



# LS SERIES FRAMELESS MOTOR KIT

**HIGH TORQUE-TO-WEIGHT RATIO | LIGHT-WEIGHT AND LOW-INERTIA | HIGHLY EFFICIENT  
RING ARCHITECTURE | ZERO COGGING FOR PRECISION MOVEMENT | SCALABLE IN SIZE AND POWER**

## Data Sheet Model Number: LSI-224-31

ThinGap's LS Line includes numerous high performance brushless permanent magnet motors. The LS line targets lower speed, high precision applications such as gimbals, optics, and precision robotics. The highest torque density with high power capability and low thermal resistance.

### Motor Parameter Table

| Continuous Parameters                    | Units            | Value          |
|--|------------------|----------------|
| Continuous Torque @ Max Speed            | N-m              | 8.7            |
| Max Continuous Speed                     | RPM              | 1300           |
| Max Continuous Power                     | W                | 1189           |
| Required Motor Voltage @ Max Speed       | $V_{pk-l}$       | 413            |
| Max Continuous Phase Current @ Max Speed | $A_{RMS}$        | 2.47           |
| Peak Parameters@Max Speed                | Units            | Value          |
| Peak Torque (1 sec)*                     | N-m              | 71             |
| Peak Phase Current (1 sec)               | $A_{RMS}$        | 20.6           |
| Peak Power (1 sec)*                      | W                | 9666           |
| Motor Constants                          | Units            | Value          |
| Voltage Constant (l-l)                   | $V_{pk-l}/rad/s$ | 2.883          |
| Voltage Constant (l-l)                   | $V_{pk-l}/kRPM$  | 302            |
| Torque Constant                          | $N-m/A_{RMS}$    | 3.531          |
| Motor Constant                           | $N-m/VW$         | 1.095          |
| Electrical Parameters                    | Units            | Value          |
| Terminal Resistance @ 20°C               | $\Omega$         | 6.933          |
| Terminal Resistance @ Max Temperature    | $\Omega$         | 9.727          |
| Terminal Inductance                      | $\mu H$          | 1170 $\pm$ 10% |
| Number of Magnetic Poles                 | ea               | 32             |
| Electrical Frequency @ Max Speed         | Hz               | 347            |
| Mechanical Parameters                    | Units            | Value          |
| Rotor Inertia                            | $kg-m^2$         | 8.481E-03      |
| Outer Diameter                           | mm               | 223.52         |
| Through Hole Diameter                    | mm               | 183.59         |
| Axial Height                             | mm               | 31.14          |
| Rotor Mass                               | kg               | 1.190          |
| Stator Mass                              | kg               | 0.914          |
| Part Set Mass                            | kg               | 2.103          |
| Temperature Parameters                   | Units            | Value          |
| Max Stator Temperature                   | °C               | 130            |
| Max Rotor Temperature                    | °C               | 85             |
| Thermal Resistance                       | °C/W             | 1.23           |

All motor parameters calculated assuming 20° C ambient temperature and the motor kit not being installed into a housing. Thermal resistance can drop by 30% when mounted.

\*Includes temperature effects and losses from speed



ThinGap's LS Line of Brushless Motors  
For low speed, high precision applications such as gimbals, optics, and precision robotics. Highest torque density with high power capability. Available in sizes 25mm to 267mm.

### Torque and Mechanical Speed:

Continuous rated torque of up to 8.73 N-m and rated speed of up to 1300 RPM.

### Motor Controller Recommendation:

Standard 3-Phase Controller  
High frequency PWM recommended

### Custom Variants Available Upon Request:

Alternative winding design options  
Higher speed options  
High temperature option  
Two Phase Winding





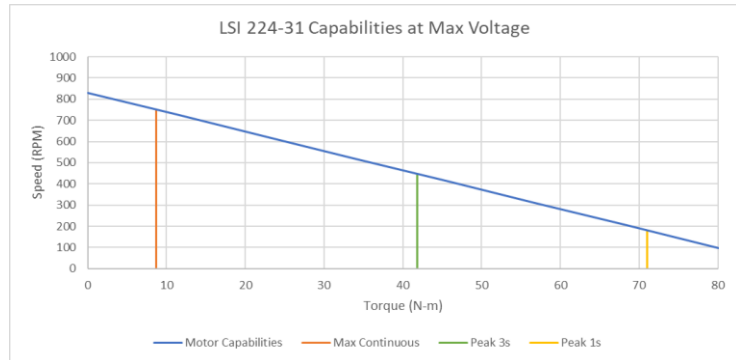
Motor Data Sheet Model Number: LSI-224-31

ThinGap technology incorporates the latest electro-magnetic components where torque limits, both continuous and peak, are determined by available cooling. The charts presented develop these limits based on natural convection from the lamination stack surface with forced convection on the coil surface due to rotation of the rotor. Mounting of the laminations stack to a heat sink will further improve maximum continuous torque capacity. Contact ThinGap for application-specific requirements.

ThinGap's frameless motor part set allows it to be completely integrated resulting in the highest ratio of torque-to-volume. In this configuration, the motor's rotor and stator can be housed within the customer's assembly utilizing a common shaft and bearing system, resulting in increased coupling efficiencies, smaller system size and lower weight. **Note:** stator and rotor assembly requires tooling due the high magnetic strength of ThinGap's rotor designs.

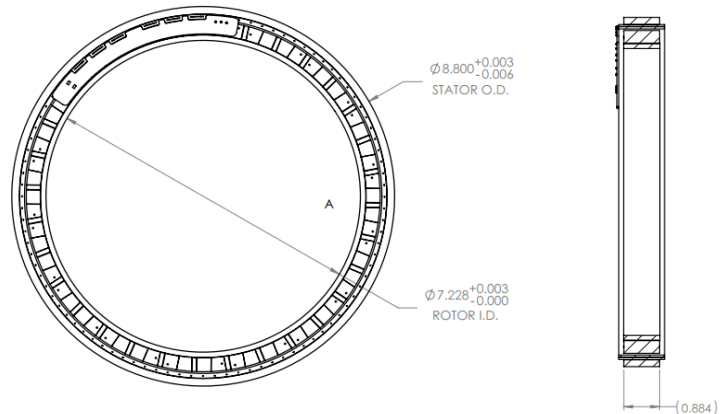
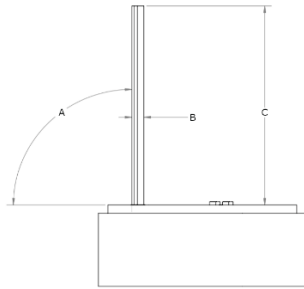
| Basic Frame Sizes Available: |                         |
|------------------------------|-------------------------|
| Motor Model (mm)             | Continuous Torque (N-m) |
| LSI-75-30                    | 1.04                    |
| LSI-105-33                   | 1.9                     |
| LSI-130-23                   | 2.25                    |
| LSI-130-40                   | 4.24                    |
| LSI-152-29                   | 1.9                     |
| LSI-152-55                   | 8.36                    |
| LSI-224-67                   | 25.51                   |
| LSI-267-32                   | 11.54                   |
| LSI-267-58                   | 24.4                    |

(Custom sizes also available.)



Example of Typical Use Speed-Torque Curve  
Higher speeds possible and is dependent on the applied voltage. Top speed may be limited mechanically. Please consult factory if higher speeds are required.

LSI-224-31 Mechanical Information



| Lead Wire Configuration Table |                     |                         |                 |
|-------------------------------|---------------------|-------------------------|-----------------|
| Configuration                 | Wire Exit Angle "A" | Wire Exit Clearance "B" | Wire Length "C" |
| Solder Pads                   | No Wires            | No Wires                | No Wires        |
| Axial                         | 90°                 | 0.18" x 0.10"           | 18"             |
| Radial Out                    | 0°                  | 0.18" x 0.10"           | 18"             |
| Radial In                     | 180°                | 0.18" x 0.10"           | 18"             |

General Mechanical Specifications  
All values should be considered nominal. Please consult factory for up-to-date mechanical drawing and ICD.

ThinGap is a leading designer and producer of US-made standard and custom motors and generators. In addition to the LS Line (presented above) for lower speed, high precision applications, the TG Line offers the highest power density motor design with high torque and inherent high-speed capability in sizes 25mm to 1 meter, and powers from mW to MW. ThinGap also develops custom and application-specific motors, such as carbon fiber-based designs and large clean output starter generators. ThinGap's high performance, zero cogging motors and generators are widely used in aerospace propulsion, hybrid power, space, medical and high-end industrial applications.

