

WB/PB 15 Series Eddy-Current and Powder Dynamometers

FEATURES

- 7 Models with Maximum Torque from 140 N·m to 1200 N·m (103 lb·ft to 885 lb·ft)
- Braking Power: 12 kW to 140 kW
- Stable Braking Torque, without Shock
- Low Moment of Inertia
- Low Residual Torque
- Operation in Either Rotational Direction
- Braking Torque Measurement Included
- High Rotational Speed
- Rated Torque Available From Zero Speed (Powder Dynamometers)
- Integrated Optical Speed Sensor

DESCRIPTION

Eddy-Current Brake Dynamometers (WB series) are ideal for applications requiring high speeds and also when operating in the middle to high power range. Eddy-Current Brakes provide increasing torque as the speed increases, reaching peak torque at rated speed. The dynamometers have low inertia as a result of small rotor diameter. Brake cooling is provided by a water circulation system, which passes inside the stator to dissipate heat generated by the braking power. The water cooling in the WB provides high continuous power ratings (max. 140 kW).

Powder Brake Dynamometers (PB series) are ideal for applications operating in the low to middle speed range or when operating in the middle to high torque range. Powder Brakes provide full torque at zero speed and are water-cooled, allowing for power ratings up to 48 kW. Both WB and PB Dynamometers have accuracy ratings of $\pm 0.3\%$ to $\pm 0.5\%$ full scale, depending on size and system configuration.

APPLICATIONS

Mounted on test benches, WB/PB 15 Series Dynamometers allow performance and reliability testing on driving elements such as electric motors, combustion engines, servomotors, geared motors, reduction gears, pneumatic equipment, hydraulic transmission systems, starter motors, electromagnetic clutches, gas turbines and turbocompressors.



*Model 2WB 15
Eddy-Current Dynamometer*

MOTOR TESTING SYSTEMS

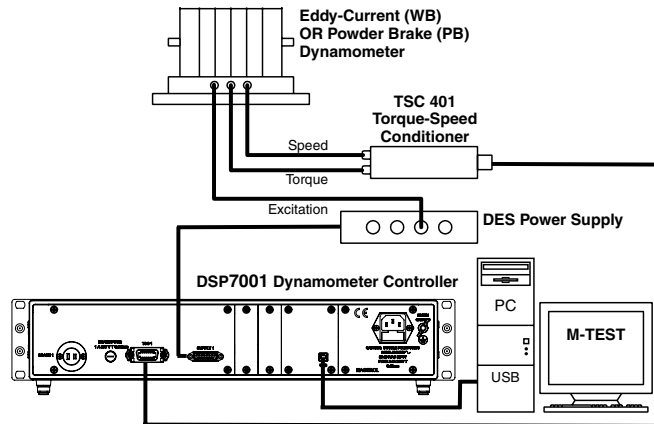
Magtrol's M-TEST 7 Software is a state-of-the-art motor testing program for Windows®-based data acquisition. Used with a Magtrol DSP7000 Programmable Dynamometer Controller, Magtrol M-TEST 7 Software provides the control of any Magtrol Eddy-Current or Powder Brake Dynamometer and runs test sequences in a manner best suited to the overall accuracy and efficiency of the Magtrol Motor Test System. The data that is generated by Magtrol's Motor Testing Software can be stored, displayed and printed in tabular or graphic formats, and can be easily imported into a spreadsheet.

Written in LabVIEW™, M-TEST 7 has the flexibility to test a majority of motor types in a variety of ways. Because of LabVIEW's versatility, obtaining data from other sources (e.g. thermocouples), controlling motor power and providing audio/visual indicators is relatively easy.

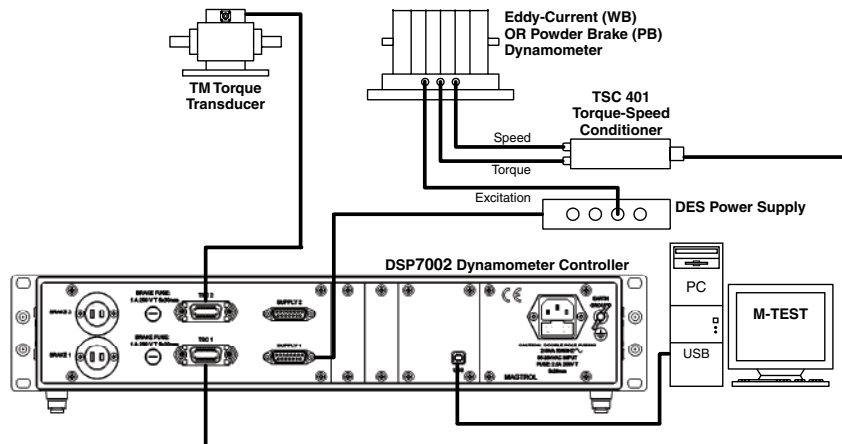
Magtrol's M-TEST 7 Software is ideal for simulating loads, cycling the unit under test and motor ramping. Because it is easy to gather data and duplicate tests, the software is ideal for use in engineering labs. Tests can be programmed to run on their own and saved for future use allowing for valuable time savings in production testing and incoming/outgoing inspection.

SINGLE DYNAMOMETER CONFIGURATIONS

The Dynamometers can be complemented by various electronic modules such as the DES 411 Power Supply, TSC 401 Torque/Speed Conditioner and DSP7000 High Speed Programmable Dynamometer Controller.

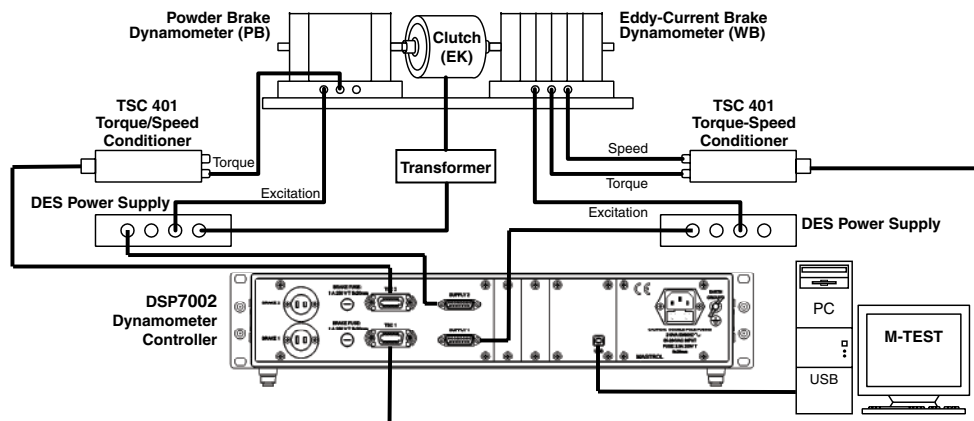


Magtrol also offers In-Line Torque Transducers, which employ a unique non-contact differential transformer torque measuring technology providing extremely accurate torque and speed measurement with superior electrical noise immunity. For a dynamic, high-precision system, the torque transducer can be mounted in line between the unit under test and the dynamometer.



TANDEM CONFIGURATION

Magtrol offers Eddy-Current and Powder Dynamometers mounted in tandem. In tandem, the unique features of each type of dynamometer brake are utilized, allowing the unit under test to be applied with nominal braking torque from zero speed to maximum rotation. The Tandem Dynamometers are available on a number of WB/PB combinations.



EDDY-CURRENT DYNAMOMETER OPERATING PRINCIPLES

The WB Eddy-Current Dynamometers develop their full power at high rotation speeds. The 15 Series is particularly intended

for motors which rotate at high speeds, up to 7500 rpm. The braking torque depends on the rotation speed.

WB DYNAMOMETER RATINGS

Model	Rated Torque		Drag Torque De-energized		Nominal Input Inertia		Rated Power	Rated Speed	Max. Speed	Excitation Current*
	N·m	lb·ft	N·m	lb·in	kg·m ²	lb·ft·s ²	kW	rpm	rpm	A
1 WB 15	140	103	1.4	12.3	5.00×10^{-2}	3.68×10^{-2}	35	2390	7500	4
2 WB 15	280	206	2.8	24.7	1.00×10^{-1}	7.37×10^{-2}	70	2390	7500	7.5
3 WB 15	420	309	4.2	37.1	1.50×10^{-1}	1.10×10^{-1}	105	2390	7500	10
4 WB 15	560	413	5.6	49.5	2.00×10^{-1}	1.47×10^{-1}	140	2390	7500	12

* Voltage at 20 °C is 45 volts.

Optical Speed Sensor

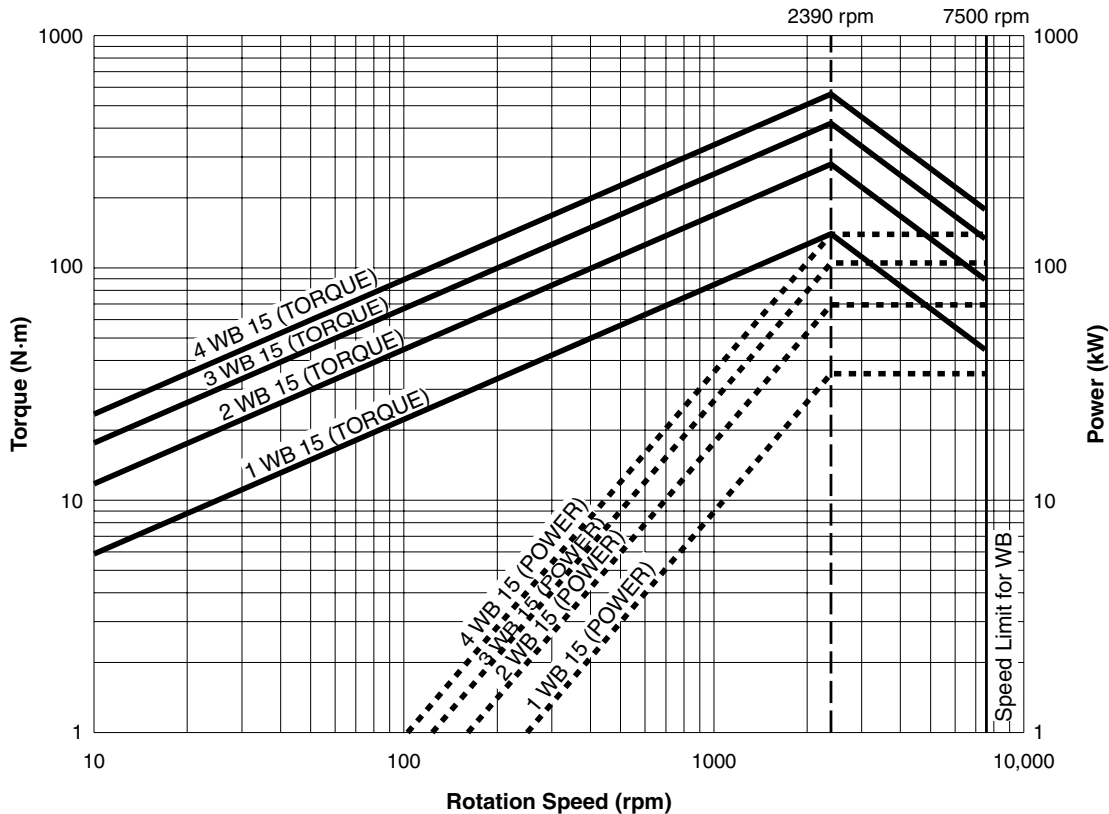
Each 15 Series WB Dynamometer has an optical speed sensor with a 60-bit pulse wheel delivered as standard.

Cooling Water Consumption

For all WB models: ≈ 30 l/kWh at $\Delta t = 30$ °C (Metric)
 ≈ 8 gal/kWh at $\Delta t = 86$ °F (US)

WB TORQUE-SPEED-POWER CURVES

The diagram below shows the characteristic curves for the 15 Series Eddy-Current Dynamometers.



POWDER DYNAMOMETER OPERATING PRINCIPLES

The PB Powder Dynamometers contain, as their name suggests, a magnetic powder. The electrical current passing through the coil generates a magnetic field, which changes the property of the powder, thus producing a smooth braking

torque through friction between rotor and stator. The Powder Dynamometers (PB) produce their rated torque at zero speed. The element to be tested can be loaded at standstill to determine the starting torque.

PB DYNAMOMETER RATINGS

Model	Rated Torque		Drag Torque De-energized		Nominal Input Inertia		Rated Power	Rated Speed	Max. Speed	Excitation Current*
	N·m	lb·ft	N·m	lb·in	kg·m ²	lb·ft·s ²	kW	rpm	rpm	A
1 PB 15	300	221	6	53	5.40×10^{-2}	3.98×10^{-2}	12	382	2000	4
2 PB 15	600	442	12	106	1.08×10^{-1}	7.96×10^{-2}	24	382	2000	7.5
4 PB 15	1200	885	24	212	2.16×10^{-1}	1.59×10^{-1}	48	382	2000	12

* Voltage at 20 °C is 45 volts.

Optical Speed Sensor

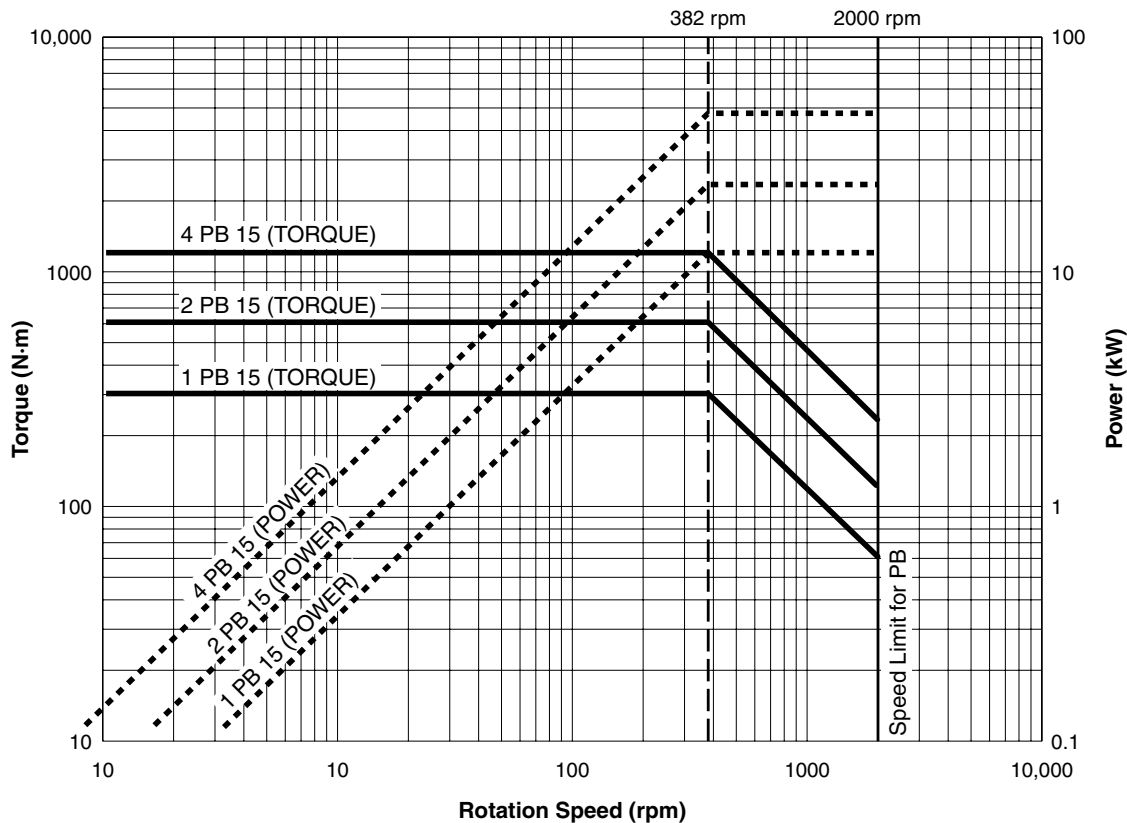
Each 15 Series PB Dynamometer has an optical speed sensor with a 60-bit pulse wheel delivered as standard. For better speed resolution in low speed applications, Magtrol offers a 600-bit or 6000-bit speed pickup (encoder) as an option.

Cooling Water Consumption

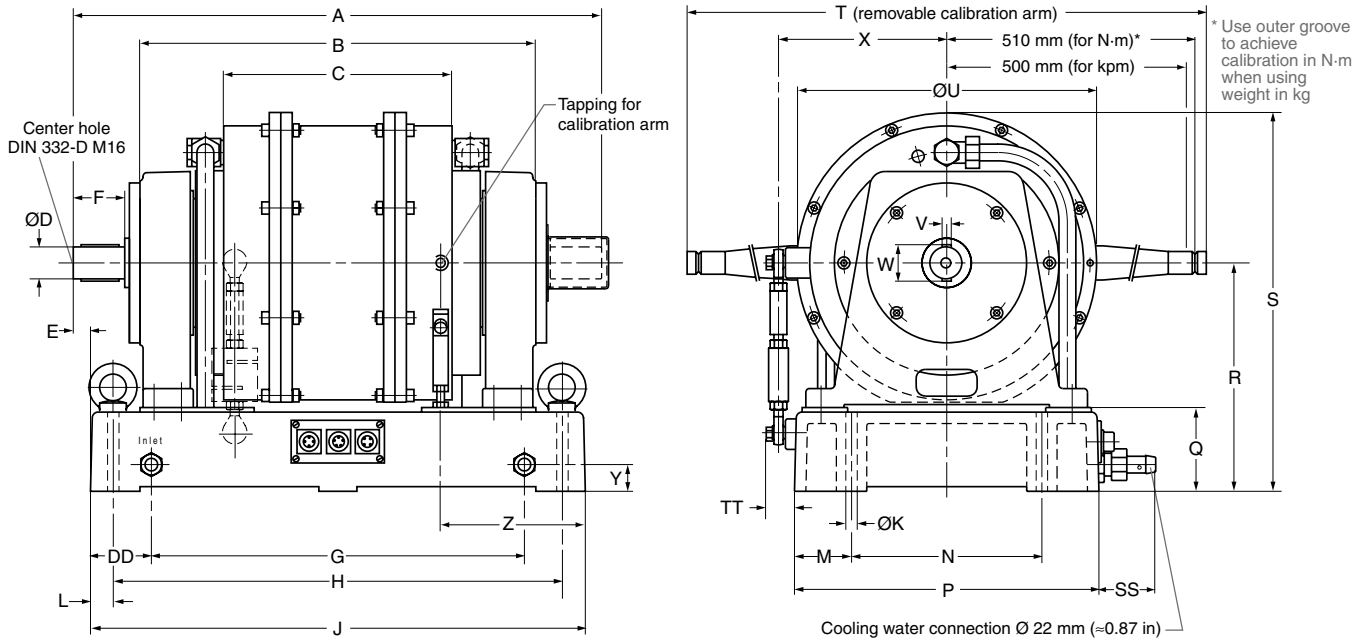
For all PB models: ≈ 30 l/kWh at $\Delta t = 30$ °C (Metric)
 ≈ 8 gal/kWh at $\Delta t = 86$ °F (US)

PB TORQUE-SPEED-POWER CURVES

The diagram below shows the characteristic curves for the 15 Series Powder Dynamometers.



SINGLE DYNAMOMETER DIMENSIONS



NOTE:
Original dimensions are in Metric units. Dimensions converted to English units have been rounded up to 2 decimal places.

Model	units	A	B	C	D	E	F	G	H	J	K	L	M	N	P
1 WB 15 / 1 PB 15	mm	544	370	150	Ø 42g6	-53	68	490	590	650	Ø 15	30	75	250	400
	in	21.42	14.57	5.91	Ø 1.6531 1.6526	-2.09	2.68	19.29	23.23	25.59	Ø 0.59	1.18	2.95	9.84	15.75
2 WB 15 / 2 PB 15	mm	694	520	300	Ø 42g6	22	68	490	590	650	Ø 15	30	75	250	400
	in	27.32	20.47	11.81	Ø 1.6531 1.6526	0.87	2.68	19.29	23.23	25.59	Ø 0.59	1.18	2.95	9.84	15.75
3 WB 15	mm	844	670	450	Ø 42g6	-78	68	840	940	1000	Ø 15	30	75	250	400
	in	33.23	26.38	17.72	Ø 1.6531 1.6526	-3.07	2.68	33.07	37.01	39.37	Ø 0.59	1.18	2.95	9.84	15.75
4 WB 15 / 4 PB 15	mm	994	820	600	Ø 42g6	-3	68	840	940	1000	Ø 15	30	75	250	400
	in	39.13	32.28	23.62	Ø 1.6531 1.6526	-0.12	2.68	33.07	37.01	39.37	Ø 0.59	1.18	2.95	9.84	15.75

Model	units	Q	R	S	T	U	V	W	X	Y	Z	DD	SS	TT	Weight
1 WB 15 / 1 PB 15	mm	110	300 ±0.2	498	1030	Ø 395	12	48	220	35	265	80	75	37	185 kg
	in	4.33	11.819 11.803	19.61	40.55	Ø 15.55	0.47	1.89	8.66	1.38	10.43	3.15	2.95	1.46	407.86 lb
2 WB 15 / 2 PB 15	mm	110	300 ±0.2	498	1030	Ø 395	12	48	220	35	190	80	75	37	290 kg
	in	4.33	11.819 11.803	19.61	40.55	Ø 15.55	0.47	1.89	8.66	1.38	7.48	3.15	2.95	1.46	639.34 lb
3 WB 15	mm	110	300 ±0.2	498	1030	Ø 395	12	48	220	35	290	80	75	37	385 kg
	in	4.33	11.819 11.803	19.61	40.55	Ø 15.55	0.47	1.89	8.66	1.38	11.42	3.15	2.95	1.46	848.78 lb
4 WB 15 / 4 PB 15	mm	110	300 ±0.2	498	1030	Ø 395	12	48	220	35	215	80	75	37	520 kg
	in	4.33	11.819 11.803	19.61	40.55	Ø 15.55	0.47	1.89	8.66	1.38	8.46	3.15	2.95	1.46	1146.40 lb

TANDEM OPERATING PRINCIPLES

Because the characteristics of the WB and PB dynamometers are complementary, Magtrol is able to offer them mounted in a tandem setup. Each dynamometer (WB and PB) can autonomously operate according to its own characteristics.

An electromagnetic clutch is needed for this application which automatically switches off at the maximum speed of the PB Powder Dynamometer and automatically switches on at zero speed.

TANDEM DYNAMOMETER RATINGS

Model	Rated Torque		Drag Torque De-energized		Nominal Input Inertia		Rated Power	Rated Speed	Max. Speed	Excitation Current*
	N-m	lb-ft	N-m	lb-in	kg-m ²	lb-ft-s ²	kW	rpm	rpm	A
2 WB 15 + EK + 1 PB 15	300	221	8.8	77	1.77×10^{-1}	1.31×10^{-1}	70	2390	7500	7.5
2 WB 15 + EK + 2 PB 15	600	442	14.8	130	2.31×10^{-1}	1.70×10^{-1}	70	2390	7500	7.5
2 WB 15 + EK + 4 PB 15	1200	885	26.8	237	3.39×10^{-1}	2.50×10^{-1}	70	2390	7500	12
4 WB 15 + EK + 1 PB 15	300	221	11.6	102	2.77×10^{-1}	2.04×10^{-1}	140	2390	7500	12
4 WB 15 + EK + 2 PB 15	600	442	17.6	155	3.31×10^{-1}	2.44×10^{-1}	140	2390	7500	12
4 WB 15 + EK + 4 PB 15	1200	885	29.6	261	4.39×10^{-1}	3.23×10^{-1}	140	2390	7500	12

* Voltage at 20 °C is 45 volts.

Optical Speed Sensor

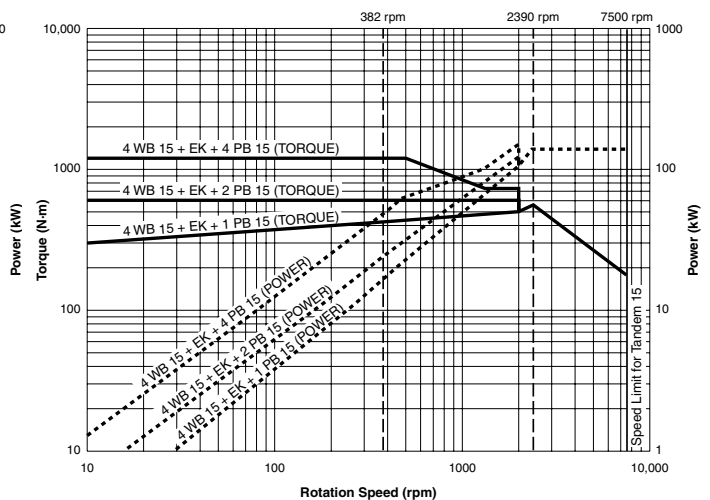
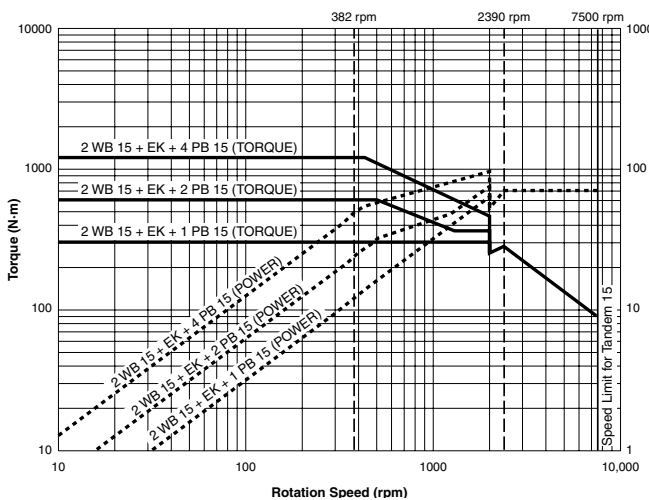
Each 15 Series Tandem Dynamometer has an optical speed sensor with a 60-bit pulse wheel delivered as standard.

Cooling Water Consumption

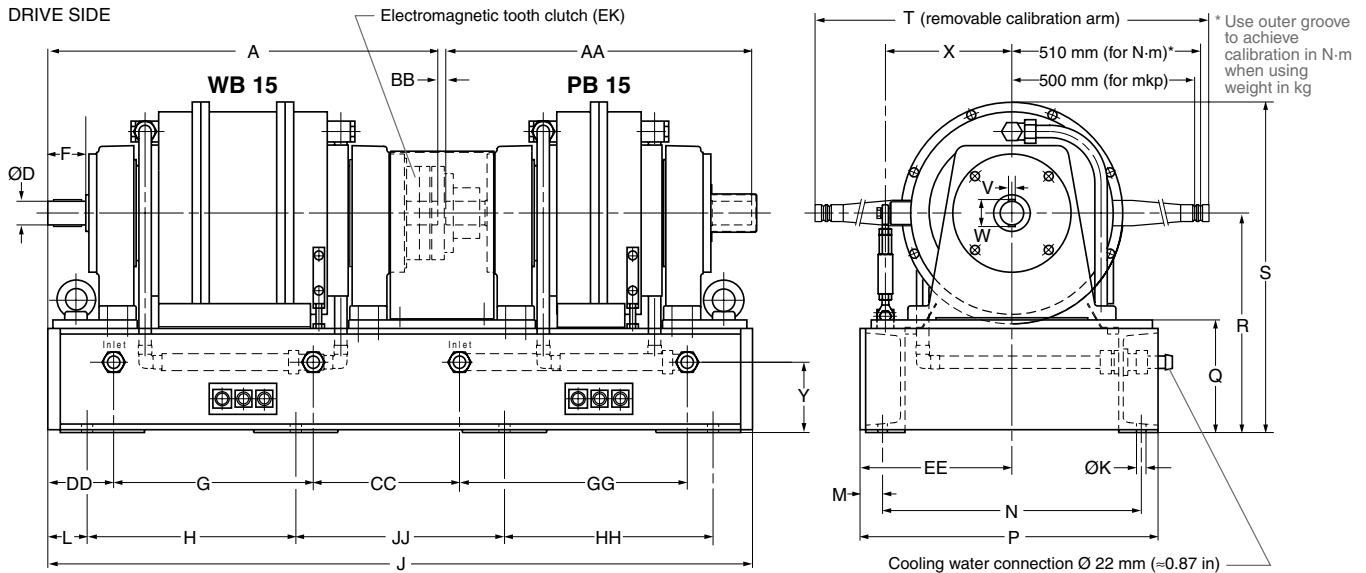
For all Tandem models: ≈ 30 l/kWh at $\Delta t = 30$ °C (Metric)
 ≈ 8 gal/kWh at $\Delta t = 86$ °F (US)

TANDEM TORQUE-SPEED-POWER CURVES

The diagrams below show the characteristic curves for the 15 Series Tandem Dynamometers.



TANDEM DIMENSIONS



NOTE:

Original dimensions are in Metric units. Dimensions converted to English units have been rounded up to 2 decimal places.

Model	units	A	D	F	G	H	J	K	L	M	N	P	Q	R	S
2 WB 15 + EK + 1 PB 15	mm	694	Ø 42g6	68	355	371	1253	Ø 17	70	40	460	530	200	390 ±0.2	588
	in	27.32	Ø 1.6531 1.6526	2.68	13.98	14.61	49.33	Ø 0.67	2.76	1.57	18.11	20.87	7.87	15.362 15.346	23.15
2 WB 15 + EK + 2 PB 15	mm	694	Ø 42g6	68	355	371	1403	Ø 17	70	40	460	530	200	390 ±0.2	588
	in	27.32	Ø 1.6531 1.6526	2.68	13.98	14.61	55.24	Ø 0.67	2.76	1.57	18.11	20.87	7.87	15.362 15.346	23.15
2 WB 15 + EK + 4 PB 15	mm	694	Ø 42g6	68	355	521	1703	Ø 17	70	40	460	530	200	390 ±0.2	588
	in	27.32	Ø 1.6531 1.6526	2.68	13.98	20.51	67.05	Ø 0.67	2.76	1.57	18.11	20.87	7.87	15.362 15.346	23.15
4 WB 15 + EK + 1 PB 15	mm	994	Ø 42g6	68	655	521	1553	Ø 17	70	40	460	530	200	390 ±0.2	588
	in	39.13	Ø 1.6531 1.6526	2.68	25.79	20.51	61.14	Ø 0.67	2.76	1.57	18.11	20.87	7.87	15.362 15.346	23.15
4 WB 15 + EK + 2 PB 15	mm	994	Ø 42g6	68	655	521	1703	Ø 17	70	40	460	530	200	390 ±0.2	588
	in	39.13	Ø 1.6531 1.6526	2.68	25.79	20.51	67.05	Ø 0.67	2.76	1.57	18.11	20.87	7.87	15.362 15.346	23.15
4 WB 15 + EK + 4 PB 15	mm	994	Ø 42g6	68	655	590	2003	Ø 17	70	40	460	530	200	390 ±0.2	588
	in	39.13	Ø 1.6531 1.6526	2.68	25.79	23.23	78.86	Ø 0.67	2.76	1.57	18.11	20.87	7.87	15.362 15.346	23.15

Model	units	T	V	W	X	Y	AA	BB	CC	DD	EE	GG	HH	JJ	Weight
2 WB 15 + EK + 1 PB 15	mm	1030	12	48	225	125	544	14	260	117	270 ±0.1	405	371	371	485 kg
	in	40.55	0.47	1.89	8.86	4.92	21.42	0.55	10.24	4.61	10.634 10.626	15.94	14.61	14.61	1069.24 lb
2 WB 15 + EK + 2 PB 15	mm	1030	12	48	225	125	694	14	260	117	270 ±0.1	555	471	421	590 kg
	in	40.55	0.47	1.89	8.86	4.92	27.32	0.55	10.24	4.61	10.634 10.626	21.85	18.54	16.57	1300.73 lb
2 WB 15 + EK + 4 PB 15	mm	1030	12	48	225	125	994	14	260	117	270 ±0.1	855	521	521	820 kg
	in	40.55	0.47	1.89	8.86	4.92	39.13	0.55	10.24	4.61	10.634 10.626	33.66	20.51	20.51	1807.79 lb
4 WB 15 + EK + 1 PB 15	mm	1030	12	48	225	125	544	14	260	117	270 ±0.1	405	471	421	715 kg
	in	40.55	0.47	1.89	8.86	4.92	21.42	0.55	10.24	4.61	10.634 10.626	15.94	18.54	16.57	1576.31 lb
4 WB 15 + EK + 2 PB 15	mm	1030	12	48	225	125	694	14	260	117	270 ±0.1	555	521	521	820 kg
	in	40.55	0.47	1.89	8.86	4.92	27.32	0.55	10.24	4.61	10.634 10.626	21.85	20.51	20.51	1807.79 lb
4 WB 15 + EK + 4 PB 15	mm	1030	12	48	225	125	994	14	260	117	270 ±0.1	855	590	683	1050 kg
	in	40.55	0.47	1.89	8.86	4.92	39.13	0.55	10.24	4.61	10.634 10.626	33.66	23.23	26.89	2314.85 lb

DYNAMOMETER OPTIONS

Industrial Version (IS)

Single WB and PB Dynamometers are also available in an industrial version which includes bearing supports, but does not provide a base plate, or torque and speed measurement.

Vertical Mounting (V)

Vertical Mounting is available on the Eddy-Current (WB) Dynamometer only. The vertical version has an adapted bearing fitting and its maximum speed is limited.

Speed Pickup (DG)

All models, including tandems, are equipped with a 60-bit optical speed sensor. On PB Dynamometers, a 600-bit or 6000-bit speed pickup (encoder) is available as an option for low speed applications.

Mechanical Rotor Blocking Device (MB)

A mechanical rotor blocking device, which allows locked rotor testing, is available for the WB Dynamometer.

DYNAMOMETER MODELS

Eddy-Current	Powder	Tandem
1 WB 15	1 PB 15	2 WB 15 + EK + 1 PB 15
2 WB 15	2 PB 15	2 WB 15 + EK + 2 PB 15
3 WB 15	4 PB 15	2 WB 15 + EK + 4 PB 15
4 WB 15		4 WB 15 + EK + 1 PB 15
		4 WB 15 + EK + 2 PB 15
		4 WB 15 + EK + 4 PB 15

ORDERING INFORMATION

If one of the listed options is desired, please follow the dynamometer model (see table above) with a dash and then the appropriate suffix (as noted in parenthesis). For example, a Model 1 PB 15 Powder Dynamometer with an optional 6000-bit speed pickup is a 1 PB 15 - DG - 6000.

Example: **1 PB 15 - DG - 6000**
└───┬───┘ └───┬───┘
Dynamometer Model Option

SYSTEM OPTIONS AND ACCESSORIES

	DESCRIPTION	MODEL / PART #
ELECTRONICS	High Speed Programmable Dynamometer Controller	DSP7000
	Torque-Speed Conditioner (includes necessary cables)	TSC 401/121
	Power Supply (includes necessary cables)	DES 411/121
	High Speed Single-Phase Power Analyzer	6510 _e
	High Speed Three-Phase Power Analyzer	6530
SOFTWARE	M-TEST 7 Motor Testing Software	M-TEST 7
	Temperature Testing Hardware	HW-TTEST
MISC	Dynamometer Table for (with grooved table top) 1 & 2 WB/PB 15 Series Dynamometers	005476
	Water Cooling Kit for DES 411/121 Power Supply (for 2, 3 and 4 WB or 2 and 4 PB 15)	234-311-900-011
	Transformer (24 VDC) for electromagnetic clutch of tandem dynamometers	234-311-920-011
	Couplings, Thermostatic Sluice, Pressure Sensitive Switch	On Request
	Water Cooling System for Brake	On Request
	Calibration Weights	On Request

Due to the continual development of our products, we reserve the right to modify specifications without forewarning.



www.magtrol.com

MAGTROL INC

70 Gardenville Parkway
 Buffalo, New York 14224 USA
 Phone: +1 716 668 5555
 Fax: +1 716 668 8705
 E-mail: magtrol@magtrol.com

MAGTROL SA

Centre technologique Montena
 1728 Rossens/Fribourg, Switzerland
 Phone: +41 (0)26 407 3000
 Fax: +41 (0)26 407 3001
 E-mail: magtrol@magtrol.ch

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