLACEMENT OF OR CURE OF SUCH NONCONFORMING OR NON-DELIVERED GOODS OR RETURN OF THE PURCHASE PRICE FOR SUCH GOODS AND IN NO EVENT SHALL EXCEED THE PRICE OR CHARGE FOR SUCH GOODS. GAST EXPRESSLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE WITH RESPECT TO THE GOODS SOLD. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTIONS SET FORTH IN THIS WARRANTY, notwithstanding any knowledge of Gast regarding the use or uses intended to be made of goods, proposed changes or additions to goods, or any assistance or suggestions that may have been made by Gast personnel.

Unauthorized extensions of warranties by the customer shall remain the customer's responsibility.

CUSTOMER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF GAST PRODUCTS FOR CUSTOMER'S USE OR RESALE, OR FOR INCORPORATING THEM INTO OBJECTS OR APPLICATIONS WHICH CUSTOMER DESIGNS, ASSEMBLES, CONSTRUCTS OR MANUFACTURES.

This warranty can be modified only by authorized Gast personnel by signing a specific, written description of any modifications.

MAINTENANCE RECORD

DATE	PROCEDURE PERFORMED

MAINTENANCE RECORD

DATE	PROCEDURE PERFORMED

TROUBLESHOOTING CHART

Low		High		Pump	Motor	Excess	Reason and remedy
Vacuum	Pressure	Vacuum	Pressure	Overheat	Overload	Noise	for problem.
	•			•	•	•	Filter dirty. Clean or replace.
•			At pump	•	•	•	Muffler dirty. Clean or replace.
•	•					•	Valves dirty or valves bent. Clean or replace.
•	•					•	Damaged or worn piston rings. Repair or replace.
	•			•	•		Leaky relief valve. Inspect and adjust.
•	•					•	Damaged valves. Replace.
•		At pump	•	•	•	•	Plugged vacuum/pressure line. Inspect and repair.
•	•			•	•		Low voltage, won't start. Check power source.
•	•					•	Worn rings/piston hitting cylinder. Replace.
	•			•	•	•	Cylinder misadjustment. Realign.
•	•					•	Leaky hose or check valve. Replace.
•	•			•	•	•	Dirt or liquid on top of piston. Inspect and clean.
•	•					•	Blown head gasket. Replace.

We have Gast Authorized Repair Facilities throughout the world. For the most up-to-date listing, contact one of our sales offices below:

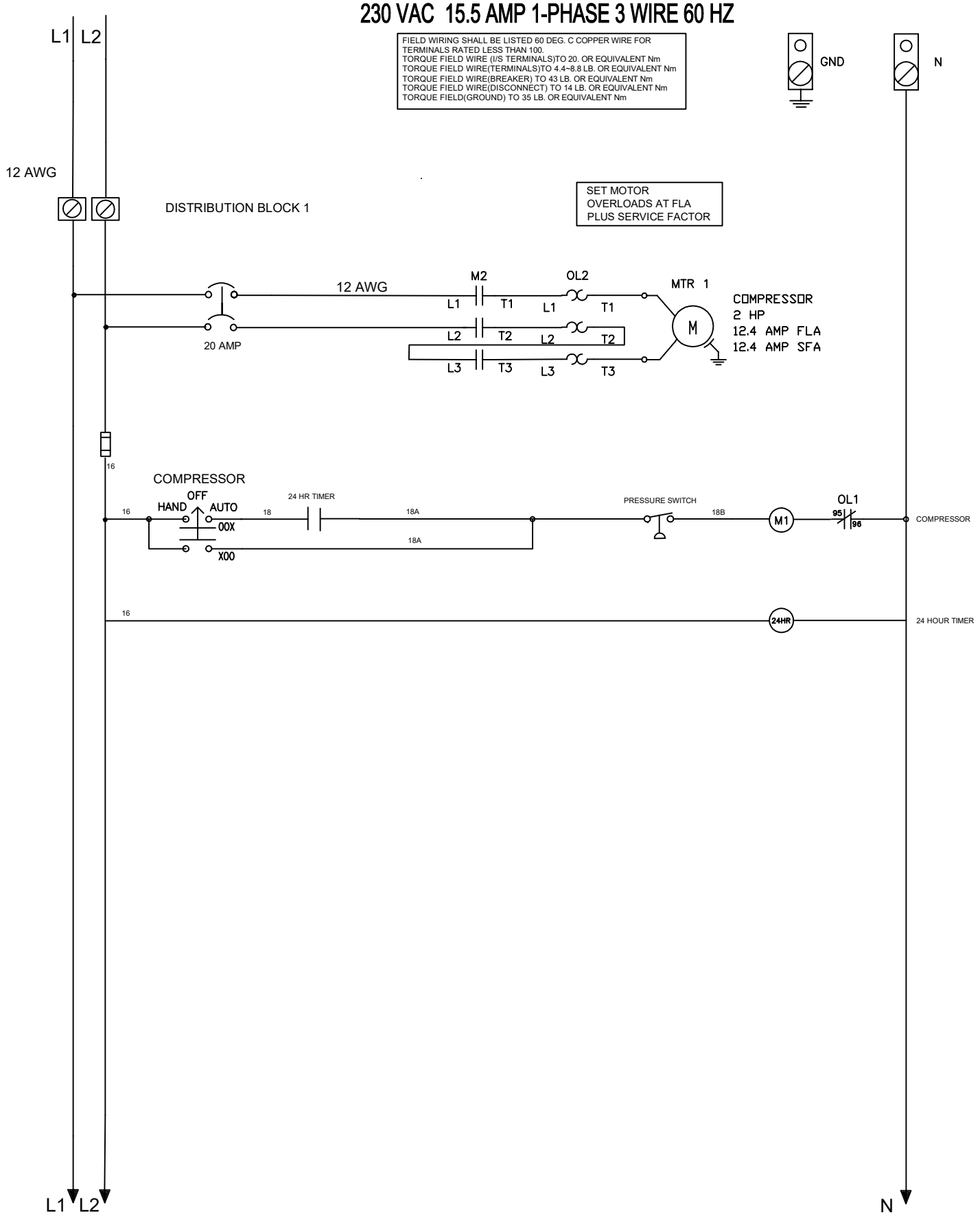
World Headquarters
P.O. Box 97
2550 Meadowbrook Rd.
Benton Harbor, MI 49023-0097
Ph: 269/926-6171
FAX: 269/925-8288
www.gastmfg.com

European Sales & Service Headquarters
Beech House Knaves Beech
Business Centre
Loudwater, High Wycombe Bucks,
England HP10 9SD
Tel: +44 1628 551500
Fax: +44 1628 551590
www.gastmfg.com

Gast Hong Kong
Unit 12, 21/F, Block B
New Trade Plaza
6, On Ping Street, Shatin
N. T. Hong Kong
Ph: (852) 2690 1008
Fax: (852) 2690 1012
www.gasthk.com

ENVIRO-EQUIPMENT

230 VAC 15.5 AMP 1-PHASE 3 WIRE 60 HZ



	DATE	NAME
DRAWN BY	1-18-23	JPC
CKD BY		

ENVIRO-EQUIPMENT
10120 Industrial Drive
Pineville, NC 28134
704-556-7723

PROJECT: 1621	DRAWING-NO.: EEI 301
	JOB-NO.:
PAGE DESCRIPTION	PAGE: 1 OF 1

Series RM Rate-Master® Flowmeters

Specifications - Installation and Operating Instructions

Fig. 1

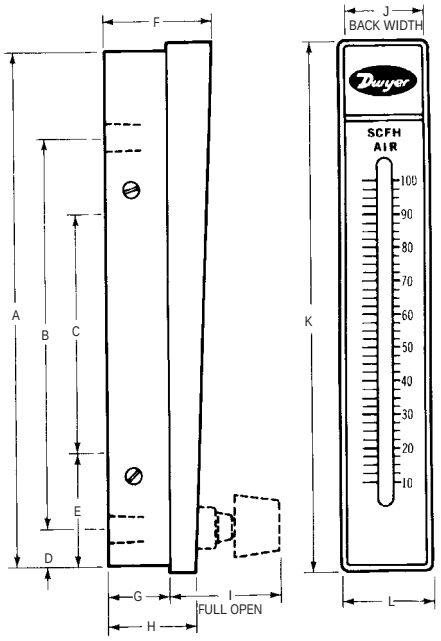


Fig. 2

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) 10 - 32 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. Its calibration will be checked for you at no charge. 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.

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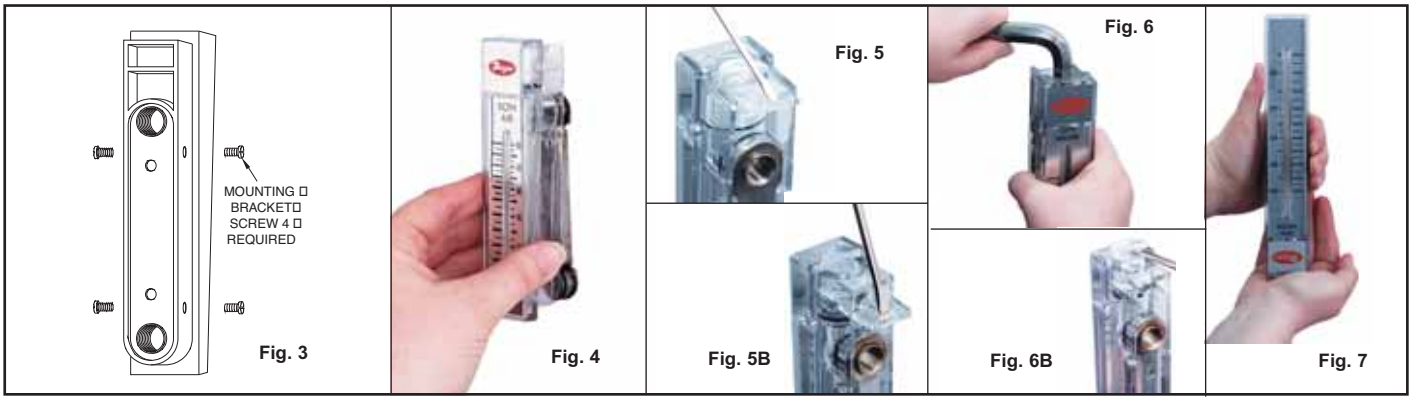


Fig. 3 Fig. 4 Fig. 5 Fig. 5B Fig. 6 Fig. 6B Fig. 7

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.

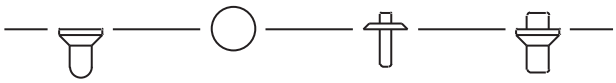
Surface Mounting on Piping Only Without Panel: For a temporary or laboratory type installation, the panel may be omitted altogether and the flowmeter installed directly in rigid piping. Its light weight permits this without difficulty.

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. 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, special non-removable valves are available on special order. 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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VACUUM AND PRESSURE LIQUID FILLED GAUGES
Back Mount

U Clamp

Standard

Flange Mount

- Suitable for Air, Water, Oil & Gas
- Dual Scale PSI/Kpa
- Stainless Steel Case & Bezel
- Brass Internals & NPT Connection
- Phosphor Bronze Bourdon Tube
- Accuracy 1-1/2" - 2-1/2": 3-2/3% 4":1%
- Ambient Temperature -30 F to 160˚F
- Liquid Filled Helps Dampen Effects of Pulsation and Vibration
- Liquid Filled Lubricates the Gauge Movement Keeping the Contaminates (Dirt) Away, Extending the Life of the Gauge
- ANSE 40.1 Compliant
- Connection: 1/8" NPT 1-1/2" Dial
  1/4" NPT 2" & Above

Part No.	Dial Size (In)	Pressure Range Code
Back Mount Pressure Gauges		
LFSB15-PSI	1-1/2	2
LFSB20-PSI	2	3
LFSB25-PSI	2-1/2	4
LFSB25-PSI	2-1/2	6
LFSB40-PSI	4	5
LFSB40-PSI	4	6
Back Mount U-Clamp Pressure Gauges		
LFSB25-PSI-U	2-1/2	4
LFSB25-PSI-U	2-1/2	6
LFSB40-PSI-U	4	5
LFSB40-PSI-U	4	6
Back Mount Flange Pressure Gauges		
LFSB25-PSI-F	2-1/2	4
LFSB25-PSI-F	2-1/2	6
LFSB40-PSI-F	4	5

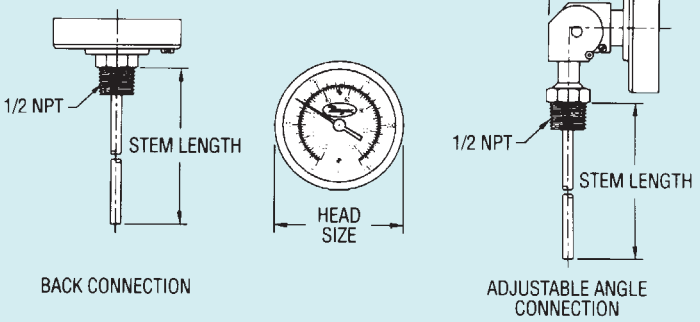
LFSB40-PSI-F	4	6
Back Mounted Vacuum Gauges		
VFSB15-030	1-1/2	7
VFSB20-030	2	7
VFSB25-030	2-1/2	7
VFSB40-030	4	7
Back Mount U- Clamp Vacuum Gauges		
VFSB25-030U	2-1/2	7
VFSB40-030U	4	7

Pressure Code Range	**PSI/Hg**
1	15, 30, 60, 100, 160, 200, 300 PSI
2	Same As Range 1 Plus 600, 1000, 2000, 3000, 5000 PSI
3	Same As Range 1 Plus 600, 1000, 2000, 3000, 5000, 6000 PSI
4	Same As Range 1 Plus 400, 600, 1000, 1500, 2000, 3000, 4000, 5000, 6000 PSI
5	Same As Range 1 Plus 400, 600, 1000, 1500, 2000, 3000, 5000, 6000 psI
6	10,000, 15000 PSI
7	-30” to 0” Hg

Series BT

Bimetal Thermometers

2″, 3″ or 5″ Dial, Dual Scale, ±1% FS Accuracy, External Reset



Series BT Bimetal Thermometers offer accurate, reliable service even in the toughest environments. These corrosion resistant units are constructed from stainless steel and are hermetically sealed to prevent crystal fogging. The bimetal element directly drives pointer, eliminating gears and linkage. An external reset screw allows field calibration and easy-to-read aluminum dial minimizes parallax error. Choose back connection, lower connection or adjustable angle for easy viewing and installation. Adjustable models can be rotated a full 360° and tilted over a 180° arc. NOTE: When using in pressurized applications, use a suitable thermowell. Bimetal thermometers are commonly used to measure water temperature on chillers and boilers.

SPECIFICATIONS
Wetted Materials: 304 SS.
Housing Material: Series 300SS.
Lens: Glass.
Accuracy: ±1% full scale.
Response Time: ≤ 40 seconds.
Temperature Limits: Head: 200°F (93°C); Stem: Not to exceed 50% over-range or 1000°F (538°C) or 800°F (427°C) continuously.
Process Connection: 1/4″ NPT on 2″ dial size; 1/2″ NPT on 3″ or 5″ dial size.
Stem Diameter: 1/4″ O.D.
Immersion Depth: Minimum 2″ in liquids, 4″ in gas.

Model	Dial Size, Stem Length	Temperature Range, °F(°C)	Degree Div., °F(°C)
Back Connection			
BTB22551*	2″, 2-1/2″	0/250	2
BTB2405D	2″, 4″	0/250 (-20/120)	2 (2)
BTB2409D	2″, 4″	200/1000 (100/550)	10 (5)
BTB32510D	3″, 2-1/2″	0/200 (-20/100)	2 (2)
BTB3255D	3″, 2-1/2″	0/250 (-20/120)	2 (2)
BTB3257D	3″, 2-1/2″	50/550 (10/290)	5 (5)
BTB34010D	3″, 4″	0/200 (-20/100)	2 (2)
BTB3405D	3″, 4″	0/250 (-20/120)	2 (2)
BTB3407D	3″, 4″	50/550 (10/290)	5 (5)
BTB3605D	3″, 6″	0/250 (-20/120)	2 (2)

Model	Dial Size, Stem Length	Temperature Range, °F(°C)	Degree Div., °F(°C)
Adjustable Angle Connection			
BTA54010D	5″, 4″	0/200 (-20/100)	2 (2)
BTA5405D	5″, 4″	0/250 (-20/120)	2 (2)
BTA5407D	5″, 4″	50/550 (10/290)	5 (5)
BTA56010D	5″, 6″	0/200 (-20/100)	2 (2)
BTA5605D	5″, 6″	0/250 (-20/120)	2 (2)
BTA5607D	5″, 6″	50/550 (10/290)	5 (5)
Lower Connection			
BTC3255D	3″, 2.5″	0/250(-20/120)	2 (2)

*Model offered in Fahrenheit scale only.

REGULATOR INSTRUCTION SHEET
SERIES R37

Standard Units: Relieving
"N" Designates: Non-Relieving
Maximum Supply Pressure: 250 PSI
Operating Temperature Range: 40° F to 120° F

WARNING: For compressed air service only. Not to be used on life support systems.

INSTALLATION

Install regulators so the airflow is in the direction In-Out as indicated on the head of all units. Regulators should be installed downstream from filter or upstream from lubricators, but as close as possible to the pneumatic tools or appliances being serviced. The regulator will accurately control secondary pressure between 10 and 250 PSI (see optional spring kits), maximum primary pressure is 250 PSI. The self-bleed feature permits use on dead-end applications.

WARNING: Units are die cast aluminum, do not over torque when installing regulator or gauge. Use of Teflon tape is not recommended.

OPERATION ADJUSTMENTS

After the regulator is installed, back off pressure adjusting knob before the air is turned on. Turn on the air supply and regulate the adjusting knob until the pressure gauge shows the desired pressure. To lock adjusting knob, push down until knob snaps into locking groove. To make regulator tamper-resistant, remove adjusting knob from unit. Regulator may be readjusted by replacing knob.

MAINTENANCE

On detection of air leaks, pressure fluctuation, or "creep", depressurize system and remove bottom cap. Inspect valve seat for damage or wear. Inspect seat in head casting for foreign material or damage. Clean with kerosene and blow out with air. Replace any damaged parts. If leaks persist, remove bonnet, inspect diaphragm and diaphragm seat for wear or foreign materials.

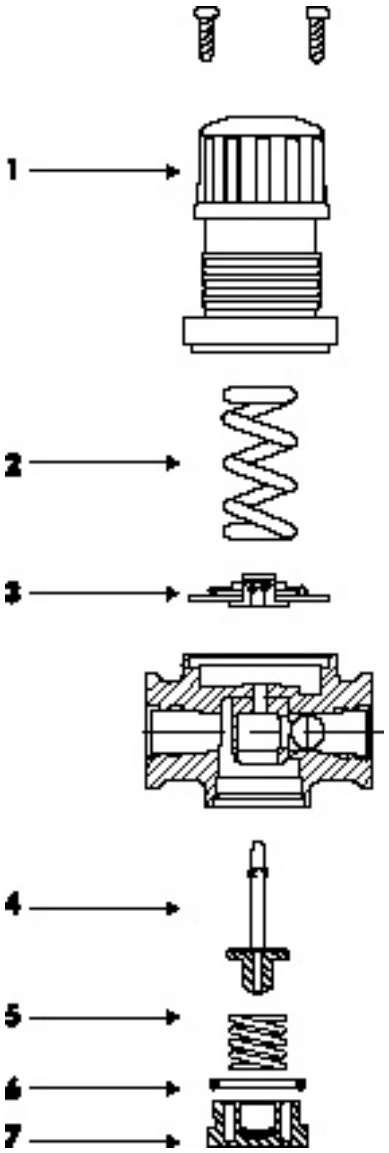
TAMPER-PROOF OPTION

The tamper proof cap (P/N 75104) has been provided in the plastic bag to ensure that the reduced pressure cannot be tampered with. To make the unit "tamper-proof", proceed as follows: turn the adjustment knob until the desired reduced pressure is reached. Remove the adjustment knob by pulling upward. Install the tamper-proof cap in its place.

NOTE: To make permanently tamper-proof, LOCTITE the cap into place.

CAUTION: By permanently loctiting the tamper-proof cap into place, the pressure adjustment cannot be changed.

R37



ID#	DESCRIPTION	KIT NO.	CONTENTS
		R370	
4, 5, 6, 7	Valve Kit	VK37	Valve Assy., O-Rings, Valve Spring, Bottom Plug
3	Diaphragm Kit	DK35HD	Relieving Diaphragm 0-250 Lbs.
		DK35HDN	Non-Relieving Diaphragm 0-250 Lbs.
2	Spring Kit	SK35	Spring, 5-125 PSI Range (STD)
		SK35L	Spring, 3-60 PSI Range
		SK35H	Spring, 10-250 PSI Range
1	Spring Cage Kit	SC35	Adjusting Knob, Adjusting Screw Assembly Spring Cage, Screws (STD)
Not Shown		SC35T	T-Handle Adjusting Screw Assy., Spring Cage, Screws