



ELECTRICAL ENGINEERING Co.

- RESEARCH AND DEVELOPMENT
- MANUFACTURING
- INTERNATIONAL BUSINESS

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QUALITY-ENVIRONMENT INTEGRATE SYSTEM



DIRECT DRIVE HIGH TORQUE MOTORS



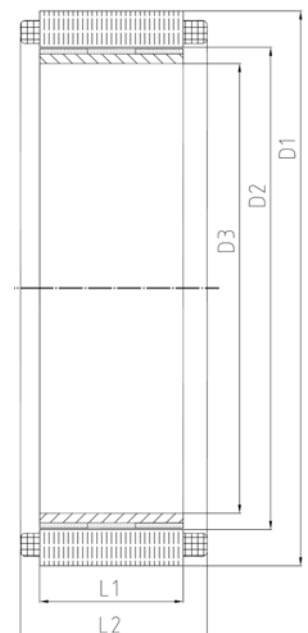
The synchronous permanent magnet torque motors created by ICPE consist of

- a stator wound with three phases coils
- a rotor with high energy permanent magnets fixed on a soft iron core

Features:

- direct drive
- brushless
- low speed
- frameless
- high torque density
- low torque ripple
- low cogging
- low mass
- high efficiency

| Dimensions [mm] | D1 | D2 | D3 | L1 | L2 | Torque [Nm] |
|------------------|------|------|-----|-----|-----|-------------|
| ICPE TORQUE 1800 | 580 | 504 | 471 | 150 | 200 | 1800 |
| ICPE TORQUE 3600 | 1092 | 1020 | 987 | 100 | 150 | 3600 |



Other configurations, torque, windings, diameter, length, speed can be developed at request.

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| Parameter | ICPE-TORQUE 3600 | ICPE-TORQUE 1800 |
|---|------------------|------------------|
| Peak torque (Nm) | 6000 | 2600 |
| Nominal torque (Nm) | 3600 | 1800 |
| Motor constant (Nm/W ^{1/2}) | 66.6 | 31.6 |
| Electrical time constant (sec) | 0.013 | 0.017 |
| Power input, stalled at peak torque (W) | 8100 | 6800 |
| No load speed (rad/s) | 3.4 | 3.4 |
| Ripple torque % (average to peak) | <2 | <2 |
| Rotor moment of inertia (kg m ²) | 15.8 | 1.6 |
| Resistance (Ω) | 3.1 | 2.65 |
| Inductance (mH) | 40 | 46 |
| Amps at peak torque (A) | 35 | 35 |
| Amps at nominal torque (A) | 22 | 24 |
| Torque sensitivity (Nm/A) | 170 | 74 |
| Number of poles | 142 | 64 |
| Cogging torque (Nm) | <50 | <15 |
| Back EMF line-line (V _{rms} / rad/s) | 101 | 43 |
| Bus voltage (DC) | 600 | 300 |

Traditionally, servo drives use high speed rotary motors in combination with mechanical transmissions. These motors are designed to run efficiently at high speed where cogging, speed ripple, and torque ripple are not serious issues. Mechanical transmissions are used to transform the high speed motion of the motor into the low speed, high torque operation required by the application. The gearboxes are expensive, noisy, produce torque ripple and require additional maintenance. Replacing these systems with direct drives – torque motors, considerably increases performances of the systems, and also, maintenance and operating costs are considerably reduced when implementing direct drive motors. Torque motors eliminate the need for gearboxes, worm-gear drives, or other mechanical transmission elements and enable a direct coupling of the payload to the drive. This enables a drive with high dynamic response without hysteresis.

The most unique feature of a torque motor concerns the physical dimensions. They have a relatively large diameter to length ratio, and they also have a rather short axial length. Additionally, torque motor can simultaneously have both a very large outer diameter and inner diameter, resulting in a motor that is a thin ring.

One important outcome of this characteristic is that the mass is quite low as a function of the diameter. Also, the large diameter allows very high torque to be developed.

Applications:

- direct drive of telescope or radar stations
- rotary tables
- indexing tables
- pick and place robots
- grinding machines
- wind/hydro generators
- elevators