

ZERO COGGING | HIGHLY EFFICIENT ARCHITECTURE | OPTIMIZED ROTOR INERTIA SPACE HERITAGE | LIGHTWEIGHT COMPOSITE STATOR | SCALABLE SIZE AND POWER

Data Sheet Model Number:

TGR 89-26

ThinGap's TGR Series includes numerous high performance brushless permanent magnet motors. The TGR Series targets reaction wheel applications where a high efficiency, weight optimized solution with dynamic response capabilities is desired.



ThinGap's TGR Line of Brushless motor kits designed for use in reaction wheel applications; both in atmosphere and vacuum. These motor kits are available in sizes ranging from 29 mm to 89 mm

Derated Specifications for Vacuum

Continuous torque of up to 0.346 N-m and a rated speed of up to 6000 RPM.

Motor Controller Recommendation 3-Phase Controller

High Frequency PWM power input

Motor Parameter Table

Continuous Torque @ Max Speed*N-m0.7450.346Max Continuous SpeedRPM60006000Max Continuous Power*W468217Required Moto Voltage @ Max SpeedVpLiI41.339.1Max Continuous Phase Current @ Max SpeedVpLII41.339.1Max Continuous Phase Current @ Max SpeedUnitsAtmosphereVacuumPeak Parameters@Max SpeedUnitsAtmosphereVacuumPeak Torque (1 sec)*N-m2.862.77Peak Phase Current (1 sec)Assas39.838.61Peak Torque (3 sec)*W17971743Peak Torque (3 sec)*W11621128Motor ConstantsUnitsCommon ValueVoltage Constant (I-I)VpL/rad/s0.059Voltage Constant (I-I)VpL/rad/s0.073Motor ConstantN-m/Assas0.073Motor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Muther of Magnetic Polesea12Electrical ParametersUnitsCommon ValueMotor Resistance @ Max TemperatureRg0.125Avial Heightmm89Through Hole Diametermm89Rotor Inertiakg0.353Axial Heightmm26.1 </th <th>Continuous Parameters</th> <th>Units</th> <th>Atmosphere</th> <th>Vacuum</th>	Continuous Parameters	Units	Atmosphere	Vacuum
Max Continuous SpeedRPM60006000Max Continuous Power*W468217Required Motor Voltage @ Max SpeedV _{pkH} 41.339.1Max Continuous Phase Current @ Max SpeedV _{pkH} 41.339.1Peak Parameters@Max SpeedUnitsAmosphereVacuumPeak Torque (1 sec)*N-m2.862.77Peak Phase Current (1 sec)A _{RMS} 39.838.61Peak Torque (3 sec)*N-m1.851.79Peak Torque (3 sec)*N-m1.851.79Peak Phase Current (3 sec)A _{RMS} 25.724.93Peak Pase Current (3 sec)N-m1.851.79Peak Phase Current (1 sec)A _{RMS} 0.0591128Motor ConstantsUnitsCommon ValueVoltage Constant (1-1)V _{pkts/} /rad/s0.073Voltage Constant (1-1)V _{pkts/} /kRPM6.208Torque ConstantN-m/VW0.105Electrical ParametersUnitsCommon ValueMotor ConstantN-m/VW0.321Motor Resistance @ 20°CΩ0.321Motor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceHz600Mechanical ParametersUnitsCommon ValueNumber of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Max Enter Fieldmm26.1Rotor Inertiakg0.353Rotor Inertiakg <t< th=""><th>Continuous Torque @ Max Speed*</th><th>N-m</th><th>0.745</th><th>0.346</th></t<>	Continuous Torque @ Max Speed*	N-m	0.745	0.346
Max Continuous Power*W468217Required Motor Voltage @ Max SpeedV _{pkH} 41.339.1Max Continuous Phase Current @ Max SpeedA _{RMS} 10.34.80Peak Parameters@Max SpeedUnitsAtmosphereVacuumPeak Torque (1 sec)*N-m2.862.77Peak Phase Current (1 sec)A _{RMS} 39.838.61Peak Torque (3 sec)*N-m1.851.79Peak Phase Current (3 sec)A _{RMS} 25.724.93Peak Power (3 sec)*W11621128Motor ConstantsUnitsCommon ValueVoltage Constant (I-I)V _{pkL} /rad/s0.059Voltage Constant (I-I)V _{pkL} /rad/s0.073Motor ConstantN-m/VW0.105Torque ConstantN-m/VW0.105Electrical ParametersUnitsCommon ValueMotor Resistance @ Dave ConstantN-m/VW0.105InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz60Motor Inertiakg-m²3.44E-04Number of Magnetic Polesea12Electrical Frequency @ Max Speedkg0.353Mator Inertiakg0.353Rotor Inertiakg0.098Part Set Masskg0.098Part Set Masskg0.452Torque Constantmm26.1Rotor Inertiakg0.098Number of Magnetic Poleskg0.353<	Max Continuous Speed	RPM	6000	6000
Required Motor Voltage @ Max Speed V _{pli-1} 41.3 39.1 Max Continuous Phase Current @ Max Speed A _{RMS} 10.3 4.80 Peak Parameters@Max Speed Units Atmosphere Vacuum Peak Parameters@Max Speed N-m 2.86 2.77 Peak Phase Current (1 sec)* A _{RMS} 39.8 38.61 Peak Power (1 sec)* W 1797 1743 Peak Torque (3 sec)* N-m 1.85 1.79 Peak Torque (3 sec)* N-m 1.85 1.79 Peak Torque (3 sec)* W 1162 1128 Motor Constants Units Common Value Voltage Constant (I-I) V _{plst} /rad/s 0.059 Voltage Constant (I-I) V _{plst} /RRPM 6.208 Torque Constant N-m/A _{RMS} 0.073 Motor Constant N-m/MemS 0.0073 Motor Resistance @ 20°C Ω 0.321 Motor Resistance @ Max Temperature Ω 0.463 Inductance µH 12.4 ± 20% Number of Ma	Max Continuous Power*	W	468	217
Max Continuous Phase Current @ Max Speed A_{RMS} 10.34.80Peak Parameters@Max SpeedUnitsAtmosphereVacuumPeak Torque (1 sec)*N-m2.862.77Peak Phase Current (1 sec) A_{RMS} 39.838.61Peak Phase Current (2 sec)*W17971743Peak Torque (3 sec)*N-m1.851.79Peak Phase Current (3 sec) A_{RMS} 25.724.93Peak Phase Current (3 sec) A_{RMS} 25.724.93Peak Power (3 sec)*W11621128Motor ConstantsUnitsCommon ValueVoltage Constant (I-I) $V_{pkt}/kRPM$ 6.208Voltage Constant (I-I) $V_{pkt}/kRPM$ 6.208Torque ConstantN-m/ARMS0.073Motor ConstantN-m/W0.105Electrical ParametersUnitsCommon ValueMotor Resistance @ 20°C Ω 0.321Motor Resistance @ Max Temperature Ω 0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperatur	Required Motor Voltage @ Max Speed	V _{pkl-I}	41.3	39.1
Peak Parameters@Max SpeedUnitsAtmosphereVacuumPeak Torque (1 sec)*N-m2.862.77Peak Phase Current (1 sec)A _{RMS} 39.838.61Peak Power (1 sec)*W17971743Peak Power (1 sec)*N-m1.851.79Peak Phase Current (3 sec)A _{RMS} 25.724.93Peak Power (3 sec)*W11621128Motor ConstantsUnitsCommon ValueVoltage Constant (I-I)V _{pkt-/} /rad/s0.059Voltage Constant (I-I)V _{pkt-/} /RRPM6.208Torque ConstantN-m/A _{RMS} 0.073Motor ConstantN-m/A _{RMS} 0.073Motor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.353Stator Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature'C130Max Stator Temperature'C130	Max Continuous Phase Current @ Max Speed	A _{RMS}	10.3	4.80
Peak Torque (1 sec)* N-m 2.86 2.77 Peak Phase Current (1 sec) A _{RMS} 39.8 38.61 Peak Power (1 sec)* W 1797 1743 Peak Torque (3 sec)* N-m 1.85 1.79 Peak Phase Current (3 sec) A _{RMS} 25.7 24.93 Peak Power (3 sec)* W 1162 1128 Motor Constants Units Common Value Voltage Constant (I-I) V _{pkt} /rad/s 0.059 Voltage Constant (I-I) V _{pkt} /rkRPM 6.208 Torque Constant N-m/A _{RMS} 0.073 Motor Resistance @ 20°C Ω 0.321 Motor Resistance @ 40°C Ω 0.463 Inductance µH 12.4 ± 20% Number of Magnetic Poles ea 12 Electrical Praemeters Units Common Value Motor Resistance @ Max Spee	Peak Parameters@Max Speed	Units	Atmosphere	Vacuum
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Peak Power (1 sec)*W17971743Peak Torque (3 sec)*N-m1.851.79Peak Phase Current (3 sec)ARMS25.724.93Peak Power (3 sec)*W11621128Motor ConstantsUnitsCommon ValueVoltage Constant (I-I)V _{pki-1} /rad/s0.059Voltage Constant (I-I)V _{pki-1} /kRPM6.208Torque ConstantN-m/ARMS0.073Motor ConstantN-m/VW0.105Electrical ParametersUnitsCommon ValueMotor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Motor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersVitsCommon ValueMax Stator Temperaturemm26.1Rotor Masskg0.353Stator Temperature°C130Max Stator Temperature°C130	Peak Phase Current (1 sec)	A _{RMS}	39.8	38.61
Peak Torque (3 sec)*N-m1.851.79Peak Phase Current (3 sec)A _{RMS} 25.724.93Peak Power (3 sec)*W11621128Motor ConstantsUnitsCommon ValueVoltage Constant (I-I)V _{pk1-1} /rad/s0.059Voltage Constant (I-I)V _{pk1-1} /rad/s0.073Motor ConstantN-m/A _{RMS} 0.073Motor ConstantN-m/A _{RMS} 0.073Motor ConstantN-m/ARMS0.073Motor ConstantN-m/ARMS0.0321Motor Resistance @ 20°CΩ0.463Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical ParametersUnitsCommon ValueMotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm26.1Rotor Masskg0.353Stator Masskg0.935Stator Masskg0.452Comperature ParametersVoltsCommon ValueMax Stator Temperature°C95	Peak Power (1 sec)*	W	1797	1743
Peak Phase Current (3 sec)A _{RMS} 25.724.93Peak Power (3 sec)*W11621128Motor ConstantsUnitsCommon ValueVoltage Constant (I-I)V _{pik-I} /rad/s0.059Voltage Constant (I-I)V _{pik-I} /rRPM6.2.08Torque ConstantN-m/A _{RMS} 0.073Motor ConstantN-m/A _{RMS} 0.073Motor ConstantN-m/VW0.105Electrical ParametersUnitsCommon ValueMotor Resistance @ 20°CΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Prequency @ Max SpeedHz600Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm26.1Rotor Masskg0.353Stator Masskg0.98Part Set Masskg0.98Part Set Mass"Common ValueMax Stator Temperature°C130	Peak Torque (3 sec)*	N-m	1.85	1.79
Peak Power (3 sec)*W11621128Motor ConstantsUnitsCommo-ValueVoltage Constant (I-I)V _{pkl-l} /rad/s0.059Voltage Constant (I-I)V _{pkl-l} /kRPM6.208Torque ConstantN-m/A _{RMS} 0.073Motor ConstantN-m/VW0.105Electrical ParametersUnitsCommo-ValueMotor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Mechanical ParametersUnitsCommo-ValueRotor Inertiakg-m²3.44E-04Outer Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.452Temperature ParametersUnitsCommo-ValueMax Stator Temperature°C130	Peak Phase Current (3 sec)	A _{RMS}	25.7	24.93
Motor ConstantsUnitsCommon ValueVoltage Constant (I-I)V _{pkl-l} /rad/s0.059Voltage Constant (I-I)V _{pkl-l} /kRPM6.208Torque ConstantN-m/A _{RMS} 0.073Motor ConstantN-m/A _{RMS} 0.073Motor ConstantN-m/W0.105Electrical ParametersUnitsCommon ValueMotor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm55Axial Heightmm26.1Rotor Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature°C130	Peak Power (3 sec)*	W	1162	1128
Voltage Constant (I-I)V _{pkt-I} /rad/s0.059Voltage Constant (I-I)V _{pkt-I} /kRPM6.208Torque ConstantN-m/A _{RMS} 0.073Motor ConstantN-m/VW0.105Electrical ParametersUnitsCommon ValueMotor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical ParametersUnitsCommon ValueMotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm55Axial Heightmm26.1Rotor Masskg0.098Part Set Masskg0.452Temperature°C130	Motor Constants	Units	Common Value	
Voltage Constant (I-I)V PkI-I/kRPM6.208Torque ConstantN-m/ARMS0.073Motor ConstantN-m/ARMS0.005Electrical ParametersUnitsCommon ValueMotor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm26.1Rotor Masskg0.353Stator Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature°C130	Voltage Constant (I-I)	V _{pkl-I} /rad/s	0.059	
Torque ConstantN-m/A _{RMS} 0.073Motor ConstantN-m/VW0.105Electrical ParametersUnitsCommon ValueMotor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon Value	Voltage Constant (I-I)	V _{pkl-l} /kRPM	6.208	
Motor ConstantN-m/VW0.105Electrical ParametersUnitsCommon ValueMotor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon Value	Torque Constant	N-m/A _{RMS}	0.073	
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Motor Resistance @ 20°CΩ0.321Motor Resistance @ Max TemperatureΩ0.463InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon Value	Electrical Parameters	Units	Common Value	
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InductanceµH12.4 ± 20%Number of Magnetic Polesea12Electrical Frequency @ Max SpeedHz600Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature°C130	Motor Resistance @ Max Temperature	Ω	0.463	
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Electrical Frequency @ Max SpeedHz600Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature°C130Max Rotor Temperature°C95	Number of Magnetic Poles	ea	12	
Mechanical ParametersUnitsCommon ValueRotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature°C130Max Rotor Temperature°C95	Electrical Frequency @ Max Speed	Hz	600	
Rotor Inertiakg-m²3.44E-04Outer Diametermm89Through Hole Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature°C130	Mechanical Parameters	Units	Common Value	
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Through Hole Diametermm55Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature°C130Max Rotor Temperature°C85	Outer Diameter	mm	89	
Axial Heightmm26.1Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature°C130Max Rotor Temperature°C95	Through Hole Diameter	mm	55	
Rotor Masskg0.353Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature°C130Max Rotor Temperature°C85	Axial Height	mm	26.1	
Stator Masskg0.098Part Set Masskg0.452Temperature ParametersUnitsCommon ValueMax Stator Temperature°C130Max Rotor Temperature°C85	Rotor Mass	kg	0.353	
Part Set Mass kg 0.452 Temperature Parameters Units Common Value Max Stator Temperature °C 130 Max Rotor Temperature °C 85	Stator Mass	kg	0.098	
Temperature Parameters Units Common Value Max Stator Temperature °C 130 Max Rotor Temperature °C 85	Part Set Mass	kg	0.4	52
Max Stator Temperature °C 130	Temperature Parameters	Units	Commo	n Value
Max Rotor Temperature °C 95	Max Stator Temperature	°C	13	30
	Max Rotor Temperature	°C	8	5

* Torque values assume that the stator mounting ring is being used to sink heat into the motor assembly

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TGR 89-26

thingap for series MOTOR KIT

TGR 89-26 Mechanical Information





General Mechanical Specifications

All values are in inches and should be considered nominal. Please consult factory for up-to date mechanical drawing and ICD.



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



Example of Vacuum Use Efficiency Curve Torque values derated for use in vacuum. Chart assumes zero windage and uses generic bearings for the calculation. Please consult the factory if more information on assumptions used in the calculations is required.



TGR Series Motor Capabilities