MAGNETIC BRAKE SYSTEMS
A DIVISION OF TECHNICAL FILM SYSTEMS, INC.

DYNAMOMETER DATA SHEET

(Version 1.0)

MODEL:
DI3M-2.4T-FM

Max continuous power dissipation:	2.0 HP (1.5 kW)
Max continuous brake torque:	134 in-oz. (95 N-cm)
Max brake speed:	15,000 RPM

4650 Calle Quetzal • Camarillo, CA 93012-9101 • Phone: 805.383.6903
E-Mail: sales@magbrakesystems.com • Website: www.magbrakesystems.com

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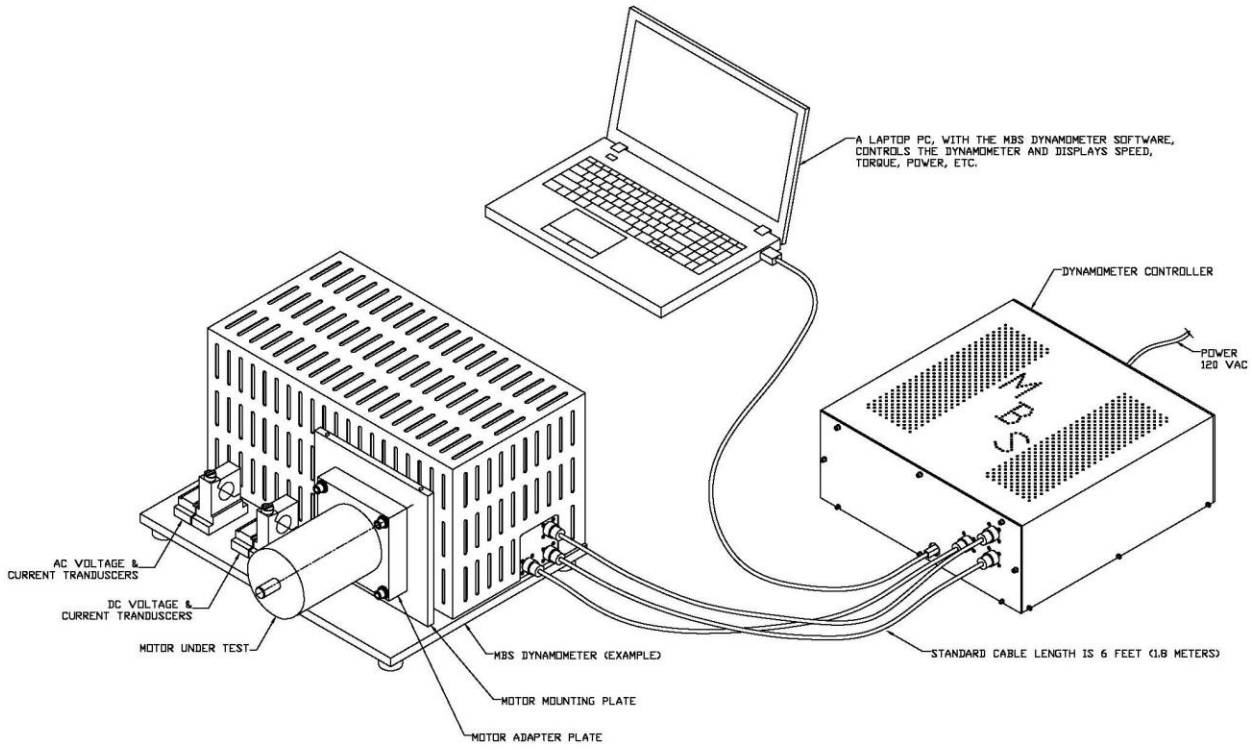
1. OVERVIEW

This data sheet is a reference for the performance specifications of the dynamometer models listed on the cover page.

The MBS dynamometers may be used to test just about any type of motor (i.e. electric, hydraulic, pneumatic, reciprocating). Types of testing include: endurance testing, speed versus torque curves, measure stall torque, efficiency, temperature rise, performance verification, etc. MBS dynamometers are sold as complete systems (shown in image below) that include: the dynamometer, controller, computer with software, calibration weight, manual and all cables. Our systems do not require annual fees, licenses or permits. The software is user friendly, is very configurable (i.e. changing units, display scale limits, data acquisition rate, etc.) and has some safety precautions build in to prevent damage to the motor under test and/or the system (i.e. brake temperature sensor, setting current limit, setting power limit, trigger input signals).



The nomenclature of the dynamometer part number is described at the end of this document. The power dissipation rating for this system is located on the bottom of the cover page. This data sheet may also be used to determine the best configuration for a system.

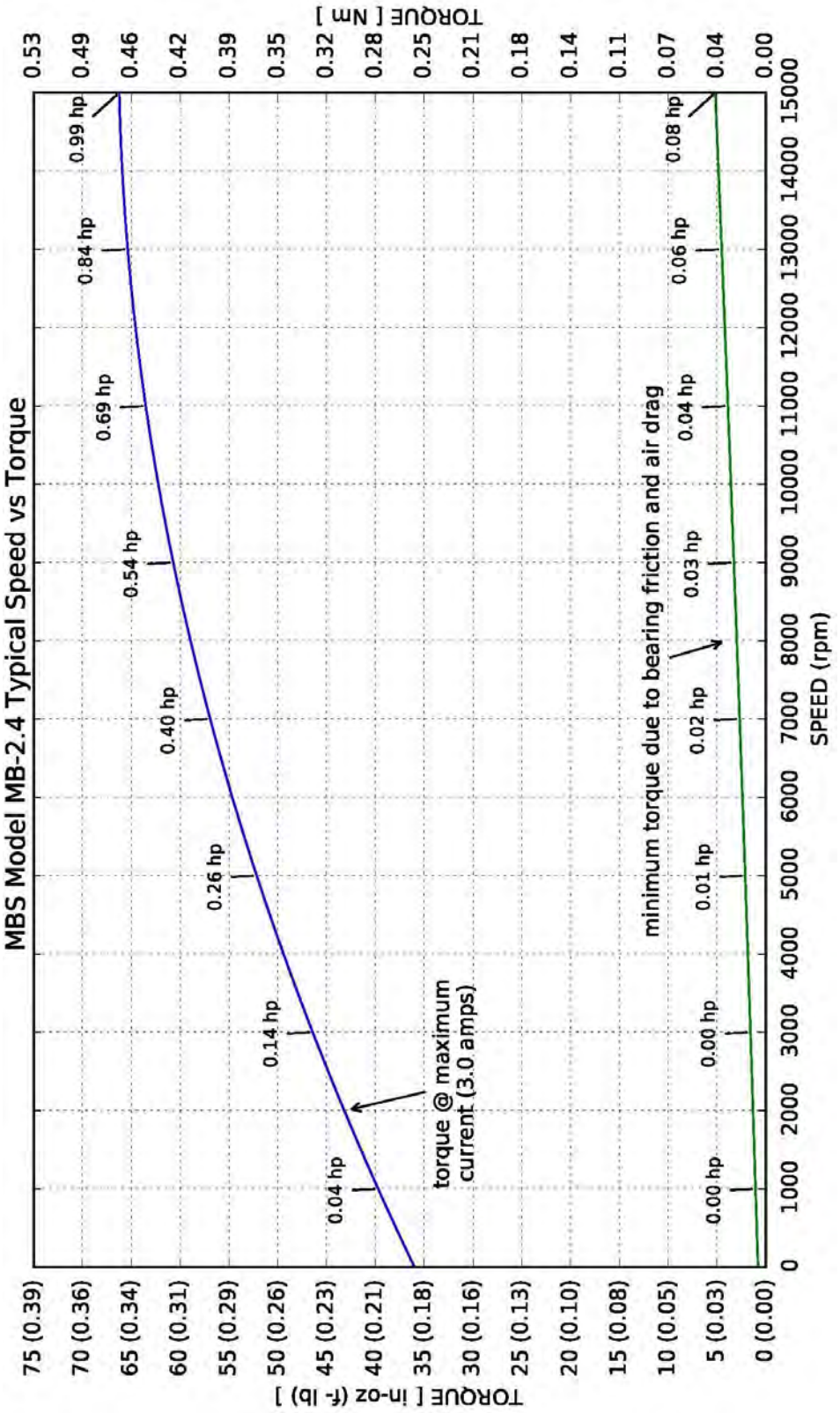
Dynamometers, or more specifically the size of the brakes for the dynamometers, are selected based on the required power dissipation and required torque.

The DI3M-2.4T-FM is a direct drive system where one of the brakes may be un-coupled to test smaller motors; the load cell measures the motor torque.

Dynamometers, or more specifically the brakes for the dynamometers, are sized based on the required power dissipation and required torque. The benefit of this dynamometer as an inline system is the ability to test much higher speeds than an off the shelf transmission can handle.

The torque, speed, voltage and current ranges (and types; i.e. DC, AC) need to be specified when purchasing a dynamometer in order to select the limits for the instrumentation. The following performance specifications for load cells, transducers, etc. are based on vendor specifications.

2. SPEED vs. TORQUE CURVE – MB-2.4 BRAKE (FOR ONE BRAKE)



3. TORQUE & SPEED OUTPUT TO MOTOR

Motor_Spd (RPM)	Motor Torque (in-oz.)	Power (HP)	Pulley Ratio (motor/brake)	Qty. Brakes	Brake Torque (in-oz./qty.)	Brake_Spd (RPM)	Time (sec)
0	36	0	Direct drive	1	36	0	cont.
0	72	0	Direct drive	2	72	0	cont.
8,500	60	0.5	Direct drive	1	60	8,500	cont.
8,500	120	1.0	Direct drive	2	120	8,500	cont.
15,000	67	1.0	Direct drive	1	67	15,000	cont.
15,000	134	2.0	Direct drive	2	134	15,000	cont.

Table 1: Torque, Speed and Power (English Units)

Motor_Spd (RPM)	Motor Torque (N-cm)	Power (Watts)	Pulley Ratio (motor/brake)	Qty. Brakes	Brake Torque (N-cm/qty.)	Brake_Spd (RPM)	Time (sec)
0	25.4	0	Direct drive	1	25.4	0	cont.
0	50.8	0	Direct drive	2	50.8	0	cont.
8,500	42.4	373	Direct drive	1	42.4	8,500	cont.
8,500	84.7	746	Direct drive	2	84.7	8,500	cont.
15,000	47.3	746	Direct drive	1	47.3	15,000	cont.
15,000	94.6	1,492	Direct drive	2	94.6	15,000	cont.

Table 2: Torque, Speed and Power (SI Units)

The tables are based on the performance graph for the MBZ-2.4 Brake, shown in Figure 1. The 2.4 model brake has been known to operate up to 20,000 RPM but no data is available above 15,000 RPM.

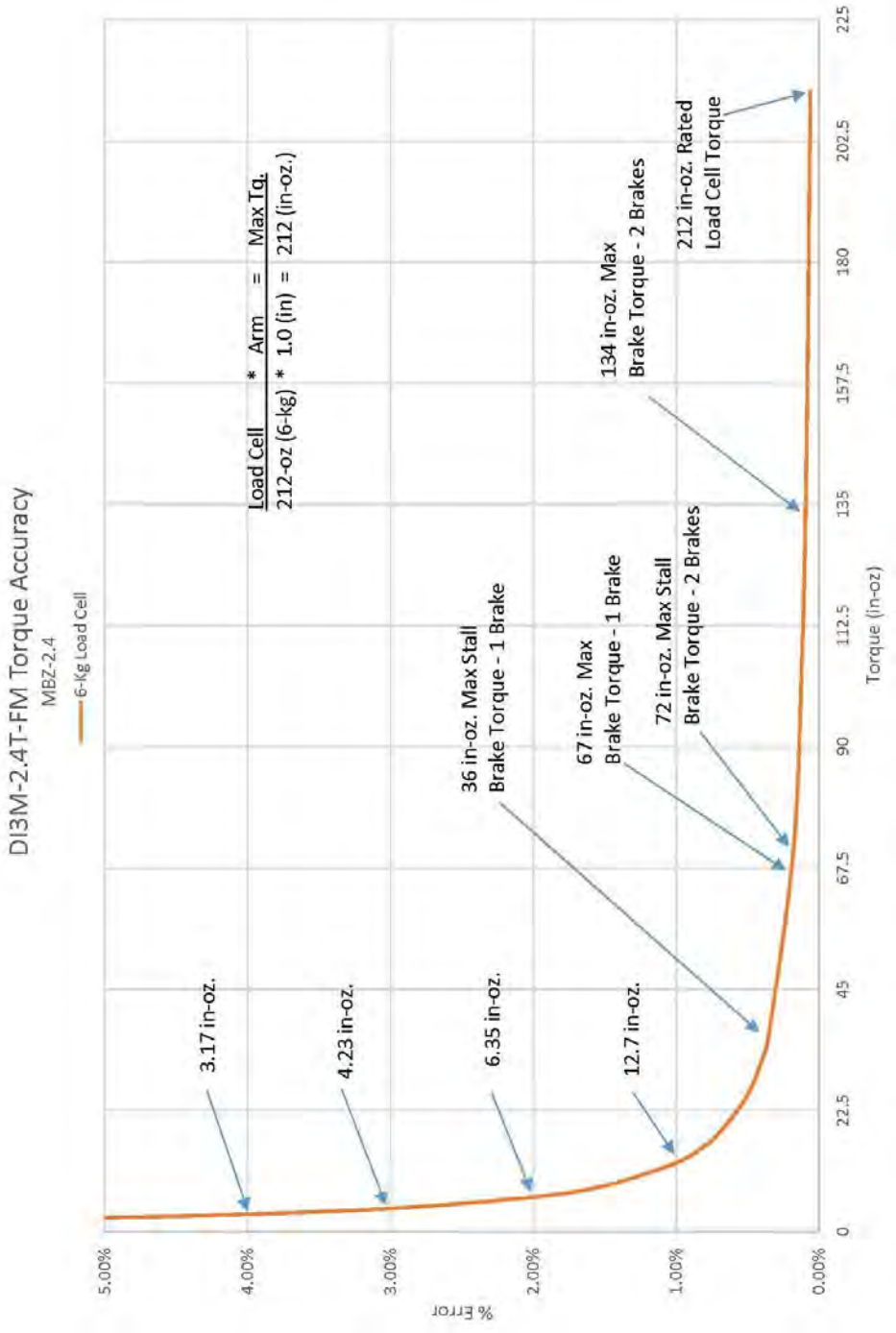
4. LOAD CELL (DI3M-2.4T-FM, Measure Motor Torque)

Load Cell Load Rating ..... 212 oz. (6 kg)
Arm Length ..... 1.0 inches (2.54 cm)
Max Brake Torque ..... 134 in-oz. (94.6 N-cm)
Max Torque to L.C ..... 212 in-oz. (150 N-cm)
Non-Linearity ..... 0.02% of R.O.
Hysteresis ..... 0.02% of R.O.
Non-Repeatability ..... 0.02% of R.O.
Zero Balance ..... ±1% of R.O.
Compensated Temperature Range ..... 14°F to 104°F
Safe Temperature Range ..... 14°F to 140°F
Temperature Effect on Output ..... 0.002% of Load/°F
Temperature Effect on Zero ..... 0.002% of Load/°F
Safe Overload ..... 150% of R.O.*

* Hard stops are in place to help prevent damage from over-load.

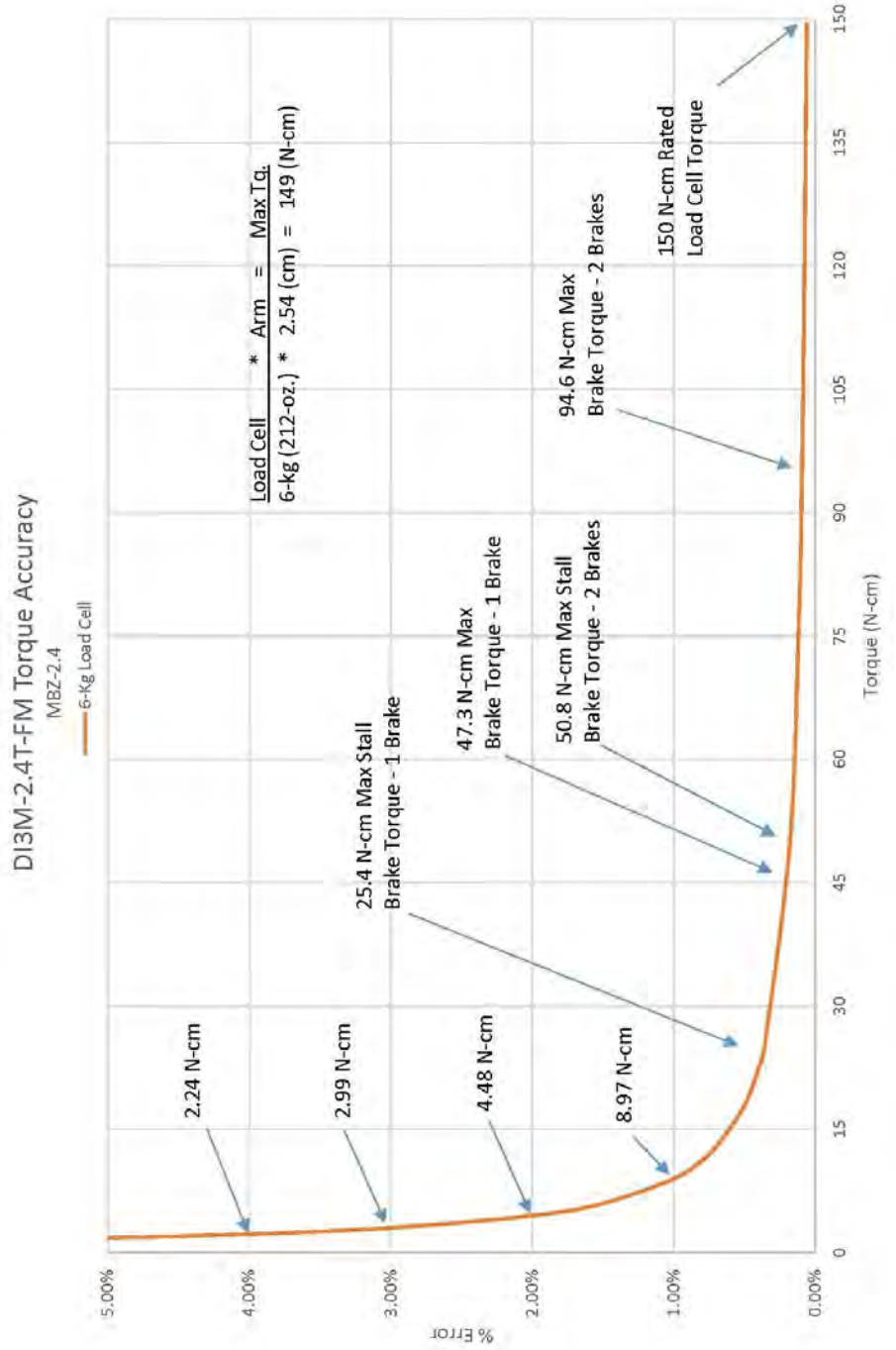
4.1 Load Cell Accuracy Plot (in-oz.)

The Torque Error plot shows the percentage error as a function of measured torque. These plots show the range that a load cell will accurately measure. The maximum torque to the motor is based on the maximum torque from the brake. The error plot is based on published data from the load cell vendor.



4.2 Load Cell Accuracy Plot (N-cm)

The Torque Error plot shows the percentage error as a function of measured torque. These plots show the range that a load cell will accurately measure. The maximum torque to the motor is based on maximum torque from the brake. The error plot is based on published data from the load cell vendor.



5. SPEED MEASUREMENT

A standard brake has five magnets (alternative quantity are optional) which trigger a hall effect sensor. The speed is averaged over one revolution of the brake. A 48-MHZ clock is used to measure the time between magnets.

Parameter	Conditions	Min.	Typ.	Max.	Units
Clock Error	~25°C		±30		PPM
	-10°C to 60°C		±50		PPM
	-40°C to 85°C		±100		PPM
Brake Speed	5 magnets	12		180*	KPM
	30 magnets	2		30*	KPM

* Theoretical speed; actual maximum speed is limited to the speed of the brake.

6. DATA SAMPLING

Sampling is the frequency of measuring and recording data; this rate is adjustable by the operator.

Parameter	Conditions	Min.	Typ.	Max.	Units
Sampling Rate	2.3 GHz Proc.	20	50	-	ms

i.e. 50 ms = 20 samples (or readings) per second.

7. LAPTOP COMPUTER

Parameter	Conditions	Min.	Typ.	Max.	Units
Processor		2.3			GHz
Memory		8			GB
Display	LED LCD		15.6		inches

8. POWER REQUIREMENTS

The MBS Dynamometer requires two 115 or 230 VAC power outlets: one for the laptop computer and one for the controller. The brakes in the dynamometer structure receive power from the controller.

Item	Voltage	Type	Current (amps)	Freq. (Hz)	# Plugs
Controller	115/230	VAC	1.1/0.6	50/60	1
Laptop	110-240	VAC	1.2	50/60	1
Dynamometer	24	VDC	6.0	-	none

9. DC VOLTAGE TRANSDUCERS

9.1 Input

Range ..... 0 VDC to: 1, 5, 10, 50, 150, 200 up to 600 VDC
Overload ..... 2x voltage range selected
Frequency Range ..... DC only

9.2 Output

Basic Accuracy 1.0%
Linearity..... ..... 10% to 100% F.S.
Thermal Drift ..... 500 PPM/°C
Response Time ..... 250 ms

9.3 Environmental and Physical Characteristics

Operating Temperature ..... 0°C to +50°C
Insulation Category ..... CAT II
Vibration Tested to ..... IEC 60068-2-6, 1995
Pollution Degree 2
Altitude ..... 2000-meter max.
Insulation Voltage ..... 2500 VDC
MTBF ..... Greater than 100K hours
Relative Humidity ..... 5% to 95%, non-condensing
Weight ..... 0.5 lbs.

10. AC VOLTAGE TRANSDUCERS – SINGLE PHASE

10.1 Input

Range ..... 0 VAC to: 50, 150, 250, 500, 600 VAC
Overload ..... 2x voltage range selected
Frequency Range ..... 20 Hz to 5 kHz

10.2 Output

Basic Accuracy 0.5%
Linearity ..... 10% to 100% F.S.
Calibration ..... True RMS sensing
Thermal Drift ..... 500 PPM/°C
Response Time ..... 250 ms

10.3 Environmental and Physical Characteristics

Operating Temperature ..... 0°C to +60°C
Insulation Category ..... CAT II
Vibration Tested to ..... IEC 60068-2-6, 1995
Pollution Degree 2
Altitude ..... 2000-meter max.
Insulation Voltage ..... 2500 VDC
MTBF..... Greater than 100K hours
Relative Humidity ..... 5% to 95%, non-condensing
Weight ..... 0.5 lbs.

11. DC CURRENT TRANSDUCERS (Split Core)

11.1 Input

Range	0 ADC to: 2, 5, 10, 20, 30, 50, 75, 100
	up to 600 ADC
Overload	4x current range selected
Frequency Range	DC only

11.2 Output

Basic Accuracy	1.0%
Linearity	0% to 100% F.S.
Thermal Drift	500 PPM/°C
Response Time	250 ms

11.3 Environmental and Physical Characteristics

Operating Temperature	0°C to +50°C
Insulation Category	CAT II
Vibration Tested to	IEC 60068-2-6, 1995
Pollution Degree	2
Altitude	2000-meter max.
Insulation Voltage	2500 VDC
MTBF	Greater than 100K hours
Relative Humidity	5% to 95%, non-condensing
Weight	0.5 lbs.

12. AC CURRENT TRANSDUCERS – SINGLE PHASE (Split Core)

12.1 Input

Range	0 AAC to: 5, 10, 15, 20, 25, 30, 40, 50 up to
	600 AAC
Overload	4x current range selected
Frequency Range	20 Hz to 5 kHz

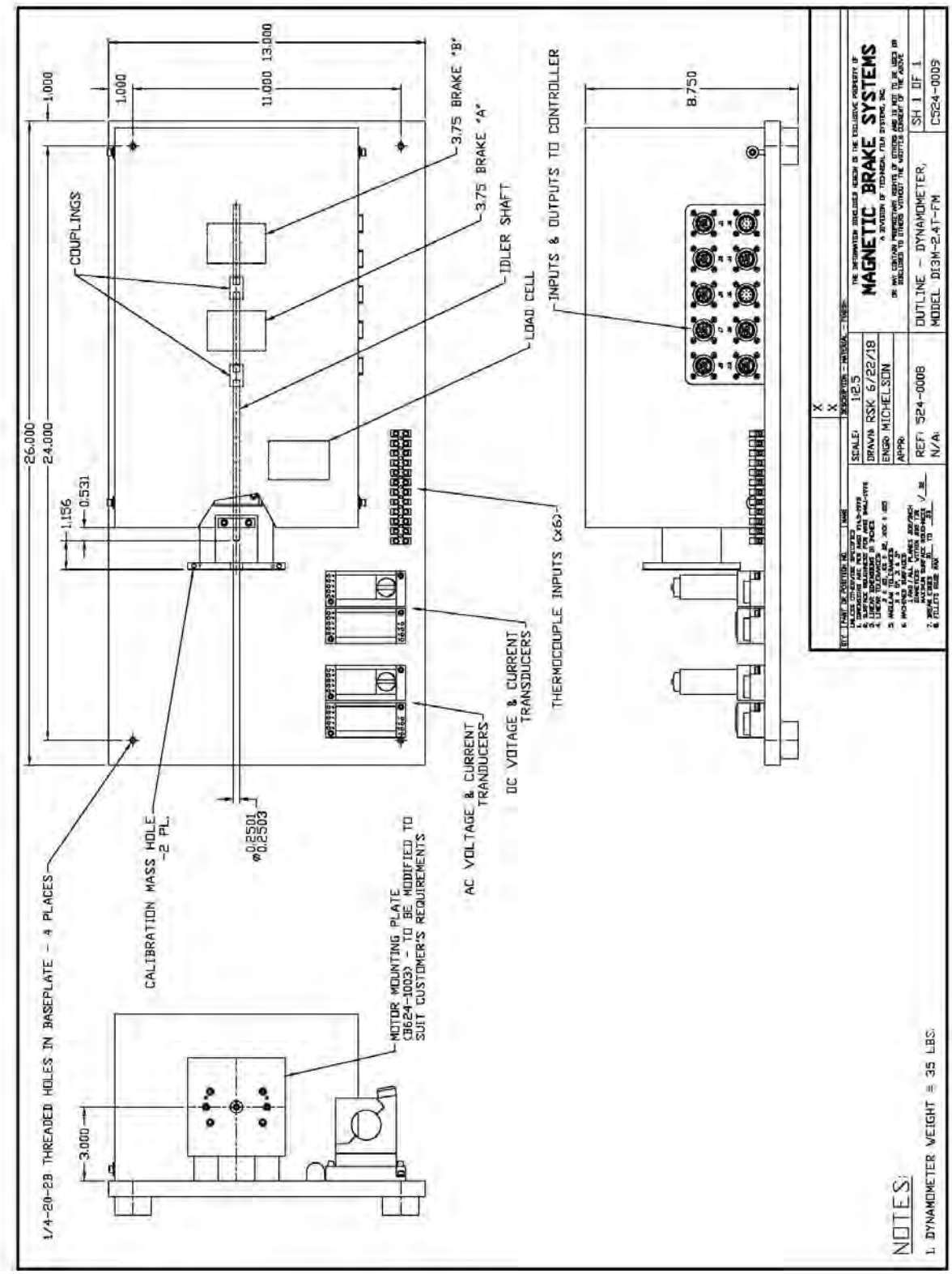
12.2 Output

Basic Accuracy	0.5%
Linearity	10% to 100% F.S.
Calibration	True RMS sensing
Thermal Drift	500 PPM/°C
Response Time	250 ms

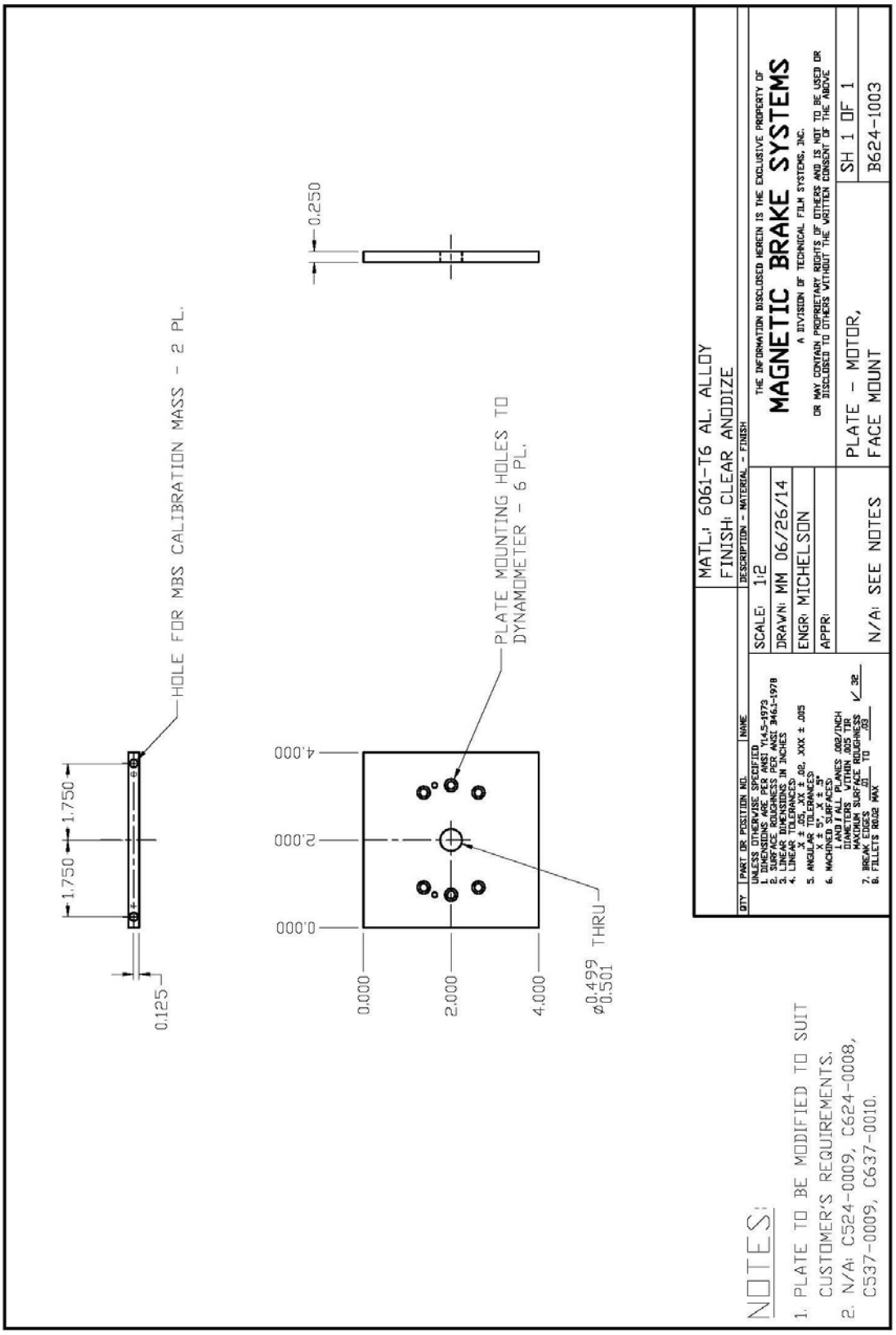
12.3 Environmental and Physical Characteristics

Operating Temperature	0°C to +60°C
Insulation Category	CAT II
Vibration Tested to	IEC 60068-2-6, 1995
Pollution Degree	2
Altitude	2000-meter max.
Insulation Voltage	2500 VDC
MTBF	Greater than 100K hours
Relative Humidity	5% to 95%, non-condensing
Weight	0.5 lbs.

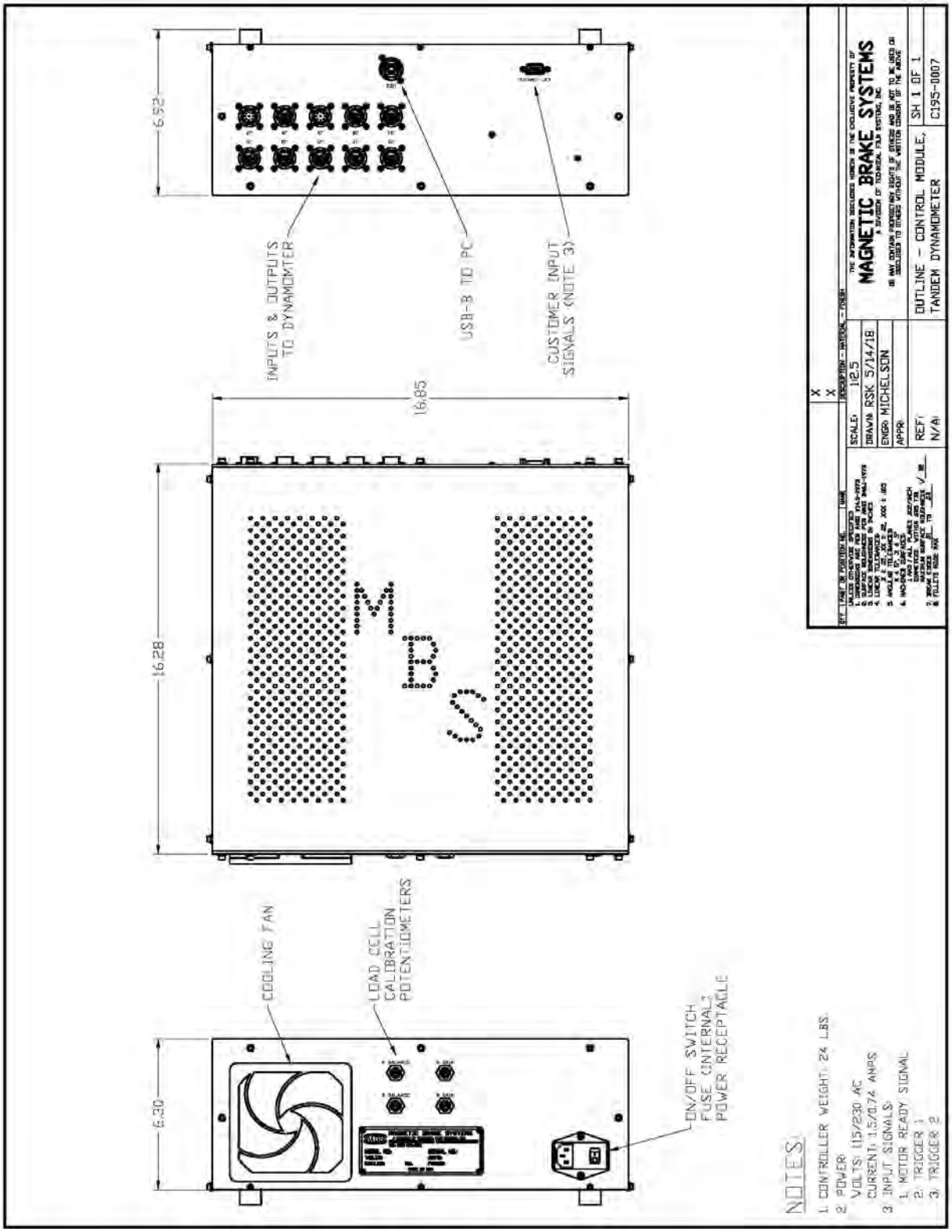
13. DYNAMOMETER LAYOUT – DB3M-2.4T-FM, LOAD CELL ON MOTOR



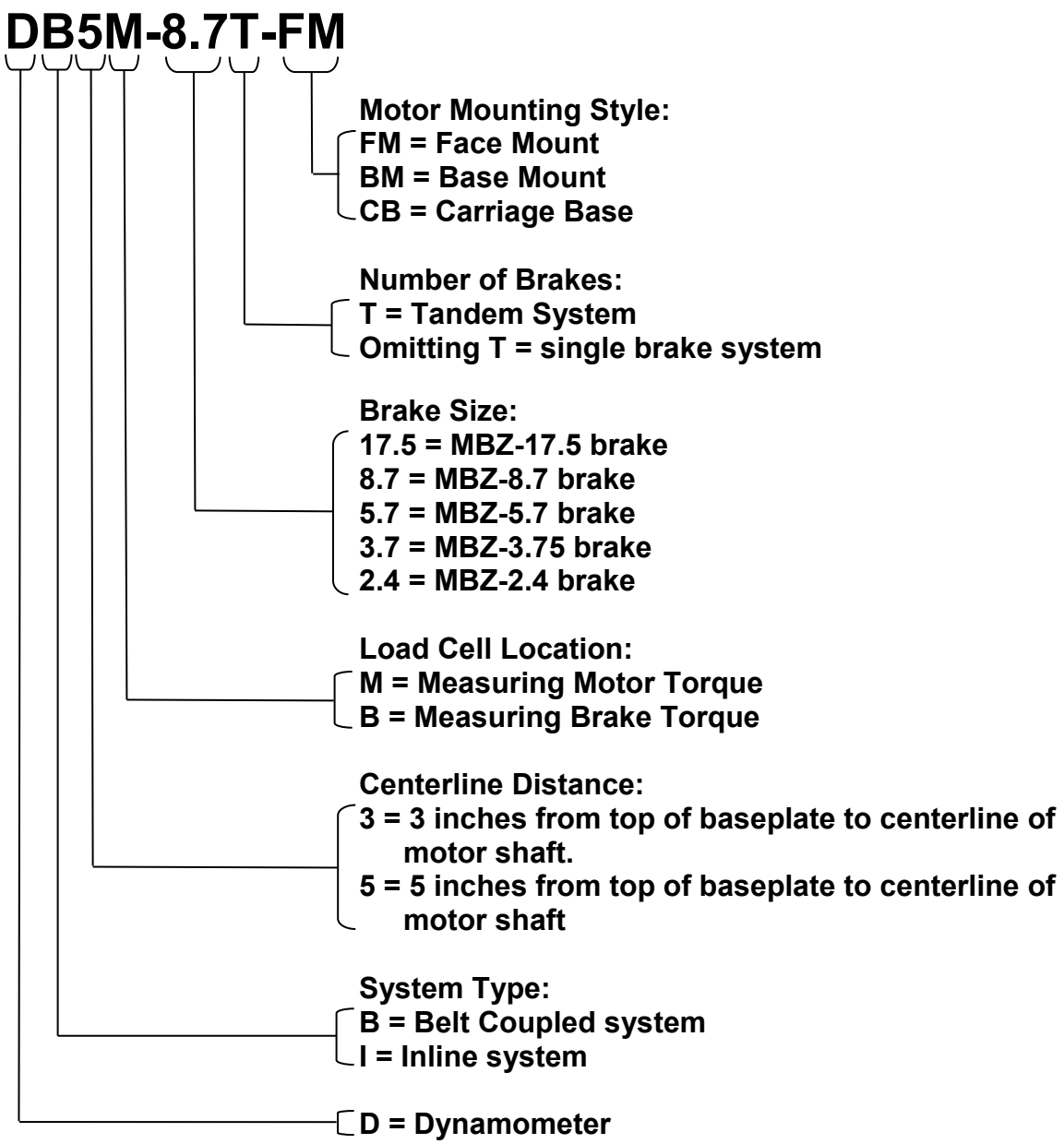
14. MOTOR MOUNTING PLATE



15. DYNAMOMETER CONTROLLER



16. NOMENCLATURE OF DYNAMOMETER PART NUMBER



The load cell(s) size(s) and type(s) of voltage & Current transducers are to be specified individually.