# LOW TEMPERATURE RANGE SMARTMOTOR™ (SM23165M-LTR)

Engineered for robust and reliable operation in harsh environments and high altitudes

The Moog Animatics Low Temperature Range (LTR) SmartMotor™ is available in a standard NEMA 23 frame size, model SM23165M-LTR (the "LTR-23"). This motor has been engineered for robust and reliable operation in extremely frigid environments and at high altitudes.[1]

To achieve this, an onboard internal heater ensures that the motor can start up in temperatures below -40 degrees C. Along with this, other design changes allow it to withstand random vibrations up to 6 G RMS, 10 - 2000 Hz, and standard IP sealing protects the motor from condensation[2] and IP67 sealing is optionally available.[3]

The LTR-23 motor provides the availability of many Class 5 SmartMotor™ features in a fully integrated, 23-frame, IP sealed package specifically designed for extremely low temperature and high altitude applications.

**Features:**

- NEMA 23 size
- Designed for operation with extreme temperatures, vibrations and high altitude
- IP65 high altitude operation; IP67 possible within operating temperature using flurosilicone O-ring between motor flange and IP67 mating component
- Low temp startup with onboard heater to raise circuit temperature from -65 to -40 °C
- Magnetic, single turn absolute encoder
- Three 5 V TTL sourcing inputs
- RS-422 differential communication
- Non-RoHS

[1] For RoHS exempt applications only – the LTR motors contain lead-based solder on some internal components to achieve increased reliability over greater thermal ranges.
[2] IP sealed only when mounted to an equivalently sealed mating component.
[3] LTR-23 IP67 sealing available only within operating temperature, requires a flurosilicone O-ring between motor flange and IP67 rated mating component.

## ADVANTAGES

- Extreme low temperature startup through onboard heater
- Protection against condensation through standard IP sealing
- High altitude operation ensured through proprietary design and testing
- Ease of programming through powerful AniBasic (BASIC-like) language with over 200 commands
- Minimal cabling and space requirements due to fully integrated design
- Ability to solve difficult application problems through field-proven Class 5 features

## APPLICATIONS

- Aerospace motion actuation where high altitude and low temperature are factors
- Motion requirements in arctic regions
- Pan and tilt solar collectors
- High altitude surveillance cameras
- Refrigerated food and pharmaceutical processing
- Wind tunnel testing in extreme temperatures
- Cryogenic containment handling
- Cold thermal test chambers
- Nozzle/valve flow for coolers
- Ice handling systems



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# SPECIFICATIONS

## TECHNICAL DATA

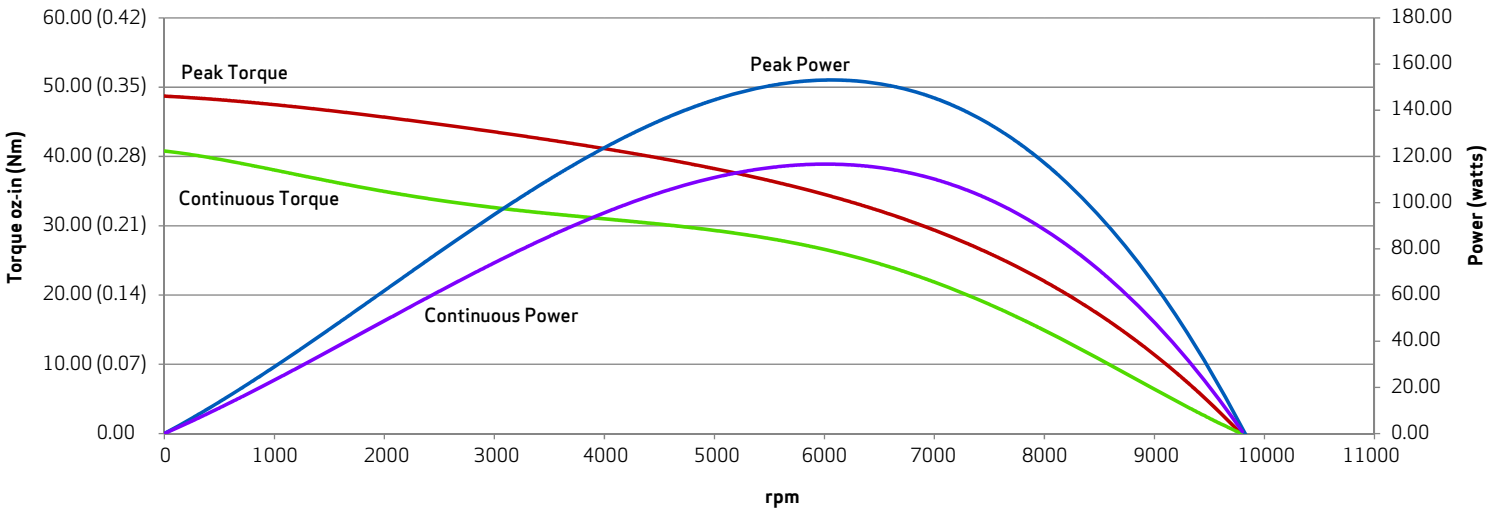
| | | |
|---|---|---|
| **Continuous torque (up to 5500 rpm)** | 28 | oz-in |
| | 0.19 | N-m |
| **Peak torque at stall** | 44 | oz-in |
| | .31 | N-m |
| **Nominal continuous power (@ 6000 rpm)** | 115 | watts |
| **No load speed** | 9,800 | rpm |
| **Motor constant** | 6.70 | oz-in/(watts)$^{.5}$ |
| **Rotor inertia** | 0.99 | (oz-in-sec$^2$) x10$^{-2}$ |
| **Weight** | 1.3 | lb |
| | .59 | kg |
| **Shaft diameter** | 0.25 | in |
| | 6.35 | mm |
| **Shaft, radial load** | 15 | lb |
| | 6.80 | kg |
| **Shaft, axial thrust load** | 3 | lb |
| | 1.36 | kg |
| **Maximum continuous current (@ 7000 rpm)** | 3.1 | amps |
| **Peak power (@ 7000 rpm)** | 145 | watts |
| **Torque sensitivity ($K_t$)** | 6.02 | oz-in/amp |
| **Voltage constant ($K_e$)** | 4.45 | volts/krpm |
| **Terminal resistance ($R_T$)** | 0.77 | Ohms |
| **Terminal inductance ($L_T$)** | 0.83 | mH |

Storage temperature -65 to +85 °C.
Normal operating temperature -55 to +70 °C.
External power or heater must bring temperature up to at least -40 °C for startup from cold.*
**Consult manual found on the website for more details.*

⚠ **Warning: This product contains lead-based solder on some internal components.**

## PERFORMANCE TORQUE AND POWER CURVE

SM23165M-LTR motor torque versus speed, 48 volts, MDT commutation, 25 °C ambient (curves are derated at higher ambient).



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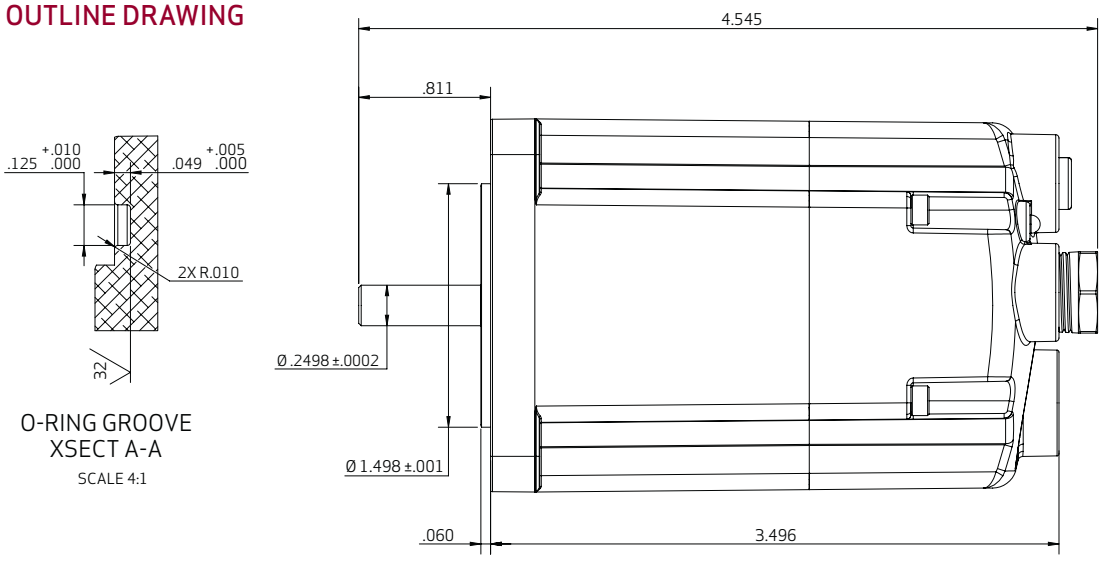
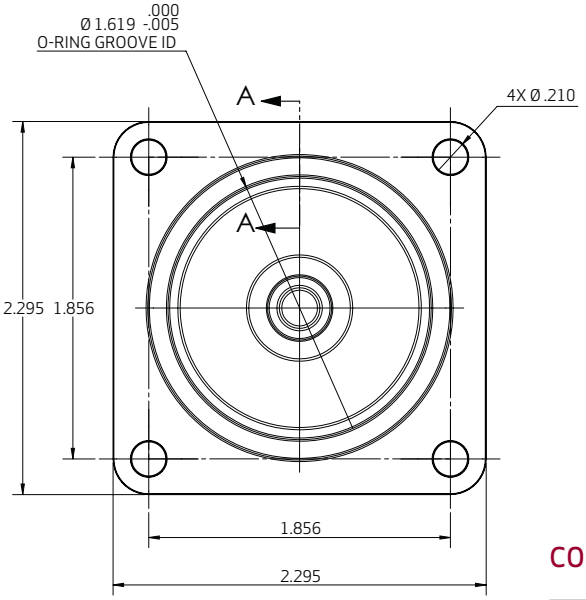
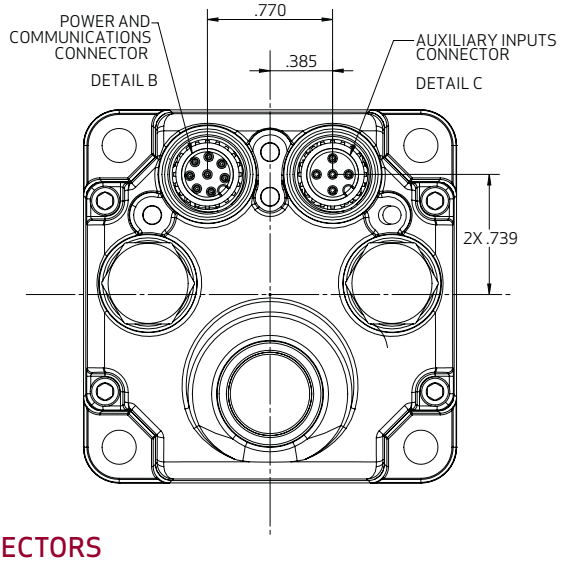
# SPECIFICATIONS

## OUTLINE DRAWING



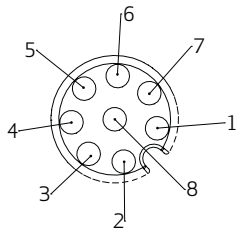




Dimensions are in inches

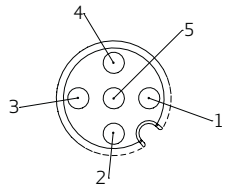
## CONNECTORS

| Power and Communications Pin # | Signal |
|---|---|
| 1 | Power return |
| 2 | Heater return |
| 3 | Heater +48 V |
| 4 | Rx+ |
| 5 | Tx- |
| 6 | Rx- |
| 7 | +48 V power in |
| 8 | Tx+ |



Detail B

| AUX Inputs Pin # | Signal |
|---|---|
| 1 | I/O 2 |
| 2 | I/O 0 |
| 3 | Ground |
| 4 | I/O 1 |
| 5 | N/C |



Detail C


Moog has offices around the world.
For more information or the office nearest you, contact us online.
**mcg@moog.com**





SM23165M-LTR SmartMotor™ Technical Data Sheet
MA1024 09/18


For product information, visit
**www.animatics.com**

This technical data is based on current available information and is subject to change at any time. Specifications for specific systems or applications may vary.

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