**MODELS:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Max continuous power dissipation</th>
<th>Max. Power for 30 seconds</th>
<th>Max continuous brake torque</th>
<th>Max brake speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB6B-3.75T-FM</td>
<td>3.3 HP (2.46 kilowatts)</td>
<td>4.5 HP (3.37 kilowatts)</td>
<td>540 in-oz. (381 N-cm)</td>
<td>12,000 RPM</td>
</tr>
<tr>
<td>DB6B-3.75T-BM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DB6M-3.75T-FM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DB6M-3.75T-BM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DYNAMOMETER DATA SHEET**

(Version 1.1)
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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. MBS systems do not require annual fees, licenses or permits. The software is user friendly, easily configurable (i.e. changing units, display scale limits, data acquisition rate, etc.) and has some safety precautions built 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 model 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.
A belt coupled system will provide a much broader range of torque/speed supplied to the motor under test, which makes a dynamometer more cost-effective and diverse than a direct drive system. The pulleys are mounted to the brake and an idler shaft, which the motor couples to. The idler shaft strictly provides a torsional load to the motor.

There are two options in load cell configurations for this system.

First option: motor load cell is included (i.e. DB6M-3.75T-FM or DB6M-3.75T-BM). In this system, the operator may exchange the motor load cell as required in order to provide the highest accuracy of measurement for a specific torque range. Accuracy plots may be viewed in Section 3: Motor Torque and Speed. The brakes also have their own load cell, which the controller for the brake uses to control the torque of the brake.

The software allows the operator to switch between reading/recording the motor torque and brake torque. In some cases, such as when a motor is placed in an environmental test chamber (the dynamometer remains outside the test chamber), it may not be possible to measure the motor torque.

Second option: motor load cell is not included (i.e. Model DB6B-3.75T-FM or DB6B-3.75T-BM). For this system, the motor torque is calculated by measuring the brake torque and multiplying by the transmission. Though belt friction, bearing friction and any other minor losses may not be accounted for in the measurements, the bearing friction is usually negligible and a properly aligned belt may have an efficiency as high as 98%. When measuring the brake torque, the air drag from the brake is not measured; however, the dynamometer software compensates for the air drag.

The motor torque, motor speed, voltage range, current range and power type(s) (i.e. DC, AC, AC-3ph) need to be specified when purchasing a dynamometer in order to select the types and limits for the measurement instruments. The following performance specifications for load cells, transducers, etc., are based on vendor specifications.

A certified calibration weight comes with each system. The zero torque and gain are adjusted by the operator as part of the calibration procedure. Calibration takes a couple of minutes and may be performed as often as desired. Customers may use calibrated weights to simulate a specific load to check for torque accuracy.
2. SPEED vs. TORQUE CURVE – FOR ONE MB-3.75 BRAKE
3. MOTOR TORQUE & SPEED

Systems that measure motor torque allow for three options for the load cell arm length: 2-inches, 3-inches, & 4-inches. Below are tables that list possible speed/torque combinations based on different pulley ratios:

3.1 Pulley Ratio’s (English Units)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>90</td>
<td>0</td>
<td>1:4</td>
<td>2</td>
<td>180</td>
<td>0</td>
<td>Cont.</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1,800</td>
<td>95</td>
<td>0.17</td>
<td>1:4</td>
<td>2</td>
<td>190</td>
<td>450</td>
<td>Cont.</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3,600</td>
<td>105</td>
<td>0.37</td>
<td>1:4</td>
<td>2</td>
<td>210</td>
<td>900</td>
<td>Cont.</td>
<td>2</td>
<td>2</td>
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<tr>
<td>12,000*</td>
<td>62.5</td>
<td>0.74</td>
<td>1:4</td>
<td>1</td>
<td>250</td>
<td>3,000</td>
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<td>2</td>
<td>1</td>
</tr>
<tr>
<td>12,000*</td>
<td>0.84</td>
<td>0.1</td>
<td>1:4</td>
<td>1</td>
<td>3.4***</td>
<td>3,000</td>
<td>Cont.</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1: Speed, Torque & Power (English Units) 4:1 ratio

<table>
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<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>360</td>
<td>0</td>
<td>1:1</td>
<td>2</td>
<td>180</td>
<td>0</td>
<td>Cont.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>1,800</td>
<td>450</td>
<td>0.8</td>
<td>1:1</td>
<td>2</td>
<td>225</td>
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<td>Cont.</td>
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<td>3</td>
</tr>
<tr>
<td>3,600</td>
<td>520</td>
<td>1.9</td>
<td>1:1</td>
<td>2</td>
<td>260</td>
<td>3,600</td>
<td>Cont.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>12,000</td>
<td>260</td>
<td>3.3</td>
<td>1:1</td>
<td>2</td>
<td>130</td>
<td>12,000</td>
<td>Cont.</td>
<td>4</td>
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<tr>
<td>12,000</td>
<td>40</td>
<td>0.5</td>
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<td>1</td>
<td>40***</td>
<td>12,000</td>
<td>Cont.</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2: Speed, Torque & Power (English Units) 1:1 ratio

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1,440</td>
<td>0</td>
<td>4:1</td>
<td>2</td>
<td>180</td>
<td>0</td>
<td>Cont.</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>1,000</td>
<td>2,160</td>
<td>2.1</td>
<td>4:1</td>
<td>2</td>
<td>270</td>
<td>4,000</td>
<td>Cont.</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>2,000</td>
<td>1,360</td>
<td>2.7</td>
<td>4:1</td>
<td>2</td>
<td>170</td>
<td>8,000</td>
<td>Cont.</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3,000</td>
<td>1,040</td>
<td>3.3</td>
<td>4:1</td>
<td>2</td>
<td>130</td>
<td>12,000</td>
<td>Cont.</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3,000</td>
<td>160</td>
<td>0.5</td>
<td>4:1</td>
<td>1</td>
<td>40***</td>
<td>12,000</td>
<td>Cont.</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 3: Speed, Torque & Power (English Units) 1:4 ratio

The table is based on the performance graph for the MB-3.75 Brake, shown in Section 2.
* Maximum speed is limited to the physical speed limits of the pulleys and belt.
** See Table 7 for load cell specifications based on the number shown.
*** Torque required to overcome the air drag of brake at speed; does not account for bearing friction or belt losses.
3.2 Pulley Ratio’s (SI Units)

<table>
<thead>
<tr>
<th>Motor Speed (RPM)</th>
<th>Motor Torque (Ncm)</th>
<th>Power (watts)</th>
<th>Pulley Ratio (M/B)</th>
<th>Qty. Brks</th>
<th>Brake Torque (Ncm)</th>
<th>Brake Speed (RPM)</th>
<th>Time</th>
<th>Mtr. Arm (cm)</th>
<th>L.C. Ref. #**</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>64</td>
<td>0</td>
<td>1:4</td>
<td>2</td>
<td>127</td>
<td>0</td>
<td>Cont.</td>
<td>5.08</td>
<td>2</td>
</tr>
<tr>
<td>1,800</td>
<td>67</td>
<td>127</td>
<td>1:4</td>
<td>2</td>
<td>134</td>
<td>450</td>
<td>Cont.</td>
<td>5.08</td>
<td>2</td>
</tr>
<tr>
<td>3,600</td>
<td>74</td>
<td>280</td>
<td>1:4</td>
<td>2</td>
<td>148</td>
<td>900</td>
<td>Cont.</td>
<td>5.08</td>
<td>2</td>
</tr>
<tr>
<td>12,000*</td>
<td>44</td>
<td>555</td>
<td>1:4</td>
<td>2</td>
<td>176</td>
<td>3,000</td>
<td>Cont.</td>
<td>5.08</td>
<td>2</td>
</tr>
<tr>
<td>12,000*</td>
<td>0.6</td>
<td>89</td>
<td>1:4</td>
<td>1</td>
<td>2.4***</td>
<td>3,000</td>
<td>Cont.</td>
<td>5.08</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4: Speed, Torque & Power (SI Units) 1:4 Pulley Ratio

<table>
<thead>
<tr>
<th>Motor Speed (RPM)</th>
<th>Motor Torque (Ncm)</th>
<th>Power (watts)</th>
<th>Pulley Ratio (M/B)</th>
<th>Qty. Brks</th>
<th>Brake Torque (Ncm)</th>
<th>Brake Speed (RPM)</th>
<th>Time</th>
<th>Mtr. Arm (cm)</th>
<th>L.C. Ref. #**</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>254</td>
<td>0</td>
<td>1:1</td>
<td>2</td>
<td>127</td>
<td>0</td>
<td>Cont.</td>
<td>7.62</td>
<td>3</td>
</tr>
<tr>
<td>1,800</td>
<td>318</td>
<td>600</td>
<td>1:1</td>
<td>2</td>
<td>159</td>
<td>1,800</td>
<td>Cont.</td>
<td>7.62</td>
<td>3</td>
</tr>
<tr>
<td>3,600</td>
<td>367</td>
<td>1,385</td>
<td>1:1</td>
<td>2</td>
<td>184</td>
<td>3,600</td>
<td>Cont.</td>
<td>7.62</td>
<td>3</td>
</tr>
<tr>
<td>12,000</td>
<td>198</td>
<td>2,486</td>
<td>1:1</td>
<td>2</td>
<td>99</td>
<td>12,000</td>
<td>Cont.</td>
<td>10.2</td>
<td>2</td>
</tr>
<tr>
<td>12,000</td>
<td>28</td>
<td>355</td>
<td>1:1</td>
<td>1</td>
<td>28***</td>
<td>12,000</td>
<td>Cont.</td>
<td>5.08</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5: Speed, Torque & Power (SI Units) 1:1 Pulley Ratio

<table>
<thead>
<tr>
<th>Motor Speed (RPM)</th>
<th>Motor Torque (Ncm)</th>
<th>Power (watts)</th>
<th>Pulley Ratio (M/B)</th>
<th>Qty. Brks</th>
<th>Brake Torque (Ncm)</th>
<th>Brake Speed (RPM)</th>
<th>Time</th>
<th>Mtr. Arm (cm)</th>
<th>L.C. Ref. #**</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1,017</td>
<td>0</td>
<td>4:1</td>
<td>2</td>
<td>127</td>
<td>0</td>
<td>Cont.</td>
<td>10.2</td>
<td>6</td>
</tr>
<tr>
<td>1,000</td>
<td>1,525</td>
<td>1,600</td>
<td>4:1</td>
<td>2</td>
<td>191</td>
<td>4,000</td>
<td>Cont.</td>
<td>10.2</td>
<td>7</td>
</tr>
<tr>
<td>2,000</td>
<td>960</td>
<td>2,012</td>
<td>4:1</td>
<td>1</td>
<td>120</td>
<td>8,000</td>
<td>Cont.</td>
<td>10.2</td>
<td>5</td>
</tr>
<tr>
<td>3,000</td>
<td>790</td>
<td>2486</td>
<td>4:1</td>
<td>2</td>
<td>99</td>
<td>12,000</td>
<td>Cont.</td>
<td>10.2</td>
<td>5</td>
</tr>
<tr>
<td>3,000</td>
<td>113</td>
<td>355</td>
<td>4:1</td>
<td>1</td>
<td>28***</td>
<td>12,000</td>
<td>Cont.</td>
<td>10.2</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 6: Speed, Torque & Power (SI Units) 4:1 Pulley Ratio

The table is based on the performance graph for the MB-3.75 Brake, shown in Section 2.
* Maximum speed is limited to the physical speed limits of the pulleys and belt.
** See Table 7 for load cell specifications based on the number shown.
*** Torque required to overcome the air drag of brake at speed; does not account for bearing friction or belt losses.
### 3.3 Load Cell Size

The load cell(s) for the system should be specified by their load rating (column 2 or 3). Sections 5.1 & 5.2 has the data for the listed load cells.

<table>
<thead>
<tr>
<th>Load Cell Ref. #</th>
<th>Load Rating (lbs.)</th>
<th>Load Rating (Kg.)</th>
<th>Arm (inches [cm])</th>
<th>Max Torque (in-lbs.)</th>
<th>Max Torque (in-oz.)</th>
<th>Max Torque (Ncm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.2</td>
<td>1</td>
<td>2 [5.08]</td>
<td>4.4</td>
<td>70.5</td>
<td>49.8</td>
</tr>
<tr>
<td>1</td>
<td>2.2</td>
<td>1</td>
<td>3 [7.62]</td>
<td>6.6</td>
<td>106</td>
<td>74.7</td>
</tr>
<tr>
<td>1</td>
<td>2.2</td>
<td>1</td>
<td>4 [10.16]</td>
<td>8.8</td>
<td>141</td>
<td>99.6</td>
</tr>
<tr>
<td>2</td>
<td>4.4</td>
<td>2</td>
<td>2 [5.08]</td>
<td>8.8</td>
<td>141</td>
<td>99.6</td>
</tr>
<tr>
<td>2</td>
<td>4.4</td>
<td>2</td>
<td>3 [7.62]</td>
<td>13.3</td>
<td>212</td>
<td>149</td>
</tr>
<tr>
<td>2</td>
<td>4.4</td>
<td>2</td>
<td>4 [10.16]</td>
<td>17.7</td>
<td>282</td>
<td>199</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
<td>5</td>
<td>2 [5.08]</td>
<td>17.7</td>
<td>353</td>
<td>249</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
<td>5</td>
<td>3 [7.62]</td>
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<td>374</td>
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<tr>
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<td>11</td>
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<td>22</td>
<td>10</td>
<td>2 [5.08]</td>
<td>44.3</td>
<td>705</td>
<td>498</td>
</tr>
<tr>
<td>5</td>
<td>22</td>
<td>10</td>
<td>3 [7.62]</td>
<td>66.4</td>
<td>1058</td>
<td>747</td>
</tr>
<tr>
<td>5</td>
<td>22</td>
<td>10</td>
<td>4 [10.16]</td>
<td>88.5</td>
<td>1411</td>
<td>966</td>
</tr>
<tr>
<td>6</td>
<td>33</td>
<td>15</td>
<td>2 [5.08]</td>
<td>66.4</td>
<td>1058</td>
<td>747</td>
</tr>
<tr>
<td>6</td>
<td>33</td>
<td>15</td>
<td>3 [7.62]</td>
<td>100</td>
<td>1587</td>
<td>1121</td>
</tr>
<tr>
<td>6</td>
<td>33</td>
<td>15</td>
<td>4 [10.16]</td>
<td>133</td>
<td>2116</td>
<td>1495</td>
</tr>
<tr>
<td>7</td>
<td>44</td>
<td>20</td>
<td>2 [5.08]</td>
<td>88.5</td>
<td>1411</td>
<td>996</td>
</tr>
<tr>
<td>7</td>
<td>44</td>
<td>20</td>
<td>3 [7.62]</td>
<td>133</td>
<td>2116</td>
<td>1495</td>
</tr>
<tr>
<td>7</td>
<td>44</td>
<td>20</td>
<td>4 [10.16]</td>
<td>177</td>
<td>2822</td>
<td>1993</td>
</tr>
</tbody>
</table>

*Table 7: Load Cell Reference*

The following sections, 4 & 5, are the specifications for the different types of load cells.
4. LOAD CELLS (DB6B-3.75T-FM, Measuring Brake Torque)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load Cell Load Rating</td>
<td>176.4 oz. (5 kg)</td>
</tr>
<tr>
<td>Arm Length</td>
<td>3.00 inches (7.62 cm)</td>
</tr>
<tr>
<td>Rated torque of Load Cell</td>
<td>530 in-oz. (374 N-cm)</td>
</tr>
<tr>
<td>Safe Overload torque of Load Cell</td>
<td>795 in-oz. (562 N-cm)</td>
</tr>
<tr>
<td>Max Brake Torque</td>
<td>300 in-oz. (212 N-cm)</td>
</tr>
<tr>
<td>Non-Linearity</td>
<td>0.02% of Rated Output (R.O.)</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>0.02% of R.O.</td>
</tr>
<tr>
<td>Non-Repeatability</td>
<td>0.02% of R.O.</td>
</tr>
<tr>
<td>Zero Balance</td>
<td>±5% of R.O.</td>
</tr>
<tr>
<td>Compensated Temperature Range</td>
<td>14°F to 104°F</td>
</tr>
<tr>
<td>Safe Temperature Range</td>
<td>14°F to 140°F</td>
</tr>
<tr>
<td>Temperature Effect on Output</td>
<td>0.002% of Load/°F</td>
</tr>
<tr>
<td>Temperature Effect on Zero</td>
<td>0.002% of Load/°F</td>
</tr>
<tr>
<td>Safe Overload</td>
<td>150% of R.O.*</td>
</tr>
</tbody>
</table>

* Hard stops are in place to help prevent damage from over-load.
4.1 Brake Load Cell Accuracy Plot (in-oz.) – Linear
DB6B-3.75_Torque Accuracy

5-kg Load Cell Measuring Torque of one MBZ-3.75 Brake

Load Cell * Arm = Max Tq
5-kg (177-oz) * 7.62 (cm) = 373 (Ncm)

Max Brake Torque: 211 Ncm
Max Load Cell Rating: 373 Ncm
5. LOAD CELLS (DB6M-3.75T-FM, Measuring Motor Torque):

For section 5.1 & 5.2, reference Table 7, in section 3.3 Load Cell Sizes.

5.1 Load Cell #'s 1 through 3:

- Safe Overload ...................................................... 150% of R.O.*
- Non-Linearity ............................................................. 0.02% of Rated Output (R.O.)
- Hysteresis ............................................................... 0.02% of R.O.
- Non-Repeatability ...................................................... 0.02% of R.O.
- Zero Balance ............................................................. ±5% 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

5.2 Load Cell #'s 4 through 7:

- Safe Overload ...................................................... 150% of R.O.*
- Non-Linearity ............................................................. 0.02% of Rated Output (R.O.)
- Hysteresis ............................................................... 0.02% of R.O.
- Non-Repeatability ...................................................... 0.02% of R.O.
- Zero Balance ............................................................. ±1% mV/V
- 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

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

The Torque Accuracy plots to follow show the percentage error as a function of measured torque. These plots show the range that the load cell selected will accurately measure, based on published data from vendor. Plots are shown on a linear scale and, for clarity, on a logarithmic scale. The maximum torque to the motor is based on the pulley ratio selected for belt coupled systems.
### 5.3 Motor Load Cell Accuracy Plots (in-oz, 4-inch arm) - Linear

#### DB6M-3.75T-FM_Torque Accuracy

*Various load cells measuring motor torque w/ 4-inch arm*

<table>
<thead>
<tr>
<th>Load Cell * Arm</th>
<th>Max Tq. (lbs [kg])</th>
<th>Max Tq. (in-lbs [in-oz])</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2 [1] * 4</td>
<td>8.8 [141]</td>
<td></td>
</tr>
<tr>
<td>4.4 [2] * 4</td>
<td>18 [288]</td>
<td></td>
</tr>
<tr>
<td>22 [10] * 4</td>
<td>89 [1,416]</td>
<td></td>
</tr>
<tr>
<td>44 [20] * 4</td>
<td>177 [2,832]</td>
<td></td>
</tr>
</tbody>
</table>

**Motor Load Cell Load:**

2,832 in-oz.

**Max Torque:**

270 in-oz x 2 brakes,
4:1 ratio = 2,160 in-oz to motor

**Max Stall Torque (1B):**

180 in-oz stall Tq x 1 Brake,
4:1 ratio = 720 in-oz to motor

**Max Stall Torque (2B):**

180 in-oz stall Tq x 2 Brakes,
4:1 ratio = 1,440 in-oz to motor

**Max Power Dissipation:**

130 in-oz x 2 brakes,
1:1 ratio = 360 in-oz to motor

**Graph Details:**

- Motor torque range: 0 to 3,000 in-oz
- Load cell range: 1-Kg to 20-Kg
- Arm length: 4 inches
- Percentage error range: 0.00% to 5.00%

**Plot Description:**

- The graph shows the accuracy of different load cells measuring motor torque with a 4-inch arm.
- The accuracy is measured in terms of percentage error for various load cell capacities and torque values.
5.4 Motor Load Cell Accuracy Plots (in-oz., 4-in. arm) – Logarithmic

DB6M-3.75T-FM_Torque Accuracy
various load cells measuring motor torque w/ 4-inch arm

Highest torque = 2,160 in-oz
(x2 brakes, 4:1 ratio)

<table>
<thead>
<tr>
<th>Load Cell</th>
<th>Arm</th>
<th>Max Tq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>lbs [kg]</td>
<td>in.</td>
<td>in-lbs [in-oz]</td>
</tr>
<tr>
<td>2.2 [1]</td>
<td>4</td>
<td>8.8 [141]</td>
</tr>
<tr>
<td>4.4 [2]</td>
<td>4</td>
<td>18 [288]</td>
</tr>
<tr>
<td>11 [5]</td>
<td>4</td>
<td>44 [704]</td>
</tr>
<tr>
<td>13 [6]</td>
<td>4</td>
<td>53 [848]</td>
</tr>
<tr>
<td>22 [10]</td>
<td>4</td>
<td>89 [1,416]</td>
</tr>
<tr>
<td>44 [20]</td>
<td>4</td>
<td>177 [2,832]</td>
</tr>
</tbody>
</table>
5.5 Motor Load Cell Accuracy Plots (N-cm, 10.16-cm arm) – Linear

Max Power Dissipation:
92 Ncm x 2 brakes,
1:1 ratio = 184 Ncm to motor

Max Stall Torque (2B):
127 Ncm stall Tq x 2 brakes,
4:1 ratio = 1,016 Ncm to motor

Max Stall Torque (1B):
127 Ncm stall Tq x 1 brake,
4:1 ratio = 508 Ncm to motor

Load Cell * Arm = Max Tq.

<table>
<thead>
<tr>
<th>Load Cell</th>
<th>Arm</th>
<th>Max Tq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 [2.2]</td>
<td>10.16</td>
<td>100</td>
</tr>
<tr>
<td>2 [4.4]</td>
<td>10.16</td>
<td>200</td>
</tr>
<tr>
<td>10 [22]</td>
<td>10.16</td>
<td>1,000</td>
</tr>
<tr>
<td>15 [33]</td>
<td>10.16</td>
<td>1,500</td>
</tr>
<tr>
<td>20 [44]</td>
<td>10.16</td>
<td>2,000</td>
</tr>
</tbody>
</table>

Max Torque:
191 Ncm x 2 brakes, 4:1 ratio
= 1,525 Ncm to motor

Max Load Cell Load:
2,000 Ncm
5.6 Motor Load Cell Accuracy Plots (N-cm, 10.16-cm arm) - Logarithmic

DB6M-3.75T-FM_Torque Accuracy
various load cells measuring motor torque w/ 4-inch arm

<table>
<thead>
<tr>
<th>Load Cell (kg [lbs])</th>
<th>Arm (cm)</th>
<th>Max Tq. (Ncm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 [2.2]</td>
<td>10.16</td>
<td>100</td>
</tr>
<tr>
<td>2 [4.4]</td>
<td>10.16</td>
<td>200</td>
</tr>
<tr>
<td>6 [13]</td>
<td>10.16</td>
<td>600</td>
</tr>
<tr>
<td>10 [22]</td>
<td>10.16</td>
<td>1,000</td>
</tr>
<tr>
<td>15 [33]</td>
<td>10.16</td>
<td>1,500</td>
</tr>
<tr>
<td>20 [44]</td>
<td>10.16</td>
<td>2,000</td>
</tr>
</tbody>
</table>

Max Torque to Motor
1,525 Ncm
(x2 brakes, 4:1 ratio)
5.7 Motor Load Cell Accuracy Plots (in-oz, 2-inch arm) – Linear

Max Load Cell Load: 1,408 in-oz.

Max Stall Torque (18):
180 in-oz stall Tq x 1 Brake,
4:1 ratio = 720 in-oz to motor

Max Power Dissipation:
130 in-oz x 2 brakes,
1:1 ratio = 360 in-oz to motor

180 in-oz x 2 brakes,
1:1 ratio = 360 in-oz to motor

Load Cell * Arm = Max Tq. (lbs [kg]) (in.) (in-lbs [in-oz])
2.2 [1] * 2 = 4.4 [270]
4.4 [2] * 2 = 8.8 [141]
11 [5] * 2 = 22 [352]
22 [10] * 2 = 44 [704]
33 [15] * 2 = 66 [1,056]
44 [20] * 2 = 88 [1,408]
5.8 Motor Load Cell Accuracy Plots (in-oz, 2-inch arm) – Logarithmic
5.9 Motor Load Cell Accuracy Plots (N-cm, 5.08-cm arm) – Linear

Max Power Dissipation:
92 Ncm x 2 brakes,
1:1 ratio = 184 Ncm to motor

Max Stall Torque (18):
127 Ncm stall Tq x 1 brake,
4:1 ratio = 508 Ncm to motor

Max Load Cell Load:
1,000 Ncm
5.10 Motor Load Cell Accuracy Plots (N-cm, 5.08-cm arm) – Logarithmic
6. SPEED MEASUREMENT

A standard brake has five magnets (alternative quantity or an external encoder is 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 (or pulses).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clock Error</td>
<td>~25°C</td>
<td>±30</td>
<td></td>
<td>PPM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-10°C to 60°C</td>
<td>±50</td>
<td></td>
<td>PPM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-40°C to 85°C</td>
<td>±100</td>
<td></td>
<td>PPM</td>
<td></td>
</tr>
<tr>
<td>Brake Speed</td>
<td>5 magnets</td>
<td>12</td>
<td>180,000*</td>
<td>RPM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30 magnets</td>
<td>2</td>
<td>30,000*</td>
<td>RPM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,000 PPR</td>
<td>0.066</td>
<td>5,000</td>
<td>RPM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2,000 PPR</td>
<td>0.033</td>
<td>2,000</td>
<td>RPM</td>
<td></td>
</tr>
</tbody>
</table>

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

7. DATA SAMPLING

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling Rate</td>
<td>2.3 GHz Proc.</td>
<td>20</td>
<td>50</td>
<td>-</td>
<td>ms</td>
</tr>
</tbody>
</table>

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

8. LAPTOP COMPUTER

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>2.3</td>
<td>GHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>8</td>
<td>GB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>LED LCD</td>
<td>15.6</td>
<td>inches</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A computer with a more powerful processor may allow a higher sampling frequency.

9. 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. The AC power supplies the power supplies and cooling fan in the controller; everything else is 24 VDC (or less) in the system.

<table>
<thead>
<tr>
<th>Item</th>
<th>Voltage</th>
<th>Type</th>
<th>Current (amps)</th>
<th>Freq. (Hz)</th>
<th># Plugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller</td>
<td>115/230</td>
<td>VAC</td>
<td>1.1/0.6</td>
<td>50/60</td>
<td>1</td>
</tr>
<tr>
<td>Laptop</td>
<td>110-240</td>
<td>VAC</td>
<td>1.2</td>
<td>50/60</td>
<td>1</td>
</tr>
<tr>
<td>Dynamometer</td>
<td>24</td>
<td>VDC</td>
<td>4.5</td>
<td>-</td>
<td>none</td>
</tr>
</tbody>
</table>
10. DC VOLTAGE TRANSDUCERS

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

The range represents transducers that measure from 0-1 VDC, 0-5 VDC, 0-10 VDC, etc.

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

10.3 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.
11. AC VOLTAGE TRANSDUCERS – SINGLE PHASE

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

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

11.3 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.

12. DC CURRENT TRANSDUCERS (Split Core)

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

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

12.3 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.
13. AC CURRENT TRANSDUCERS – SINGLE PHASE (Split Core)

13.1 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

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

13.3 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.
14. DYNAMOMETER – DB6B-3.75T-FM, LOAD CELL ON BRAKES

NOTES:
1. 

MAGNETIC BRAKE SYSTEMS

DB6-3.75T Data Sheet

Page 26 of 33
1. Plate to be modified to suit customer's requirements.
16. **DYNAMOMETER – DB6M-3.75T-FM, LOAD CELL ON MOTOR (OPTION 1)**
17. MOTOR MOUNTING PLATE - FACE MOUNT (DB6M)

REVISIONS

<table>
<thead>
<tr>
<th>LETTER</th>
<th>DESCRIPTION</th>
<th>BY</th>
<th>DATE</th>
<th>APPROVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>CHANGED FLATNESS TOLERANCE.</td>
<td>RSK</td>
<td>9/06/19</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. PLATE TO BE MODIFIED TO SUIT CUSTOMER'S REQUIREMENTS.

MATERIAL: 6061-T6 AL ALLOY
FINISH: CLEAR ANODIZE PER MIL-A-8625 TYPE II, CL I

SCALE: 1:2
DRAWN: MM 06/26/14
ENG: MICHELSON
APPR: 

REF: 624-0001
N/A: SEE NOTES
BASE PLATE - FACE MOUNT, MODEL 2.4
SH 1 OF 1
B624-1003A

UNLESS SHOWN OTHERWISE:
1. DIMENSIONS ARE IN MILLIMETERS
2. SURFACE ROUGHNESS PER ANSI B46.1-1973
3. LINEAR TOLERANCES
4. ANGULAR TOLERANCES
5. MACHINED SURFACES:
   1. MILL TO 0.002 INCH
   2. MILL TO 0.002 INCH MINUS 0.001 INCH
6. MACHINED SURFACES:
   1. MILL TO 0.002 INCH
   2. MILL TO 0.002 INCH MINUS 0.001 INCH
7. MADIMUM SURFACE ROUGHNESS LF 30
8. FILLETS 0.032 MAX

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18. DYNAMOMETER– DB6M-3.75T-BM, LOAD CELL ON MOTOR (OPTION 2)
19. MOTOR MOUNTING PLATE – BASE MOUNT (DB6M)

NOTES:
1. REFER TO DRAWING 624-1003A FOR 624-1029 MOUNTING HOLE DIMENSIONS.
20. CONTROLLER LAYOUT

NOTES:
1. CONTROLLER WEIGHT: 24 LBS.
2. POWER:
   VOLTS: 115/230 AC
   CURRENT: 1.5/0.74 AMPS
3. INPUT SIGNALS:
   1. MOTOR READY SIGNAL (REMOTE START)
   2. TRIGGER 1
   3. TRIGGER 2
   4. LOAD CELL AND SPEED SIGNAL OUTPUT SIGNALS (OPTIONAL).

LOAD CELL CALIBRATION POTENTIOMETERS

COOLING FAN

DN/OFF SWITCH
FUSE (INTERNAL)
POWER RECEPTACLE

INPUTS & OUTPUTS TO DYNAMOMETER

USB-A (TO PC)

REMOTE SIGNALS (NOTE 3)
21. NOMENCLATURE OF DYNAMOMETER MODEL NUMBER

DB6M-8.7T-FM

Motor Mounting Style:
FM = Face Mount
BM = Base Mount
CB = Carriage Base

Number of Brakes:
T = Tandem System
Omitting T = single brake system

Brake Size:
17.5 = MBZ-17.5 brake
8.7 = MBZ-8.7 brake
5.7 = MBZ-5.7 brake
3.7 = MBZ-3.75 brake
2.4 = MBZ-2.4 brake

Load Cell Location:
M = Measuring Motor Torque
B = Measuring Brake Torque

Centerline Distance:
3 = 3 inches from top of baseplate to centerline of motor shaft.
6 = 6 inches from top of baseplate to centerline of motor shaft

System Type:
B = Belt Coupled system
I = Inline system
D = Dynamometer

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