M-D Pneumatics®

PD PLUS BLOWER / PACKAGE SPECIFICATIONS (3200-5500)

BLOWERS: Provide _____ rotary, positive displacement blowers, each having a capacity of _____ scfm measured at 14.7 psia and 70° F standard conditions. Site Elevation is _____ feet above sea level, and the maximum average inlet temperature is _____° F. Discharge pressure after the discharge silencer of each unit shall be ____ psig. Pressure losses through inlet filter, and inlet and discharge silencers shall be included when determining the operating speed and power demand of each blower. (*Optional:* Each blower shall be sized such that operating speed at the above specified conditions does not exceed _____% of the maximum blower design speed as recommended by the blower manufacturer.)

BLOWER CONSTRUCTION: Each blower shall be designed for continuous service, supplying oil-free air, and shall operate without internal rotor contact.

Each blower shall include two (2) dynamically balanced lobe rotors, each constructed of high strength ductile iron. Each rotor support shaft shall be cast as an integral part of the rotor to prevent loss of rotor timing due to rotor spinning on its support shaft. Rotors with keyed, pinned, or friction fit rotor shafts shall not be allowed due to potential for slippage. The blower drive shaft shall be of heavy duty design.

Blower(s) shall be of five bearing design for added strength. Gear (drive) end rotor shaft bearings shall be of heavy duty design, double row ball type. Bearings and timing gears shall be securely locked in the gear endplate to maintain precise rotor to endplate clearance and to eliminate the risk of shifting end clearances.

Rotor housings shall be machined from a single casting of close grained grey iron. The housing shall be externally ribbed for maximum strength. Two (2) piece housings, subject to misalignment and loss of operating clearances shall not be allowed. End plates shall be machined from single castings of close grain grey iron. End covers shall be cast iron. For ease of service and lower repair costs, housings with integral endplates are not allowed.

For discharge temperatures above 250 F then Cooling Coils shall be provided to extend oil life.

Timing gears shall be manufactured of heat treated alloy steel, helical cut to reduce gear surface loading and to insure smooth rotational transition. Minimum AGMA quality rating shall be 8.
Rotor timing shall be accomplished via a positive locking shim and dowel arrangement with timing gear hubs also keyed to the rotor shafts in order to prevent the need for drilling and pinning after overhaul. To minimize backlash, slippage, and loss of timing, taper fit spur gears shall not be allowed.

Lubrication shall be via splash type lubrication at both the gear (drive) end and free end of the blower. Oil slingers and gear dipping in an abundant supply of oil shall be provided. Endplates shall include suitable oil level sight glass.

SELECT (1) SEAL ARRANGEMENT: ***17/46*** = air
57/81 = single envelope gas
64/67 = double envelope gas

(Seal arrangement for 17/46 series units) Positive oil seals shall ensure no contamination of the process air stream by lubricating oil. Seal arrangements shall consist of elastomeric lip type on rotor shafts adjacent to bearings, and labyrinth seals installed in each end plate adjacent to the blower process gas chamber. A vented air space shall be provided between the lip and labyrinth seals to relieve pressure against the lip seals, and to prevent subsequent oil migration into the blower housing.

Drive shaft oil seal shall be of the lip type. Shaft surfaces in contact with sealing members shall be polished to reduce seal wear and risk of leakage.

(Seal arrangement for 57/81, or series units) Positive oil seals shall ensure no contamination of the process air stream by lubricating oil. Seal arrangements shall consist of positive cartridge mechanical rotor shaft seals installed adjacent to bearings, plus labyrinth type installed in each end plate adjacent to the blower process gas chamber. Drive shaft oil seal shall be of the elastomeric lip type. Mechanical seals shall be of the balanced cartridge type to provide equal seal face pressure regardless of operating pressure, and capable of providing essentially positive gastight sealing, cumulative, less that 10^{-4} cm^3 per second per blower at any pressure up to 100 psig, without the need for externally supplied oil pressure. Closure type mechanical seals, or seals that require externally supplied oil pressure shall not be allowed. Shaft surfaces in contact with sealing members shall be polished to reduce seal wear and risk of leakage.

(Seal arrangement for 64/67 or series units) Positive oil seals shall ensure no contamination of the process air stream by lubricating oil. Seal arrangements shall consist of positive cartridge mechanical rotor shaft seals installed adjacent to bearings, plus labyrinth type installed in each end plate adjacent to the blower process gas chamber. Drive shaft oil seal shall also be of the mechanical type. Mechanical seals shall be of the balanced cartridge type to provide equal seal face pressure regardless of operating pressure, and capable of providing essentially positive gastight sealing, cumulative, less that 10^{-4} cm^3 per second per blower at any pressure up to 100 psig, without the need for externally supplied oil pressure. Closure type mechanical seals, or seals that require externally supplied oil pressure shall not be allowed. Shaft surfaces in contact with sealing members shall be polished to reduce seal wear and risk of leakage.

Blowers shall be Model _____ as manufactured by M-D Pneumatics®, Springfield, Missouri.

BLOWER PACKAGE ASSEMBLY: A structural steel base of ASTM A36 structural steel members shall be provided for each blower to facilitate factory piping. Blower, motor, V-belt drive, belt guard, filter, silencers, and instrumentation specified herein, shall be assembled at the blower manufacturer's factory in order to maintain unit responsibility of blower packages, and to ensure compatibility of all components utilized in blower package. Assemblies by packagers or other blower distributors shall not be permitted.

PIPING: Inlet and discharge piping connections for each blower package shall be factory supplied, from the inlet filter to discharge silencer and include in order, inlet filter, inlet silencer, blower, discharge silencer, pressure relief valve, pressure gauge, butterfly shut-off valve, and check valve. Necessary fittings and copper tubing for the instrumentation specified here-in shall be provided. Customer provided process piping from the blower package shall utilize flexible connectors at the point where such piping connects to the blower package.

MOTOR: Each blower shall be driven by a CL I Div II Premium Efficiency ____ Hp minimum normal torque induction electric motor, and shall not utilize motor service factor at operating conditions, including typical drive line losses of 10%. Motor shall be (1800) (3600) rpm (TEFC) 230/460 volt, 60 hertz, 3 phase, and shall be mounted on a suitable slide base with twin screw adjustment.

SELECT (1): V-BELT DRIVE OR DIRECT DRIVE (direct drive required above 250 HP)

V-BELT DRIVE: Each blower package shall include a V-belt drive with a minimum design factor of 1.4 times that of the motor nameplate horsepower rating. If multiple V-belts are required to meet this

requirement, only matched belt sets shall be utilized. Sheaves shall be secured to the blower and motor shafts with taper locking bushings. The V-belt drive shall be covered with an OSHA belt guard.

DIRECT DRIVE: Each blower package shall include a direct drive with a minimum design factor of 1.4 times that of the motor nameplate horsepower rating. Coupling shall be Falk Steelflex Type T20. The drive coupling shall be covered with a coupling guard.

INLET FILTER: Each blower shall include a dry type inlet filter, complete with weather hood to exclude rain and snow.

SILENCERS: Provide combination chamber-absorptive type silencers on both inlet and discharge of each blower. Silencers shall be bolted directly to the blower inlet and discharge port fittings to minimize undesirable noise transfer to the surrounding area. Silencers shall be supported from the base, and mounted on adjustable supports to eliminate strain on the blower housing.

FLEXIBLE CONNECTORS: Each blower package shall be provided with a discharge flexible connector for connecting process piping (by others) to the blower assembly. Flexible connectors shall be single arch, flange type, rated to 25 psig pressure, 350° F.

OPTIONAL EQUIPMENT: (SELECT AS REQUIRED)

SELECT PRESSURE RELIEF VALVE (FOR AIR SERVICE ONLY) AND/OR TEMPERATURE SWITCH

***(OPTIONAL)* PRESSURE RELIEF VALVE:** Each blower shall be protected by a discharge pressure relief valve of the high capacity full nozzle spring type. The pressure relief valve shall be factory set at a minimum of 1 psig above specified operating discharge pressure.

***(OPTIONAL)* HIGH DISCHARGE TEMPERATURE SWITCH:** The temperature switch shall be NEMA 4 rated, and shall be mounted in the discharge piping of each blower, set at 250° F, to shut-down the blower motor in the event of excess discharge temperature.

(*OPTIONAL)* FILTER RESTRICTION INDICATOR: A filter restriction indicator shall be provided for each filter to indicate increased inlet vacuum associated with blinding of the filter media.

***(OPTIONAL)* GAUGES:** Each blower shall be provided with a (0-15) (0-30) psig dial type pressure gauge, 2.5 inch dial, liquid filled, and a 50-400° F. dial type thermometer with stainless case and stem, 3 inch dial.

***(OPTIONAL)* ISOLATION VALVE:** Each blower shall be provided with a butterfly valve with locking lever operator (*OPTIONAL:* with gear operator and handwheel). The shut-off valve shall be wafer type, with cast iron body, stainless disc and stem, and EPDM seat.

***(OPTIONAL)* CHECK VALVE:** Each blower shall be protected from reverse air flow by a tight shut-off reverse air flow check valve. The check valve shall be wafer type, with cast iron body, bronze disk, EPDM seal, and with a return spring.

***(OPTIONAL)* CONTROL PANEL:** A NEMA (12) (4) control panel shall be supplied for each blower package, containing necessary magnetic starters with overload relay and through the cover reset,

circuit breaker with through the cover operator, control transformer, on-off-auto selector switch, run pilot light and terminal strip, 460/60/3.

(OPTIONAL) **VIBRATION ISOLATION PADS:** Each blower package shall be provided with four (4) vibration isolation pads of the sandwiched cork and neoprene rubber type, designed to bear the weight of the entire blower package without degradation.

(OPTIONAL) **SPARE PARTS:** Provide per blower, two replacement filter elements and one set extra V-belts.

(OPTIONAL) **SOUND ENCLOSURE**:

Provide a sound enclosure to assure noise is below ____ dBA
Acoustical panels are 16 ga. Galvanized steel.
Walls and roof filled with 2" acoustical absorption and lined with 22 ga galvanized perf.
Removable panels lined with acoustical foam to reduce weight.
Includes 120 V fan and acoustical hood for heat rejection and inlet/discharge cfm(<20 HP blowers- fan not included).
One piping penetration is included.
Enclosures are fully assembled and skidded (if over 10' in any direction check with factory for availability)
If enclosure height is over 7' high a header over removables is recommended.
Standard wind loading-70mph

QUALITY ASSURANCE: To assure the highest level of quality assurance, the supplier shall have in place, a documented and verifiable quality assurance program regularly audited by an independent firm in accordance with requirements as set forth by ISO 9001:1994. Suppliers not ISO 9001 certified are required to provide, for each blower, a certified mechanical run/seal leakage test, certified PTC-9 volumetric flow test (1 psig slip method), and certified performance curve.

DOCUMENTATION: A Standard Operation and Maintenance manual shall be provided as part of the order.

INSTALLATION: Air blowers and accessories shall be installed complete and ready for operation, and the Contractor shall arrange for the services of a qualified representative of the manufacturer to check-out installation and assist with start-up of the blowers.

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