Specification for Internal Gear Pumps

1.0 GENERAL DESCRIPTION

1.01 Scope

Pump type shall be of heavy-duty internal gear type. One rotor of internally cut gear teeth will mesh with one externally cut gear. Fluid shall be carried between gear teeth and shall be displaced when the gear teeth mesh. The surfaces of the rotors and housing shall cooperate to provide continuous sealing. Internally cut rotor shall terminate at the end of the drive shaft. The drive shaft shall be supported by bearings at two (2) locations, where by both radial and axial support is provided.

1.02 Pump Manufacturer

Acceptable manufacturers are Viking Pump or substitute approved by the Engineer prior to bid (See paragraph 1.03, Pre-submittal). A manufacturer's being named in this specification notwithstanding; all equipment approved for this project shall meet or exceed all performance, service, and warranty requirements of this specification.

1.03 Pre-Submittal

Technical documentation which shows total compliance with all performance, construction, service, and warranty requirements of this specification shall be submitted by the pump manufacturer or its authorized representative[2] at least days prior to bid[1]. Equipment must be conditionally approved by the Engineer in writing at least days prior to bid for all named or substitute manufacturers in order to be offered for this project[1]. days prior to bid, the Engineer shall furnish a final listing of equipment appearing to meet this specification and conditionally approved for this project[1]. In no case shall equipment be accepted for this project if not approved by the Engineer in writing prior to bid. Pre-submittal data shall include, but not be necessarily limited to: pump performance curves; compliance documentation for all performance values described in Section 4.0 PERFORMANCE; compliance documentation for all construction details described in Section 5.0 EQUIPMENT; and service and warranty compliance documentation required by Section 6.0 SERVICE AND WARRANTY of this specification. If a supplier submits equipment which does not meet the performance, construction, service, and warranty requirements of this specification, the supplier shall identify every deviation from these specifications. Failure to identify any deviation from these specifications or any other contract documents will result in rejection of the entire equipment pre-submittal package by the Engineer, with no further review.

Conditional approval by the Engineer under this section is based on a general review only and in no way constitutes final approval of equipment, nor waives any requirement of these specifications, nor relieves the Contractor , Manufacturer, or Manufacturer's Representative of any degree of responsibility for compliance with specific requirements of other portions of these specifications.

[1] Number of days shall be specified by the Engineer

[2] Authorized Representative shall include Authorized Distributors and OEMs

2.0 QUALITY ASSURANCE

2.01 General

The pumps shall be suitable for the full range of fluids and application conditions as approved by the Manufacturer or Manufacturer's Representative.

2.02 Standards

The Manufacturer's quality management system must conform to the requirements of ISO 9001:2008 and be able to produce a current certificate of registration as verification of such upon request by the Engineer.

2.03 Environmental Conditions

2.04 Submittals

In addition to all data required under Section 1.03, Pre-Submittal of this specification, detailed specifications and data covering pumps, motors, gear reducers, parts, and other accessories forming a part of the equipment furnished shall be submitted for approval in accordance with the procedure set forth in the General Conditions.

Data and specifications for the equipment shall include, but shall not be limited to the following:

A) Pumps

1. Manufacturer, type, and model number
2. Assembly drawing, parts list, service manual and recommended spares.
3. Performance curve(s) provided for the full range of pump application conditions
4. $NPSH_R$

B) Motors (if applicable)

1. Complete motor performance data including: rating, voltage/phase/frequency, design type, service factor, insulation class, motor pole number, current, power factor

C) Gear Reducers (if applicable)

1. Manufacturer, type, and model number
2. Gear ratio and design output speed or output speed range
3. Service manual

D) Warranty and Service

1. Warranty for the proposed equipment
2. Location of Service Centers and spare parts stock

3.0 TESTING

3.01 General

Equipment shall be shop tested in accordance with the Manufacturer's standard quality assurance testing as certified by ISO 9001:2008. In the event any equipment fails to meet the required performance specifications, the equipment shall be modified and re-tested or replaced with equipment that performs in accordance with this specification.

3.02 Certified Tests

Equipment requiring witnessed or non-witnessed as requested by the Engineer shall be tested by the Manufacturer to the following specifications:

A) Certified Performance Tests

1. Pumps shall be tested on fluid with a viscosity similar to the application fluid viscosity as specified by the Engineer. See Section 4.0 PERFORMANCE
2. Pumps shall be tested at design speed as specified by the Engineer. See Section 4.0 PERFORMANCE
3. Pumps shall be tested from minimum differential pressure to maximum differential pressure as limited by the relief valve, if applicable, or to the maximum differential pressure limit as set by the Manufacturer.

B) Certified Hydrostatic Tests

1. The hydrostatic test shall be conducted at one and one-half (1.5) times the maximum gage pressure expected at the pump discharge port or 250 PSIG, whichever is greater. This pressure includes any positive inlet pressure added to the maximum differential pressure. When a relief valve is included with the pump, the maximum gage pressure must include the full bypass pressure of the relief valve. Higher test pressures may be specified by the Engineer. Lower test pressures must be approved by the Engineer. See Section 4.0 PERFORMANCE
2. Pumps shall be hydrostatically tested for no less than 3 minutes.

C) Other Tests

1. Other certified tests may include, but are not limited to, $NPSH_R$, sound level of the complete unit, and vibration level of the complete unit.

2. Test results must be certified by the witness prior to shipment. If test is non-witnessed, test results must be certified by Manufacturer and sent to the Engineer or Manufacturer's Representative for approval prior to shipment.

A. PERFORMANCE

Heavy-duty internal gear pump shall meet the following performance requirements:

Condition	Value	Unit
Design Flow		
Maximum Flow		
Minimum Flow		
Max Pump Speed*		RPM
Max $NPSH_R$*		
Max Power Requirement*		

*At Maximum Flow operating point if applicable and application details provided by the Engineer

5.0 EQUIPMENT

5.01 Pump Design

Pump type shall be of heavy-duty internal gear type as outlined in 1.01 SCOPE. Additionally pump design shall include the following:

A. Pump stuffing box shall be able to accommodate a variety of seal options including packing, common component mechanical seals, and cartridge mechanical seals. These seals shall be accessible via the shaft end of the pump such that replacement can be made without disassembly of the wet end of the pump.

B. For packed pumps, the stuffing box shall be deep enough to accommodate ample packing to prevent excessive leakage. By shaft size, stuffing box depth shall be as follows:

Shaft Diameter	Stuffing Box Depth
Under 1.5”	2X the shaft diameter
Under 3.5”	1.5X the shaft diameter
3.5” and larger	1.2X the shaft diameter

C. A catch basin or drip pan shall be located where the pump shaft exits the seal.

D. The bearing housing assembly must provide both radial and thrust loading support. Thrust bearing must be either double row ball bearing or double tapered roller bearing design such that thrust in either direction is supported. Single row deep groove ball bearings are not acceptable. Bearing housing assembly must be adequately sized to permit removal of the seal via the shaft end of the pump. Bearing housing assembly must be threaded on the OD to permit removal from the pump bracket and to insure proper end clearance setting.

E. Pump mounting foot must be a solid, 1-piece casting integral to the pump bracket and/or casing.

F. Pump casing shall include gauge ports on both ports. Pumps weighing 75 lbs. (34 kg) or greater shall also include a drain.

G. Pump shall be fitted with an internal pressure relief valve and/or additional means of overpressure protection shall be provided in the pump system.

5.02 Pump Construction

Pump construction may be further limited by the Engineer, but at a minimum should include the following by external material type:

A. Cast Iron Externals

Parts	Preferred Material	Acceptable Alternatives
Externals (incl. casing, head, bracket, and relief valve body if applicable)	Cast Iron – ASTM A48, Class 35B	None
Rotor Gear	Cast Iron – ASTM A48, Class 35B	Steel – ASTM A148, Grade 80-40 Ductile Iron – ASTM A536, Grade 60-40-18
Idler Gear	Cast Iron – ASTM A48, Class 35B	Steel – ASTM A148, Grade 80-40 Powdered Metal, MPIF Std 35 FC-0208-50
Rotor Shaft	Cold Drawn Steel – ASTM A108, Grade 1045	17-4 PH Stainless Steel – ASTM A564 Type 630 Cond. H1150
Idler Pin	Hardened Steel – ASTM A108, Grade 1045 induction hardened	Tungsten Carbide Nitralloy
Other	As specified by the Engineer	As specified by the Engineer

B. Ductile Iron Externals

Parts	Preferred Material	Acceptable Alternatives
Externals (incl. casing, head, bracket, and relief valve body if applicable)	Ductile Iron – ASTM A536, Grade 60-40-18	None
Rotor Gear	Cast Iron – ASTM A48, Class 35B	Steel – ASTM A148, Grade 80-40 Ductile Iron – ASTM A536, Grade 60-40-18
Idler Gear	Cast Iron – ASTM A48, Class 35B	Steel – ASTM A148, Grade 80-40 Powdered Metal, MPIF Std 35 FC-0208-50
Rotor Shaft	Cold Drawn Steel – ASTM A108, Grade 1045	17-4 PH Stainless Steel – ASTM A564 Type 630 Cond. H1150
Idler Pin	Hardened Steel – ASTM A108, Grade 1045 induction hardened	Tungsten Carbide Nitralloy
Other	As specified by the Engineer	As specified by the Engineer

C. Steel Externals

Parts	Preferred Material	Acceptable Alternatives
Externals (incl. casing, head, bracket, and relief valve body if applicable)	Steel – ASTM A216, Grade WCB	None
Rotor Gear	Cast Iron – ASTM A48, Class 35B	Steel – ASTM A148, Grade 80-40 Ductile Iron – ASTM A536, Grade 60-40-18
Idler Gear	Cast Iron – ASTM A48, Class 35B	Steel – ASTM A148, Grade 80-40 Powdered Metal, MPIF Std 35 FC-0208-50
Rotor Shaft	Cold Drawn Steel – ASTM A108, Grade 1045	17-4 PH Stainless Steel – ASTM A564 Type 630 Cond. H1150
Idler Pin	Hardened Steel – ASTM A108, Grade 1045 induction hardened	Tungsten Carbide Nitralloy
Other	As specified by the Engineer	As specified by the Engineer

D. Stainless Steel Externals

Parts	Preferred Material	Acceptable Alternatives
Externals (incl. casing, head, bracket, and relief valve body if applicable)	Stainless Steel – ASTM A743, Grade CF8M	Stainless Steel – ASTM A743, Grade CF8M case hardened
Rotor Gear	Stainless Steel – ASTM A743, Grade CF8M case hardened	None
Idler Gear	Stainless Steel – ASTM A743, Grade CF8M case hardened	Non-Galling Stainless Steel – ASTM A494, Grade CY5SnBiM Polyphenylene Sulfide (PPS)
Rotor Shaft	Stainless Steel – ASTM A276 Type XM-19 or 316 Condition B	None
Idler Pin	Hard Coated Stainless Steel – ASTM A276 Type 316 Colmonoy #6 or Chrome Oxide Coated	Tungsten Carbide
Other	As specified by the Engineer	As specified by the Engineer

6.0 SERVICE AND WARRANTY

6.01 Service

The pump manufacturer shall have an authorized factory service center capable of completely servicing the proposed pumps within miles of the project site.

6.02 Warranty

The pump manufacturer shall warranty the units supplied to the Owner against defects in material and workmanship for a period of at least three (3) years from the date of startup, and extend no less than forty-two (42) months from the date of shipment.