thrus**tt**ube ®

Definition of motor properties (DS01051/D)

1.   Description

This datasheet defines the properties used on the motor properties datasheets.

2.   Electrical properties

Peak force is the force produced when the peak current is applied to the motor. It is the product of Force constant (N/Apk) and Peak current (Apk). The motor is not moving, there is no forced cooling and no additional heatsinking. The duration of the peak force is thermally limited and is therefore only allowable for a period of 1 second.

Continuous stall force is the force produced when the continuous current is applied to the motor. It is the product of either Force constant (N/Apk) and Continuous stall current (Apk) or Force constant (N/Arms) and Continuous stall current (Arms). The motor is not moving and there is no forced cooling. It is quoted with and without the addition of a **25 x 25 x 2.5cm heatsink plate** mounted with thermal grease to the mounting surface of the motor.

Peak current is the current required to heat the motor phases to their maximum operating temperature when the ambient temperature is $25^{o}C$, the motor is not moving, there is no forced cooling and no additional heatsinking. It is the maximum allowable current before demagnetisation of the magnets occurs when the magnet temperature is $100^{o}C$. The duration of the peak current is thermally limited and is therefore only allowable for a period of 1 second.

Continuous stall current is the current required to heat the motor phases to their maximum operating temperature when the ambient temperature is $25^{o}C$, the motor is not moving and there is no forced cooling. It is quoted with and without the addition of a **25 x 25 x 2.5cm heatsink plate** mounted with thermal grease to the mounting surface of the motor.

Force constant is the peak force produced when 1 ampere (peak) flows into one phase and 0.5 ampere (peak) flows out of the remaining two phases (as in sinusoidal commutation) quoted in N/Apk. Alternatively, it is the peak force produced when 0.707 ampere (rms) flows into one phase and 0.353 ampere (rms) flows out of the remaining two phases (again as in sinusoidal commutation) quoted in N/Arms.

Back EMF constant is the peak phase to phase voltage generated when the motor is travelling at a velocity of 1m/s.

Fundamental motor constant is the continuous stall force divided by the square root of the power dissipated in the motor at that continuous stall force.

Eddy current loss is the amount of opposing force produced by the motor when it is travelling at a velocity of 1m/s.

Sleeve cogging force is the amount of force variation produced by having an iron sleeve on TBX motors. The variation is independent of motor current.

Resistance is measured phase to phase at temperatures of $25^{o}C$ and $100^{o}C$.

Inductance is measured phase to phase at a frequency of 1kHz. The actual value of inductance varies as the motor position varies so it is the minimum value that is quoted.

Electrical time constant is the time taken for a step current input to the motor to reach 63.2% of its value.

Continuous working voltage is the maximum allowable continuous voltage between any two motor phases or between any motor phase and the motor safety earth.

Pole pitch is the distance in millimetres for one complete electrical cycle (between like magnetic poles).

3.   Thermal properties

Power dissipation is the maximum power that can be dissipated by the motor when the motor phases are at their maximum operating temperature, the ambient temperature is $25^{o}C$, the motor is not moving and there is

no forced cooling. It is quoted with and without the addition of a **25 x 25 x 2.5cm heatsink plate** mounted with thermal grease to the mounting surface of the motor.

Maximum phase temperature is the maximum operating temperature for the motor phases. It is limited to provide a safe operating temperature for the magnets.

Rth$_{phase-housing}$ is the temperature rise from the motor housing to the motor phases for an input power of 1 Watt to the motor. The motor is not moving, there is no forced cooling and no additional heatsinking.

Rth$_{housing-ambient}$ is the temperature rise from ambient temperature to the motor housing for an input power of 1 Watt to the motor. The motor is not moving and there is no forced cooling. It is quoted with and without the addition of a **25 x 25 x 2.5cm heatsink plate** mounted with thermal grease to the mounting surface of the motor.

Thermal time constant is the time taken for the motor phases to cool to 36.8% of the difference between motor phase and ambient temperatures when there is no current flowing, the motor is not moving, there is no forced cooling and no additional heatsinking.

4. Mechanical properties

Forcer mass (excluding bearings) is the mass of the forcer including pocket cover, pocket cover lid, cable gland and hall effect board but excluding motor bearing blocks and cable.

Thrust rod mass/metre is the mass of the thrust rod per metre excluding any fixings or mounting components.

Forcer mass (including bearings) is the mass of the forcer including pocket cover, pocket cover lid, cable gland, hall effect board, encoder and bearing blocks but excluding cable (as in ThrustTube M series).

Motor module mass (excluding forcer)/metre is the mass of the backing extrusion, bearing rail and thrust rod per metre but excluding the forcer.