MICRO DYNE
MOTOR TESTING SYSTEM

FEATURES

- Designed specifically for miniature and micro motors

- Torque: Easily convertible from 2.0 mN·m to 4.0 mN·m (0.28 oz·in to 0.57 oz·in)

- Speed: up to 100,000 rpm

- Power: 4 W

- Low inertia

- Sold as a complete, out-of-the-box motor testing system. Components include:

  - Hysteresis Dynamometer: provides precise torque loading independent of shaft speed

  - Motor Fixture: accommodates motors from 5 mm to 30 mm in diameter.

  - Dedicated Electronics: all-in-one dynamometer controller, DC wattmeter, power relay and USB interface

  - Comprehensive Motor Testing Software

  - Easy-to-use calibration software

  - All necessary connection cables

  - Calibration weights: 5 g and 10 g

Fig. 1: Micro Dyne Motor Testing System

DESCRIPTION

With over 50 years' experience in dynamometer design and torque measurement, Magtrol has revolutionized the industry. Magtrol's new Micro Dyne, capable of measuring extremely low torques (2.0 mN·m can be resolved to 0.0004 mN·m), is designed exclusively for testing miniature and micro (low-torque) motors.

For the utmost convenience, the Micro Dyne is packaged as a COMPLETE MOTOR TESTING SYSTEM. Everything that is needed to accurately and efficiently test miniature motors and micro motors is included with the purchase of a Magtrol Micro Dyne. The only component that needs to be supplied by the customer is a laptop or desktop personal computer and motor power supply.

Motor Characteristics Measured/Calculated:

- Torque
- Speed
- Amps
- Volts
- Horsepower
- Efficiency
- Input Watts
- Output Watts

DATASHEET

APPLICATIONS

Magtrol motor test systems can be found in test labs, at inspection stations, and on the manufacturing floors of most of the world's leading motor manufacturers. The Micro Dyne system is used exclusively for closed-loop testing of miniature motors and micro motors used in low-torque/high-speed applications.

Motor sub-types include, but are not limited to, the following:

- Brushed and brushless DC motors
- Gearmotors
- Brushless DC servomotors
- Vibrator motors
- Miniature air motors

These mini/micro motors are used in a diverse range of industries and products, including:

- Medical and laboratory equipment
- Robotics and automation
- Toys
- Handheld communication devices
- Audio/video equipment
- Optics and photonics
- Aerospace and defense
- Security and instrumentation
- Industrial machinery

SYSTEM COMPONENTS

DYNAMOMETER

The Micro Dyne dynamometer absorbs power with Magtrol's unique Hysteresis Braking System. Because it does not require speed to create torque, the dynamometer can conduct a full motor ramp—from free-run to locked rotor.

In addition to a dedicated motor fixture, the dynamometer base plate also includes leveling knobs and motor power terminals. The housing of the dynamometer protects all the moving parts of the brake.

ELECTRONIC UNIT

At the hub of the Micro Dyne system is a multifunctional electronic unit. The unit employs DSP technology for high-speed data acquisition and complete PC control of the dynamometer. A USB receptacle enables easy connection to a personal computer. An integrated DC wattmeter reads volts and amps, and calculates watts; and a built-in power relay controls motor power (on/off).

The front panel includes the terminals for motor power in/out and voltage sensing. LED system ready and torque range indicators are located on the front panel of the unit.

MOTOR FIXTURE

Attached to the dynamometer base plate is a motor fixture designed expressly for micro/miniature motors. The base of the fixture features an XYZ stage with 3-axis positioning for excellent adjustability and motor centering. With the included adapters, motors from 5 mm to 30 mm in diameter can be easily mounted. The fixture is keyed to help secure the motor under test and a rubber strap with knurled cam grip provides motor clamping.

MOTOR TESTING SOFTWARE

Magtrol's M-TEST 7 is a state-of-the-art comprehensive motor testing program designed for use with Windows® operating systems for PC-based data acquisition. The software measures and calculates a motor's performance characteristics by employing these user-configurable testing methods:
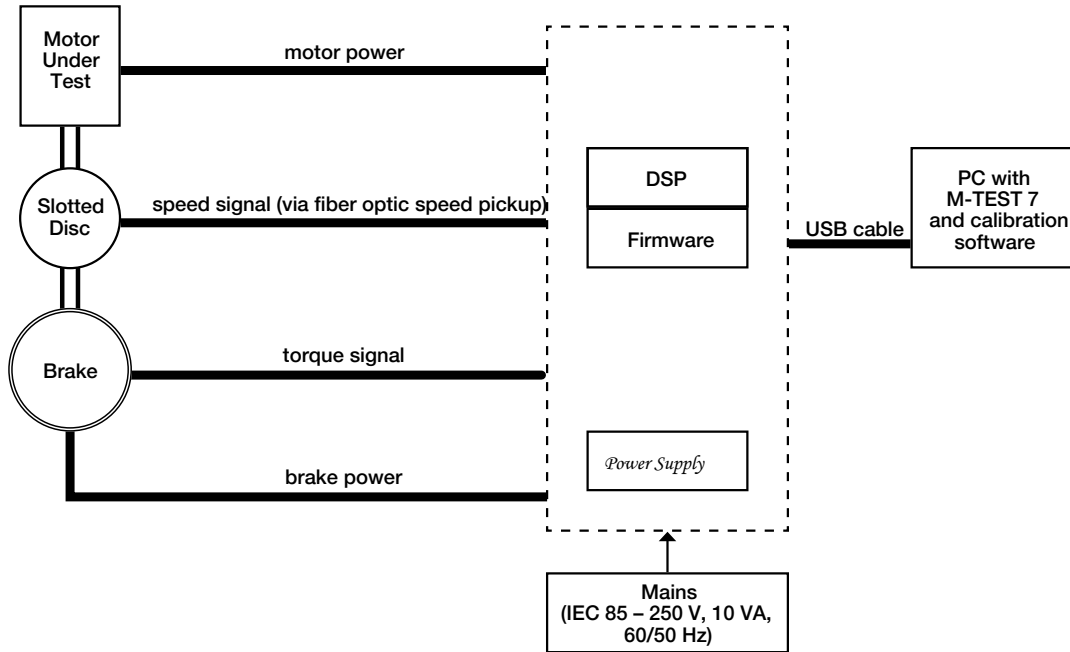
- **Ramp:** Select from average ramp down/up or ramp down with inertia correction factor. Also allows extrapolation of free-run and locked-rotor motor data, plus interpolation of specific speed or torque data points.
- **Curve:** Test speed, torque, amps, watts input, watts output and open loop parameters. Capable of adjusting sampling rate and using step or ramp from one load point to the next.
- **Pass/Fail:** Checks amps, input watts, speed, torque and output watts against user-defined limits.

The data generated can then be stored, displayed and printed in tabular or graphic formats, and is easily imported into a spreadsheet.

SYSTEM CONFIGURATION

Dynamometer

shipping bolt knob

Electonic Unit
functions as a:
- Dynamometer Controller
- DC Wattmeter
- Power Relay
- USB Interface

dynamometer shaft

motor clamping strap (with knurled cam grip)

motor under test

Motor Fixture

motor electrical connection

motor fixture adjustment knobs (vertical, horizontal, depth)

leveling knobs

voltage sense terminals

motor power OUT terminals

motor power IN terminals

BLOCK DIAGRAM

Motor Under Test

motor power

DSP

Firmware

USB cable

PC with M-TEST 7 and calibration software

Slotted Disc

speed signal (via fiber optic speed pickup)

Brake

torque signal

brake power

Power Supply

Mains (IEC 85 – 250 V, 10 VA, 60/50 Hz)

OPERATING PRINCIPLES

SPEED MEASUREMENT

The Micro Dyne contains a reflective fiber optic speed pickup. Each rotor slot that passes by the sensing end of the fiber optic generates an electronic pulse, which is then converted to a speed reading (in rpm).

TORQUE MEASUREMENT

A hysteresis brake is used to develop a resistance to rotation of a mechanical shaft. A torsional force is produced by the test motor and applied to the brake's rotor-shaft assembly. Reaction torque is measured by the angle of the brake pendulum assembly and is interpreted by the Micro Dyne system software (M-TEST 7).

SPECIFICATIONS

DYNAMOMETER

The Micro Dyne offers two different torque configurations in one unit. Depending on the motor's maximum torque rating, the user can easily switch between the 2.0 mN·m and 4.0 mN·m torque settings via the dynamometer's rear access panel. The ratings are the same for either configuration.

MAXIMUM TORQUE	NOMINAL INPUT INERTIA	MAXIMUM KINETIC POWER	MAXIMUM KINETIC POWER	MAXIMUM SPEED [a]	ACCURACY	ACCURACY
mN·m	kg·cm^2	W - 5 min	W - continuous [b]	rpm	torque	speed
4.0 or 2.0	5.43×10^{-4}	4	4	100 000	< 1% of full scale	< 0.02% of reading

a) Because the MicroDyne is optimized for high speeds, the lowest measurable speed is 50 rpm. If a motor is operating at less than 50 rpm, the speed measurement will read zero.

b) NOTE: Operating at the continuous power rating for periods of up to 4 hours is acceptable. However, operating for extended periods at high temperatures will result in premature component and bearing failure. Limiting the length of the cycle and the component temperatures will guard against premature failure. Where continuous duty is desired for longer time intervals, component temperatures should be maintained less than 100°C.

POWER ABSORPTION CURVE

Based on the maximum kinetic power ratings, the curve below represents the maximum power (heat) that the dynamometer can dissipate over time. The area under the curve equals the maximum speed/torque combinations for both a motor test of less than 5 minutes (intermittent duty), and a continuous-duty motor test.
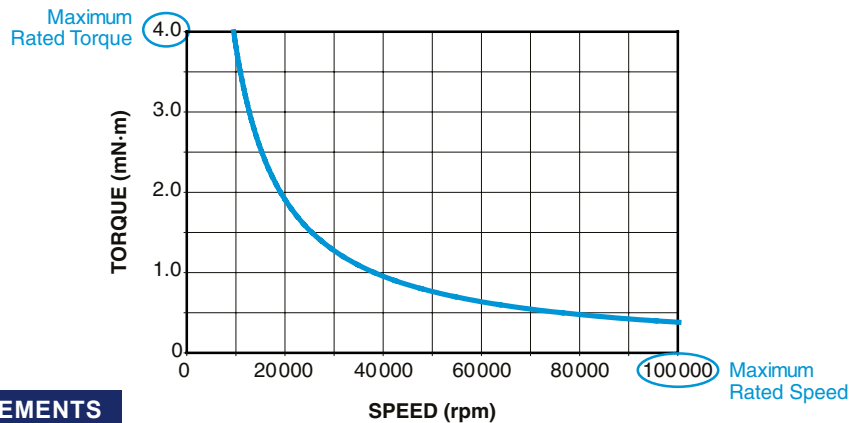
DYNAMOMETER ENVIRONMENTAL REQUIREMENTS

|	
Operating Temperature	0 °C to +70 °C
Relative Humidity	< 60% without condensation
EMC	In accordance with IEC 61326:2002

SPECIFICATIONS

ELECTRICAL UNIT

GENERAL ELECTRICAL CHARACTERISTICS

Fuse (5 × 20 mm)	IEC 500 mA 250 V T
Power Requirements	10 VA
Voltage Requirements	85 – 250 VAC, 50/60 Hz

ENVIRONMENT

Operating Temperature	0 ºC to +70 ºC
Relative Humidity	< 60% without condensation

POWER MEASUREMENT (DC)

Current Input (isolated)	± 5 A ±(0.1% Reading + 0.2% Range)
Voltage Input (isolated)	± 30 VDC ±(0.1% Reading + 0.2% Range)
Conversion Rate	15/second
Power Accuracy	0.4% of VA range
Isolation, to earth	50 V DC
Isolation, channel-to-channel	100 V DC

MOTOR FIXTURE

MOTOR ACCOMMODATION

Motor Diameter	5 mm – 30 mm
Motor Length	5 mm – 50 mm
Motor Shaft Diameter	0.75 mm – 3 mm
Maximum Load	100 g

ADJUSTABILITY

X/Y/Z Adjustable Range	±5 mm (all axes)
Controllable Motion	0.005 mm
Travel per Knob Revolution	0.318 mm

DIMENSIONS

DYNAMOMETER
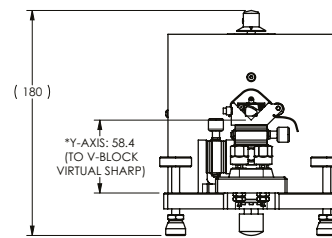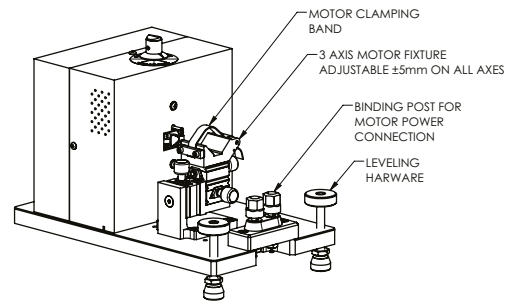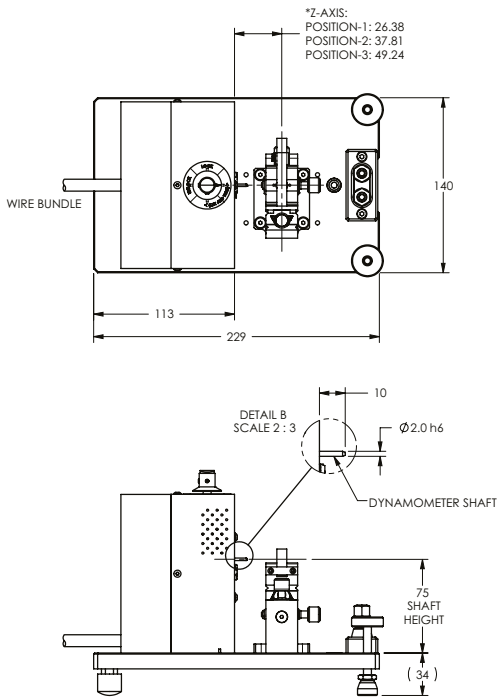
Weight	4.2 kg	9.3 lb

DIMENSIONS

ELECTRONIC UNIT

(264)
245
(267)

(195)
190
72
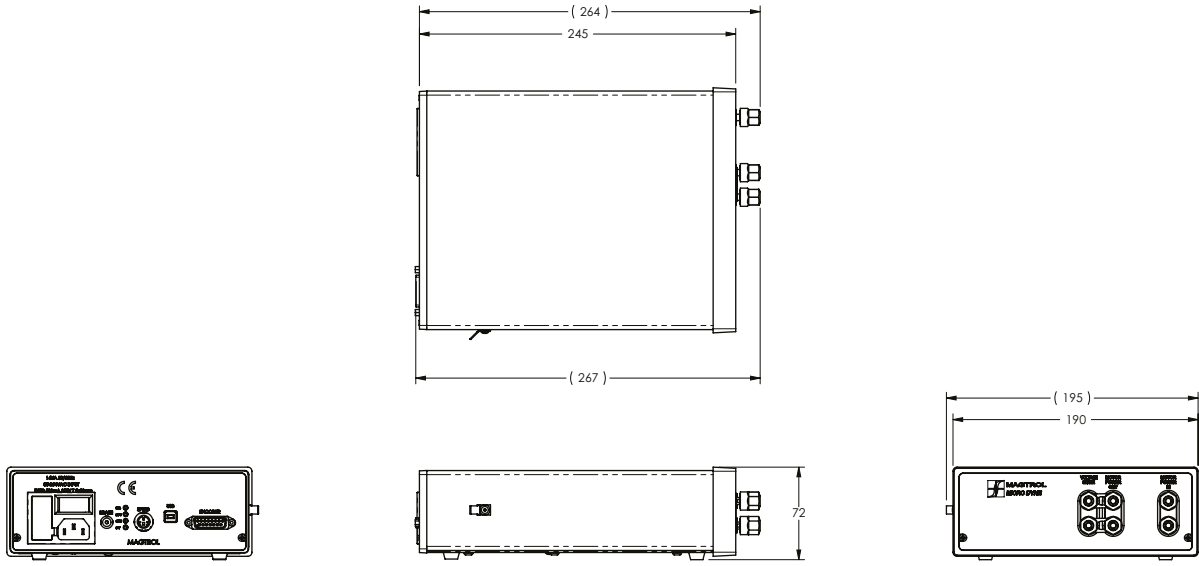
Weight	1.5 kg	3.2 lb

DATASHEET

www.magtrol.com