

MX-Series (Magnetic Drive Gear Pumps)

MODEL S-2212-M04XS09-HG-HP

Bi-Propellant Space Pump

DESCRIPTION

Flight Works M-Series (Magnetic Drive) Gear Pumps offer the highest level of quality, reliability, and versatility in the Flight Works product catalog. The S-2212-M04XS09-HG-HP model is designed for hypergolic propellants at high pressure. This fully encapsulated model uses precision-machined parts, magnetic coupling mechanics, and a high-end brushless motor designed for spaceflight applications to produce exceptional performance reliably. The motor allows for simple control, with minimal power draw



STANDARD SPECIFICATIONS

| | | |
|--|-------|---|
| Max Flow Rate | ..... | 163 ml/min @ 5 psid, 95 mL/min @ 350 psid* |
| Diff. Pressure (Max) | ..... | 350 psid* (fluid-dependent; see data chart) |
| Proof / Burst Pressure | ..... | 525 psig / 875 psig |
| NPSH _r | ..... | 4 psi above saturation pressure (fluid dependent) |
| Mass | ..... | 235 grams (with standard motor leads) |
| Envelope & Interfaces | ..... | See ICD for full details |
| Seals | ..... | None. Fully welded (Helium leak rate: < 1x10 ⁻³ sccs GHe at MDP) |
| Permissible Fluid | ..... | Hydrazine, NTO/MONs, isopropyl alcohol |
| Wetted Materials | ..... | CRES 302/304, CRES 304L, CRES 316, CRES 420, CRES 440C, CRES A286, Inconel 625, Silicon carbide |
| Design Temperature | ..... | Non-operational: -15°C to +60°C Operational/fluid: +5°C to +40°C |
| Design Environments | ..... | Random vibration (NASA GEVS levels) and vacuum; hall sensors (COTS) <i>not tested</i> for radiation tolerance |
| Nominal Voltage | ..... | 18 V |
| Control Options (requires controller) | ..... | Ground: hall sensor or back-EMF feedback Space: back-EMF feedback |

APPLICATIONS

This micro gear pump has been designed for spaceflight applications. It features a level of versatility and customization that would also allow for use in a wide field of applications with vibration or low atmospheric pressure/vacuum.

⚠ IMPORTANT

This pump is designed to operate with an inlet filter (<10 microns recommended). Operating the pump outside of these design limits in specific applications may be possible, but the customer must check and validate this.

*Temperature & Fluid Dependent – Consult factory for extended range.

Specifications and data in this document are for informational purposes only, may vary depending on the system in which the pump is integrated, and are subject to change without notice. Flight Works, Inc. makes no warranties concerning the suitability of this pump for a particular application; as such, it is the customer's responsibility to determine the safety and technical suitability of the system. Refer to the Pump User Guide for more details on handling, setup, operation, and more. This pump is a precision unit, built and assembled as a complete product. Opening, adjusting, or dropping the pump can permanently damage assembly integrity. Please contact Flight Works, Inc. by phone or email with any further questions regarding this product or its function.

S-2212-M04XS09-HG-HP

Made in the USA – Data Sheet EAR99
Product Export Controlled (ECCN 9A106.d)
Subject to Export Administration Regulations (EAR)

OPTIONS

| | |
|-----------------------|---|
| Space Basic | Product Data Sheet, Interface Control Document, External CAD/STEP file |
| Space Standard | Space Basic plus ATP data package for each unit, Product specification, integration, and test support |

OPTIONAL PROCESSES

- Precision cleaning and certification
- 100% Radiographic Inspection of welds and certification
- Vibe acceptance testing
- Thermal vacuum testing

CONFIGURATION OPTIONS

- Mounting features and design support
- Custom configurations options
- Custom wiring harness options

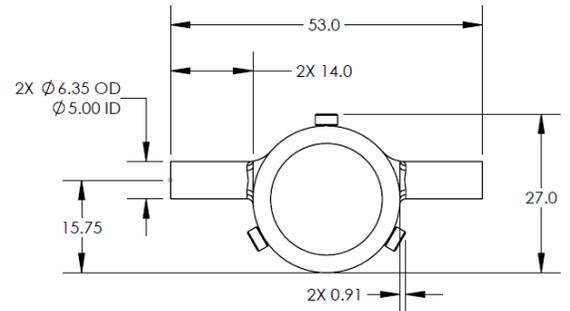
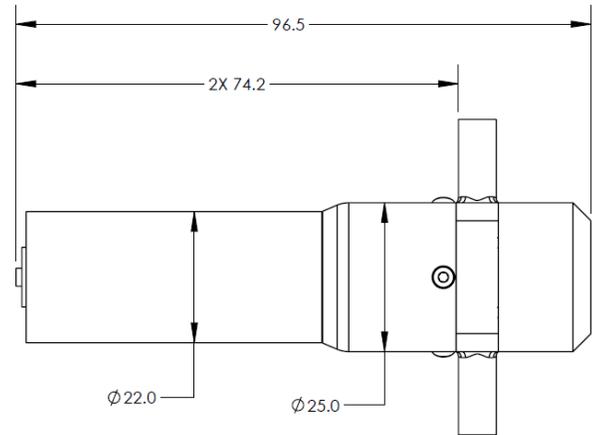
WIRE HARNESS OPTIONS

| Standard (P/N) | Shielded (P/N-1) | Shielded w/ Sensors (P/N-2) |
|---|--|---|
| <ul style="list-style-type: none"> • Motor power and hall effect sensor flying leads • 300±20 mm length • Nema HP-3 Type E AWG20 19x.203 PTFE • UL style 1213 AWG26 7x0.16 PTFE | <ul style="list-style-type: none"> • Shielded motor power leads • Motor power terminated w/ Glenair 790-045PE-7P3MM • 300±20 mm length • EMI shielding of connector is tested to meet EIA 364-83 and EIA-364-66 • Ref. S-2212-M04XS09-HP-HG ICD for pinout • Interfaces with Flight Works space motor controller | <ul style="list-style-type: none"> • Shielded motor power leads • 2x RTD mounted on assembly w/ twisted leads • Motor power and sensors terminated w/ Glenair 790-045PE-7P3MM • 300±20 mm length • Ref. S-2212-M04XS09-HP-HG ICD for pinout • Interfaces with Flight Works space motor controller |

| | |
|--------------------------|--|
| FLUIDIC INTERFACE | 2X 1/4" Tube stubs with 0.028" wall thickness (6.35 mm OD X 5.00 mm ID) |
|--------------------------|--|

SEE PAGE 3 FOR PERFORMANCE DATA

DIMENSIONS (mm)



Pump Outlet ← Pump Inlet

STANDARD ELECTRICAL INTERFACE

| STANDARD ELECTRICAL INTERFACE | |
|-------------------------------|----------------------|
| RED WIRE (20 AWG) | MOTOR WINDING 1 |
| BLACK WIRE (20 AWG) | MOTOR WINDING 2 |
| WHITE WIRE (20 AWG) | MOTOR WINDING 3 |
| RED/GREY WIRE (26 AWG) | HALL SENSOR 1 |
| BLACK/GREY WIRE (26 AWG) | HALL SENSOR 2 |
| WHITE/GREY WIRE (26 AWG) | HALL SENSOR 3 |
| GREEN WIRE (26 AWG) | 3-24 VDC HALL SENSOR |
| BLUE WIRE (26 AWG) | GROUND |

COMMON ACCESSORIES (Contact Flight Works to Purchase)

FLOW SYSTEM ITEMS

- Filters
- Fittings: Tee/Elbow/Y/Adapters
- Valves: Ball/Check/Needle

CONTROL COMPONENTS

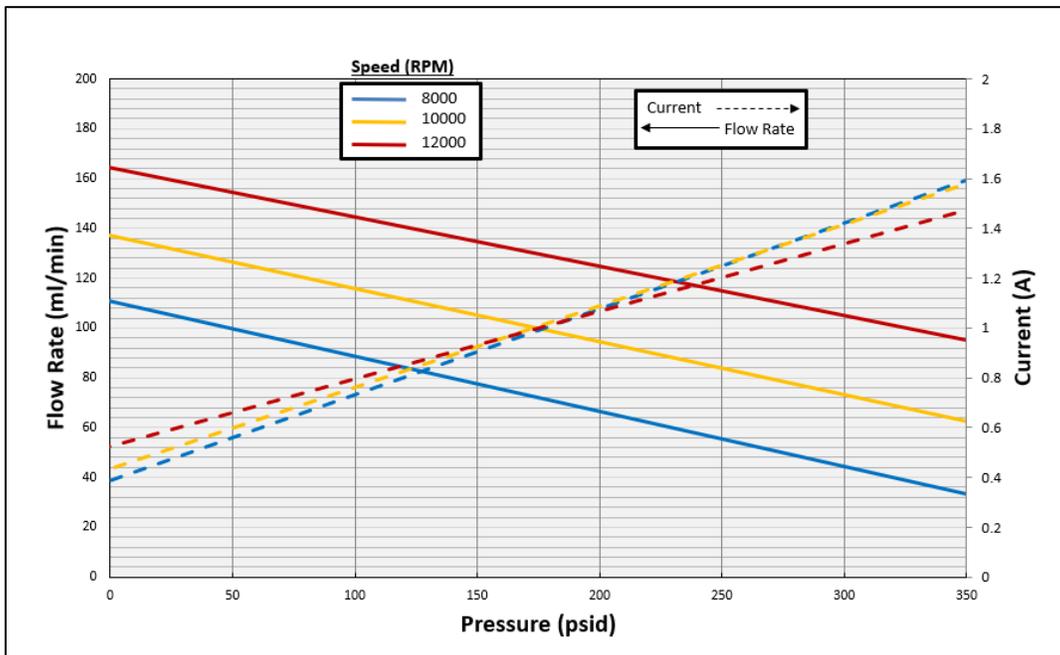
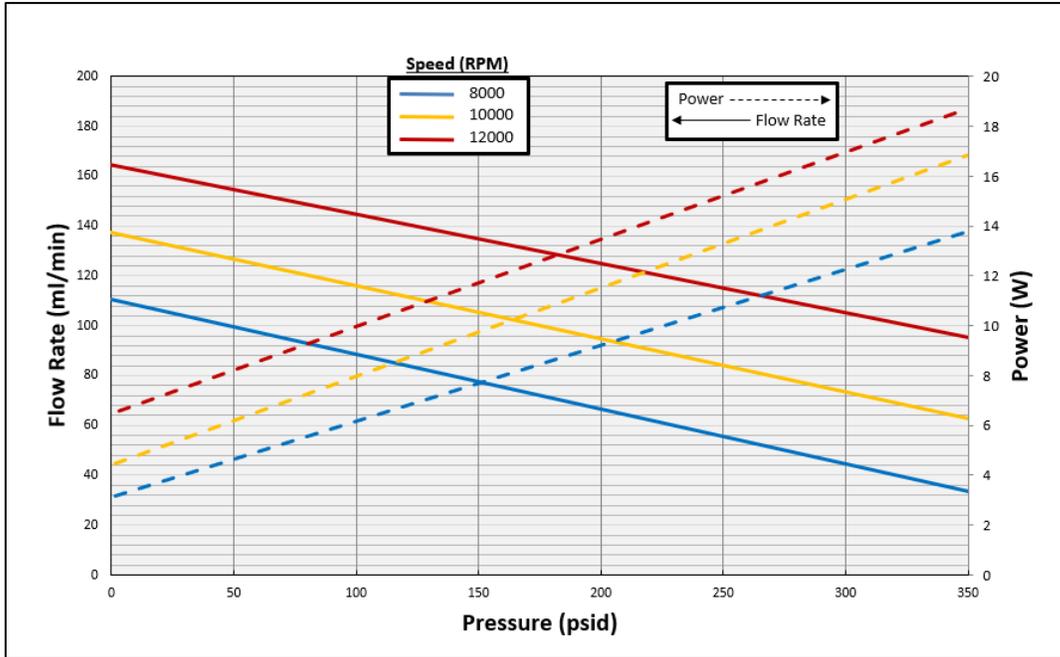
- COTS Motor Controllers
- Flight Works Space Motor Controller
- Pressure Gauges/Regulators

TUBING

- Polyurethane Tubing: 4, 6, 8mm
- Tygon Tubing: Small, Medium
- Stainless Steel Tubing: 1/16", 1/8"



Pump Performance w/ H2O ($\approx 1cP$) at 25°C



Nominal performance shown; actual performance will vary depending on unit and operating conditions

MOTOR DATA

| Motor | Nominal Voltage | Max Nominal Current | No Load Speed Constant | No Load Speed at Nominal Voltage |
|-------|-----------------|---------------------|------------------------|----------------------------------|
| XS09 | 18 V | 4.24 A | 970 RPM/V | 17,300 RPM |

