1.2 Pump Specifications

Table 1A: Performance Specifications (English System Units)

Pump Series	Pump Model	Max Flow	Max Speed	Max ΔP	Max Viscosity (2)	NPSHR (3)	Dry Lift (4)	TD (5)
	Units:	GPM	RPM	PSI	cP	ft	ft	Gal/Rev
H-Series	H1F	0.5	1750	225 (1)	100,000	3	0.5	.000276
	H3F	1.4	1750	225 (1)	100,000	2	1.5	.000828
	H5R	2.4	1750	225 (1)	100,000	2	2	.001379
	H5F	3.4	1750	225 (1)	100,000	2	4	.001930
	H7N	5.4	1750	225 (1)	100,000	5.2	6	.003070
	H7R	8.6	1750	225 (1)	100,000	5.2	6	.004910
	H7F	10.7	1750	225 (1)	100,000	5.2	7	.006140
	H9R	15.0	1750	225 (1)	100,000	4	6	.008610
	H9F	21.5	1750	225 (1)	100,000	3	14	.01228
3-Series	31F	0.5	1750	100	100,000	3	0.5	.000276
	33F	1.4	1750	100	100,000	2	1.5	.000828
	35R	2.4	1750	100	100,000	2	2	.001379
	35F	3.4	1750	100	100,000	2	4	.001930
	37R	8.6	1750	100	100,000	5.2	6	.004910
	37F	10.7	1750	100	100,000	5.2	7	.006140
	39R	15.0	1750	100	100,000	4	6	.008610
	39F	21.5	1750	100	100,000	3	14	.01228
	311F	21.5	1750	80	100,000	3	14	.01228

Table 1B: Performance Specifications (SI System Units)

Pump Series	Pump Model	Max Flow	Max Speed	Max ΔP	Max Viscosity (2)	NPSHR (3)	Dry Lift (4)	TD (5)
	Units:	LPM	RPM	bar	mPas	m	m	L/Rev
H-Series	H1F	1.9	1750	15.5 (1)	100,000	0.9	0.15	.001045
	H3F	5.3	1750	15.5 (1)	100,000	0.6	0.46	.003134
	H5R	9.1	1750	15.5 (1)	100,000	0.6	0.6	.005220
	H5F	13.0	1750	15.5 (1)	100,000	0.6	1.2	.007306
	H7N	20.0	1750	15.5 (1)	100,000	1.6	1.8	.011621
	H7R	33.0	1750	15.5 (1)	100,000	1.6	1.8	.018586
	H7F	40.5	1750	15.5 (1)	100,000	1.6	2.1	.023242
	H9R	57.0	1750	15.5 (1)	100,000	1.2	1.8	.032592
	H9F	81.4	1750	15.5 (1)	100,000	0.9	4.3	.04648
3-Series	31F	1.9	1750	6.9	100,000	0.9	0.15	.001045
	33F	5.3	1750	6.9	100,000	0.6	0.46	.003134
	35R	9.1	1750	6.9	100,000	0.6	0.6	.005220
	35F	13.0	1750	6.9	100,000	0.6	1.2	.007306
	37R	33.0	1750	6.9	100,000	1.6	1.8	.018586
	37F	40.5	1750	6.9	100,000	1.6	2.1	.023242
	39R	57.0	1750	6.9	100,000	1.2	1.8	.032592
	39F	81.4	1750	6.9	100,000	0.9	4.3	.04648
	311F	81.4	1750	5.5	100,000	0.9	4.3	.04648

NOTES:

1. Max ΔP (Maximum Differential Pressure) is derated to 125 PSI (8.6 bar) for viscosities < 10 cP (mPas).
2. Fluid viscosities > 150 cP (mPas) should use pumps with trimmed gears to reduce power consumption and increase pump efficiency. High-viscosity fluids may require larger pumps with trimmed gears operating at lower speeds. Consult factory.
3. NPSHR (Net Positive Suction Head Required) is specified @ Max Speed and < 150 cP (mPas).
4. Dry Suction Lift is based on water @ room temperature and Max Speed with PEEK Gear(s) and Carbon Bearings. For other materials, priming of the suction line is required to prevent wear and possible damage to internal components.
5. TD (Theoretical Displacement) is based on new pump operating @ Max Speed and ΔP = 0.

Table 2: Absolute Temperature & Pressure Ratings

Pump Series	Pump Models	Minimum Operating Temperature		Maximum Operating Temperature (1)		Maximum Operating Pressure (2)	
	Units:	°F	°C	°F	°C	PSIG	bar (g)
H-Series	H1F, H3F, H5R & H5F	-40	-40	500	260	300	20.7
	H7N, H7R, H7F, H9R & H9F	-40	-40	500	260	225	15.5
3-Series	31F, 33F, 35R & 35F	-40	-40	500	260	300	20.7
	37R, 37F, 39R, 39F & 311F	-40	-40	500	260	225	15.5

NOTES:

1 Actual Maximum Operating Temperature depends on materials of construction. The actual maximum surface temperature depends not on the pump but primarily on the temperature of the fluid being pumped. Pump surfaces will be approximately 20°F (11°C) above the temperature of the process fluid.

2 For pumps with ANSI 150# RF Flanges, the Maximum Operating Pressure Rating of the flange is 275 PSIG within the temperature range of -20 to 100 °F. Above 100°F, derate by 0.3 PSIG/°F.

3 The pump is designed to handle fluid temperatures ranging from 32°F (0°C) to 104°F (40°C) with standard components. For temperatures outside this range, gears and bearings may require a trim to compensate for thermal expansion. Reference the pump model code to determine if the pump is trimmed.

4 The operating ambient temperature range depends not on the pump but on the motor, which is a function of motor design, enclosure, insulation class, loading, ventilation and other factors. Refer to motor manufacturer's specifications.

Table 3: Maximum Torque Specifications (in-lbs)

Gear Combo (1) or Mag Coupling	H-Series / 3-Series	H1F / 31F	H3F / 33F	H5R / 35R	H5F / 35F	H7N	H7R / 37R	H7F / 37F	H9R / 39R	H9F / 39F	311F
Double Metal Gears (2)		23	23	93/45	93/44	223	242/122	236/120	248	241	102
Idler Gear PEEK (3)(5)		6.4	19	32	45	63	101	126	176	241	102
Idler Gear Ryton (5)		6.1	18	31	43	60	97	121	169	241	102
Idler Gear Carbon (5)		—	9	15	20	29	46	57	80	114	102
Idler Gear Kynar (5)		4	12	20	28	40	64	80	112	160	—
Idler Gear Teflon (4)(5)		—	5	8.5	12	17	26	33	46	66	66
Magnetic Coupling Size (6)	MCS (7)	33				—	—	—	—	—	—
	MCU	75								—	—
	MCA (7)	66								—	—
	MCB	120									
	MCC (7)	—	—	240							
	MCV	—	—	200							

NOTES:

1 **Gear Maximum Use Temperatures:** Metal & Carbon: 500°F; PEEK: 400°F; Ryton: 300°F; Kynar & Teflon: 230°F.

2 Torque limits for Double Metal Gears are based on the limiting torque-transmitting component of the pump (i.e., shafts, keys or gears). The recommended minimum fluid viscosity for double metal gears is 100 cP.

3 PEEK is suggested as the first choice for the idler gear material when the fluid viscosity is under 100 cP. PEEK is a high-performance Engineered Plastic that has substantially higher strength and wear resistance than Teflon and is corrosion-resistant to the majority or chemicals.

4 Teflon is the weakest material and should be considered for gears and bearings only when all other available materials are incompatible with the process fluid and when its torque, temperature and PV limits are not exceeded. Consult Liquiflo.

5 Torque ratings for plastic gears are specified @ Max Speed and 73°F (23°C). Plastic gears require torque derating at elevated temperatures. Torque ratings for Carbon gears are specified at 500°F (260°C).

6 Magnetic Couplings require torque derating at temperatures over 73°F (23°C). The required coupling size depends on the application's start-up torque, which is greater than the torque required at running conditions. If the coupling does not have sufficient strength at start-up, it will "decouple" and the pump will not operate.

7 MCS, MCA & MCC magnets are discontinued for new pumps and cartridges. Repair kits are available for pumps with these magnets.

Table 4: Pump Weights

H-Series	H1F	H3F	H5R	H5F	H7N	H7R	H7F	H9R	H9F		Units
3-Series	31F	33F	35R	35F		37R	37F	39R	39F	311F	
Pump Weight *	31	31	32	32	36	36	36	38	40	40	lb
	14	14	15	15	16	16	16	17	18	18	kg

* Approximate weight of pump with threaded ports, excluding motor.

Table 5: Pump Materials

Components		Materials
Pump Housing		316 Stainless Steel (CF8M) or Alloy-C (CX2MW/C-22)
Mounting Hardware		18-8 Stainless Steel
Mounting Bracket (Pedestal)		Cast Iron, Epoxy-Painted
Motor Frames (C-Face)		NEMA 56C/143TC/145TC/182TC/184TC; IEC 71/80/90/100/112 (B5 Flange)
Bearings		Carbon, Silicon Carbide (SiC), PEEK or Teflon (**Note 1**)
Wear Plates		Carbon, Silicon Carbide (SiC), PEEK or Teflon (**Note 1**)
Gears		316 SS, Alloy-C (C-276), PEEK, Ryton, Kynar, Teflon or Carbon (**Note 1**)
Shafts	Base Metal	316 Stainless Steel or Alloy-C (**Note 2**)
	Coating	Uncoated, Ceramic Chrome Oxide or Tungsten Carbide
Housing Pins		316 Stainless Steel or Alloy-C (**Note 2**)
Bearing Pins		Teflon, 316 Stainless Steel or Alloy-C (**Note 2**)
Retaining Rings		316 Stainless Steel or Alloy-C (**Note 2**)
Keys		316 Stainless Steel or Alloy-C (**Note 2**)
O-rings		Teflon, Viton, EPDM, Buna-N, Kalrez or Silicone/FEP-Encapsulated
Magnetic Coupling	Magnets	MCS & MCA: Ceramic MCU, MCB, MCC & MCV: Samarium Cobalt (SmCo)
	Inner Magnet Casing	316 Stainless Steel or Alloy-C (**Note 2**)
	Outer Magnet Casing	Carbon Steel/Epoxy-Painted

NOTES:

1 **Standard Grades for Nonmetal Components:** Carbon (Graphitar 114 or equivalent); SiC (Alpha-sintered); PEEK (Bearing Grade 450FC30); Ryton (PPS, 25% Glass/15% PTFE-filled); Kynar (PVDF, Pure); Teflon (PTFE, 25% Glass-filled).

2 Metallic material will match pump housing material. Alloy-C wrought parts are Grade C-276.

1.3 Model Coding

A **15-position Model Code** is used to completely describe a specific **mag-drive** pump. This code is required when ordering a new pump or a cartridge, repair kit or replacement parts for an existing pump. The table below describes the Model Code and gives a specific example:

Table 6: MAG-DRIVE Pump Model Code Description & Example

Position #	Description	Pump Model Code Example: H5FS6PEE002000US	
		Code	Selection
1	Pump Model (Size)	H5	Model H5F (H5 = Pump Size; F = Full Capacity)
2	Pump Model (Capacity)	F	
3	Basic Material & Port Type	S	316 SS Housing and Shafts & NPT Ports
4	Drive Gear	6	316 SS Drive Gear
5	Idler Gear	P	PEEK Idler Gear
6	Wear Plates	E	Carbon Wear Plates
7	Bearings	E	Carbon Bearings
8	Outer Magnet Bore (Motor Frame)	0	5/8" (NEMA 56C Motor Frame)
9	Bearing Flush	0	No Bearing Flush (Standard Housings)
10	Shaft Coating	2	Tungsten Carbide Coated
11	O-rings	0	Teflon O-rings
12	Retaining Rings	0	316 SS Retaining Rings
13	Bearing Pins	0	Teflon Bearing Pins
14	Magnetic Coupling	U	MCU (75 in-lbs) Magnetic Coupling
15	Containment Can	S	Single-Wall Containment Can
Suffix	Trim Option		No Trim Option

NOTE: See the Liquiflo Website (www.liquiflo.com) for complete Model Coding information.

1.4 General Operation

The successful and safe operation of a pump is not only dependent on the pump but also on each of the system components. It is therefore important to monitor the entire pumping system during operation and to perform the necessary maintenance to keep the system running smoothly.

A normally operating magnetic-drive gear pump will deliver a steady, pulse-less flow with no leakage, be relatively quiet and have a predictable flow rate based on the pump speed, fluid viscosity and differential pressure across the pump. Refer to the performance curves of the specific pump model being operated (see Liquiflo Product Catalog or website: www.liquiflo.com).

If a significant problem is observed during operation, the pump should be stopped so that corrective action can be taken. The observed problem could have several possible causes, and multiple remedies for each cause. For help with problem solving, refer to the Troubleshooting Guide given in **Appendix 7**.

1.5 Maintenance & Repair

The pump has internal sleeve bearings, wear plates, gears and shafts, which require replacement over time due to physical wear. The center housing of the pump may also incur physical wear and require replacement (see **Appendix 3**). O-rings and retaining rings should always be replaced when rebuilding the pump.

The main factors affecting the physical wear of the pump are operating speed, differential pressure, fluid viscosity, duty cycle, starting and stopping frequency, abrasives in the fluid and the wear properties of the materials. These factors can cause pump lifetimes to vary significantly from one application to another, making it difficult to predict when the pump will require maintenance. Therefore, the maintenance schedule for the pump is typically based on the maintenance history of the specific application. The main indicators that a pump may require maintenance are the following: (1) decreased flow rate or pressure, (2) fluid leakage, (3) unusual noise or vibrations and (4) increased power consumption.

Standard repair kits are available to facilitate repair of the pump (see **Appendix 4**). A repair kit includes all internal wear parts as well as O-rings, retaining rings, bearing lock pins, housing alignment pins and keys. The parts not included in a mag-drive pump repair kit are the housings (front, center and rear), magnets (inner and outer), containment can, pedestal and hardware (bolts, nuts and lock-washers). Before performing maintenance on the pump, review the safety precautions and follow the included instructions.

1.6 Repair Kits & Replacement Parts

Repair kits and replacement parts for the pumps can be purchased from your local Liquiflo distributor. Refer to **Appendices 3 thru 6** for individual parts information.