

Watson-Marlow Bredel APEX Hose Pumps and Appurtenances

Part 1 – General

1.01 Description

- A. Pumps shall be peristaltic hose pumps complete with specified appurtenances.
- B. Pumps driven as indicated in the process pump schedule.
- C. Provide ample room and facilities for inspection, repair, and adjustment.

1.02 Quality Assurance

- A. All hose pumps to be the product of one manufacturer and shall be manufacturer's standard catalog product.
- B. Pump manufacturer must provide pumps and accessories which are integral to pump operation and specified herein as a coordinated package, regardless of manufacturer.
- C. Pump manufacturer must have a minimum twenty (20) years of experience manufacturing hose pumps and must also have a direct business presence in the United States for a minimum of twenty (20) years. Manufacturers without a direct American presence who distribute through a third-party distributor are not acceptable.
- D. Pumps shall be assembled in compliance within ISO9001/2015 standards.
- E. All pumphead components in the fluid path shall be NSF/ANSI 61 certified for the chemical being pumped and shall be of materials specified by the manufacturer as compatible with the process fluid. Pumps with components in the fluid path that are not NSF/ANSI 61 certified for the specific chemical being pumped are not acceptable.

1.04 Submittals

- A. Submit the following:
 - 1. Certified shop drawings for pumps and all ancillary items.
 - 2. Characteristic curves of head, capacity and horsepower for pump speeds required to obtain the flows specified.
 - 3. Dimensional drawings inclusive of recommended location of anchor bolts.
 - 4. Operating, maintenance, and storage instructions.
 - 5. Schematic control and power wiring.
 - 6. Use tag numbers for all equipment as indicated and specified.
 - 7. Recommended location and mounting of pulsation dampening devices (if specified).
 - 8. Qualifications of factory trained technician and the number of service man-days provided.

1.05. Delivery, Storage, & Handling

- A. Shipping
 - 1. Ship equipment, material, and spare parts complete, except where partial disassembly is required by transportation regulations or for protection of components.
 - 2. Pumps shall be shipped with hose elements installed. In the event long term on site storage is anticipated, pumps may be shipped with hoses uninstalled

for field installation by the Contractor prior to startup if so requested by the Contractor/Engineer at time of submittal approval.

B. Receiving

1. Contractor shall inspect and inventory items immediately upon delivery to site and is responsible for storing and safeguarding equipment, material, instructions, and spare parts in accordance with manufacturer's written instructions.

Part 2 – Hose Pump

2.01 Manufacturers

A. Watson-Marlow Pumps Group - Wilmington, MA

2.02 Process Pump Schedule

Pump Model	*(ENGINEER TO SPECIFY)*				
Quantity	*(ENGINEER TO SPECIFY)*				
Tag Number(s)	*(ENGINEER TO SPECIFY)*				
Fluid Type/concentration Viscosity Specific Gravity Fluid Temperature Solid Content	*(ENGINEER TO SPECIFY)*				
Operating Capacity Min GPM Normal GPM Max GPM	*(ENGINEER TO SPECIFY)* *(ENGINEER TO SPECIFY)* *(ENGINEER TO SPECIFY)*				
Max pump RPM	*(ENGINEER TO SPECIFY)*				
Operating Suction Pressure Max Positive Static Head Max Suction Lift	*(ENGINEER TO SPECIFY)*				
Max Operating Discharge Pressure (PSI)	*(ENGINEER TO SPECIFY)*				
Pump Pitch Diameter	7.68"	7.68"	7.68"	10.4"	13.0"
Hose option (engineer to specify)	10mm	15mm	20mm	28mm	35mm
Displacement/Revolution (Gallons)	0.012	0.024	0.038	0.095	0.195
Pump Connections (ANSI 150# Flanges Connections are available as an option when required for compatibility with the process fluid)	1/2"NPT	3/4"NPT	3/4"NPT	1" ANSI 150 # Flange	1 1/2" ANSI 150 # Flange
Insert Material	AISI 316 Stainless Steel, Polypropylene, or PVDF as recommended by the manufacturer for compatibility with the process fluid.				
Power (VAC, Phase, Frequency)	*(ENGINEER TO SPECIFY)*				

Hose Material	APEX 10-20 available hoses: CSM, EPDM, F-NBR, NBR, & NR APEX 28-35 available hoses: EPDM, NBR or NR as recommended by the manufacturer for compatibility with the process fluid.
Port Orientation (Facing Pump)	*(ENGINEER TO CHOOSE BASED ON INSTALLATION LAYOUT – ports facing up, down, left, or right)*

2.03 Pump Construction

A. Pump

1. General

- Horizontal, Positive displacement, peristaltic hose pump using lubricated shoe technology and reinforced hose element. Roller style pumps or non-reinforced tube technologies are not acceptable.
- Capable of operating in either direction without flow variation
- Capable of running dry without damage to pump or hose
- Capable of pulling 95% of full vacuum
- Repeatability: $\pm 1\%$ accuracy
- Valveless/Glandless design. No seals in contact with the pumped product.

2. Hose and Lubricant

- Hose shall be manufactured of three-layer elastomer with an extruded inner wetted layer compatible with the process fluid, four layers of nylon reinforcement for 28 & 35mm hoses and two layers of nylon reinforcement for 10mm -20mm hose, and a Natural Rubber outer layer. Hose outside diameter shall be machined to maintain a wall thickness within ± 0.2 mm. The hose external surface shall have a surface roughness of Ra $7+5\mu$. Hoses must have a smooth extruded internal surface and have tolerance controlled through machining. Hoses that do not meet these minimum requirements are not acceptable.
- Pump hose must be manufactured by the pump manufacturer. Pumps using hoses that are manufactured by a third party are not acceptable.
- Pump hose to be machined with oversized ends to ensure a more secure connection between the hose & insert.
- Minimum Static Burst Pressure rating of 950 psi.
- 51-68 shore A durometer.
- Hose must be replaceable without cover or pump removal.
- Lubricant: NSF-listed food-grade, glycerin based

3. Pump Housing, Rotor, and Internal Bearing Frame

- Pump Housing: Coated cast iron for APEX 28& 35, coated cast aluminum for APEX 10-20.
- Cover: Coated cast aluminum with threaded drain plug, clear window for viewing rotation, vent cap, and lubricant registration mark for proper indication of lubricant level when pump is stationary.
- Pump rotor: Coated cast aluminum for APEX 28 & 35, coated cast iron for APEX 10-20 with two integrally mounted shoes located 180 degrees apart. Pump shall be available with a medium pressure occlusion rotor or

low-pressure occlusion rotor to maximize pump performance under various conditions of operation. Manufacturer shall supply the rotor applicable for the conditions in the Pump Schedule.

4. Connectors
 - a. Supply pump with male NPT inlet and outlet connections for APEX10-20 and ANSI/ASA 150# flanged inlet and outlet connections for APEX 28 & 35 with wetted inserts compatible with the process fluid as indicated in the Process Pump Schedule.
 - b. Connector bracket shall be of one-piece construction and shall secure to the pump housing via two or four bolts to maintain a compression seal between the pump housing and hose. The bracket shall be constructed out of 316 Stainless Steel for APEX10-20 and cast iron for the APEX 28 & 35.
 - c. Pump hose shall extend from the pumping chamber with connectors secured via a single band clamp to allow visual confirmation of leak-free connection.
5. Frame: Torsion free and constructed of formed hot dipped galvanized steel with a coating thickness of 15 microns.
6. High lubricant leak detector
 - a. Provide a float type magnetic reed switch located near the top of the pump to detect leakage of pumped product into the pump housing.
 - b. Supply Normally Closed switching, field adjustable to Normally Open
 - c. Pump manufacturer to supply switch only. Contractor is responsible for alarm and relay to turn pump off unless otherwise specified herein.
 - d. Float switch shall be rated to the following maxima:

$$V_{\max} = 240\text{VAC}, I_{\max} = 1 \text{ Amp}, P_{\max} = 50\text{VA}$$

2.04 Pump Drive System

A. Direct Coupled Gearing with Fully Protected Drive mounting.

1. Provide gearing with Fully Protected Drive direct-coupled mounting to the pump housing.
 - a. The gearbox shall bolt directly to the pump housing which shall include a buffer zone between the gearing and pumphead to prevent gearbox contamination from pump fluid or lubricant in the event of a hose lubricant seal failure. The pump's internal bearing hub shall be vented through the rear of the pump housing to allow visual detection in the event of a hose lubricant seal failure.
 - b. Close coupled pump designs which utilize the gearbox to seal the pump housing and expose the gearbox to lubricant or pumpage are not acceptable.
 - c. Long coupled pumps which require external couplings, coupling alignment, and coupling guards are not acceptable.
2. Design gear reduction to match output speed requirement of the pump using two or three-stage gearing and matching torque rating of pumping equipment. Gearing shall be classified for continuous heavy shock duty, 24 hr duty with a minimum of 1.4 service factor. Gearing shall be helical gearing with cast aluminum housing.

B. Motors

(BELOW MOTOR DETAIL IS THE TYPICAL MOTOR SPECIFICATION FOR AC FIXED SPEED OR INVERTER DUTY APPLICATIONS. ALTERNATE MOTORS ARE AVAILABLE UPON REQUEST)

1. Provide premium efficient, TEFC or TENV, squirrel-cage induction motors, NEMA C face, conforming to the latest applicable requirements of NEMA, IEEE, ANSI, and NEC standards.
2. Provide motor HP in accordance with Process Pump Schedule.
3. Motors are to be designed for continuous duty for 3-phase, 230/460VAC operation, NEMA Design B with torque and starting currents in accordance with NEMA MG1-1993-12.35 and 12.38. Ratings to be based on a 40 degree C ambient 3,300 feet altitude or lower operation with a maximum temperature rise of 80 degrees by resistance C at 1.0 service factor (and 90 degree C rise 1.15 service factor).
4. Motors shall be furnished with Class F insulation utilizing materials and insulation systems evaluated in accordance with IEEE 117 classification tests. Motors shall have 1.15 service factor but shall be selected for operation within their full load rating without applying the service factor.
5. Bearings shall be selected to provide L10 rating of 100,000 hrs minimum for C-face flexible coupled applications. For frame sizes 56-140, bearings shall be permanently lubricated. For frame sizes 180 and larger, proved capped grease fitting.
6. For frame sizes 180 and larger, motor enclosure including frame, end brackets locking bearing inner caps, fan guard, and conduit box and cover shall be cast iron, ASTM Type A48, Class 25 or better. Conduit box shall be diagonally split with tapped NPT threaded conduit entrance hole, neoprene conduit box cover gasket, neoprene lead seal gasket between box and motor frame, and ground lug. For frame sizes 56-140, motor enclosure, fan guard, conduit box, and cover shall be carbon steel. End shield shall be constructed of aluminum. Conduit box shall be top mounted with F1/F2 conduit entrance holes, grounding lug, and neoprene conduit box gasket between box and motor frame.
7. External cooling fan on TEFC motors shall be corrosion resistant, non-sparking, bi-directional, keyed, clamped, and shouldered on the motor shaft.
8. Motor rotor construction shall be die cast aluminum, fabricated copper, or their respective alloys. Motor shall have copper windings.
9. Motor leads shall be nonwicking type permanently numbered for identification.
10. All motors shall be premium efficient with minimum efficiencies exceeding NEMA MG1-1993 Table 12-10. Motor efficiency shall be determined in accordance with NEMA MG1-1993-12.58.1 and full load efficiency labeled on motor nameplate in accordance with NEMA MG1-1993-12.58.2
11. Motors shall be suitable for use with PWM type variable frequency drives. Motors frame size 56-180 shall be rated for 10:1 constant torque continuous duty over 6-60 Hz. Larger frame motors shall be rated for 4:1 constant torque continuous duty over 15-60 Hz.

12. Acceptable Manufacturers –Baldor or approved equal.

(ENGINEER TO SPECIFY THE REQUIREMENT OF SPACE HEATERS OR THERMAL PROTECTORS IF SO REQUIRED BY THE INSTALLATION)

2.05 Painting

- A. Provide pump assembly painted with manufacturer's standard paint specification.
 - 1. Single coat of a two-component acrylate
 - 2. Dry thickness 60-80 micron
 - 3. Color- RAL 3011 brown red

2.06 Spare Parts

- A. Provide spare parts that are identical to and interchangeable with parts installed. Furnish and deliver the following spare parts for each pump:
 - 1. Two replacement hose elements per pump
 - 2. One gallon hose lubricant per pump

2.07 Accessories & Control Panels

***(ENGINEER TO INCLUDE SPECIFICATION AS REQUIRED BY THE INSTALLATION. SEE WATSON-MARLOW BREDEL HOSEPUMP ACCESSORIES SPECIFICATION**

Part 3 - Execution

3.01 Installation (By Contractor)

- A. Contractor shall install pumps and appurtenances in accordance with manufacturer's printed instructions and as indicated and specified.
- B. Contractor shall install pumping equipment on a concrete pad and make final alignments thereon.
- C. Contractor shall prove the pump's suction and discharge port connections to process lines are leak free and made in a free supported state without need to apply vertical or horizontal pressure to align piping with pump nozzles.

3.02 Services

- A. Services of a factory trained technician:***(ENGINEER SHALL DETAIL THE REQUIRED NUMBER OF MAN DAYS FOR STARTUP, TRAINING, ETC. UNDER THIS HEADING)***
(By Contractor with assistance of Manufacturer's Field Service Technician)
- B. After installation of pumping equipment, and after inspection, operation, testing, and adjustment have been completed by the Contractor in the presence of the Manufacturer's Field Service Technician, Contractor shall conduct running test for each pump in the presence of the Engineer to determine its ability to operate within the performance limits specified and to deliver its rated capacity within the pressure requirements specified. Contractor shall provide labor, piping, equipment, and materials necessary for conducting all field tests.
- C. Make all adjustments necessary to place equipment in specified and working order at the time of the above tests.
- D. Test pumps on product only.

- E. Promptly correct or replace all defective equipment revealed by or noted during tests at no additional cost to the Owner and repeat tests until specified results acceptable to Engineer are obtained.

END OF SECTION