

TANDEM SERIES

IN-LINE DOUBLE DYNAMOMETERS

Magtrol offers 3 types of dynamometer brakes to absorb load: Hysteresis (**HD Series**), Eddy-Current (**WB Series**) and Magnetic Powder (**PB Series**). Each type of Dynamometer has advantages and limitations and choosing the correct one will depend largely on the type of testing to be performed. With over 50 standard models to choose from, Magtrol Sales professionals are readily available to assist in selecting the proper Dynamometer to meet your testing needs.

FEATURES

- 13 Models with Maximum Torque: 5 N·m ... 1 200 N·m (3.6 lb·ft ... 885 lb·ft)
- Braking Power: 3 kW ... 140 kW
- Stable Braking Torque, without Shock
- Low Moment of Inertia
- Operating Direction CW/CCW
- Braking Torque Measurement Integrated
- Integrated Optical Speed Sensor
- Special designs available upon request

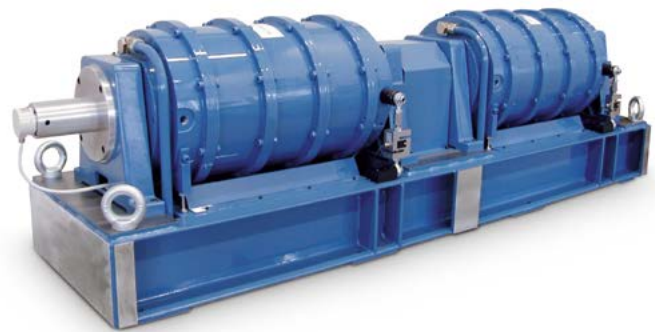


Fig. 1: 4 WB 15 + 4 PB 15 | TANDEM Dynamometer

DESCRIPTION

Eddy-current Brake Dynamometers (WB Series) provide increasing torque as the speed increases, reaching peak torque at rated speed. They are ideal for applications requiring high speeds and also when operating in the middle to high power range.

Powder Brake Dynamometers (PB Series) provide full torque at zero speed and are ideal for applications operating in the low to middle speed range or when operating in the middle to high torque range.

Tandem Dynamometers are based on the combination of Eddy-current Dynamometers (WB Series) and Powder Dynamometers (PB Series) mounted in line on a common base and connected by an electromagnetic clutch. Both dynamometers are cooled by a water circulation system,

which passes inside the stator to dissipate heat generated by the braking power, allowing a power rating up to 140 kW.

Both WB and PB Dynamometers integrates a torque measurement system with accuracy ratings of $\pm 0.3\%$ to $\pm 0.5\%$ full scale, depending on size and system configuration.

APPLICATIONS

Mounted on test benches, TANDEM Dynamometers allow performance and reliability testing on driving elements such as electric motors, servomotors, geared motors, reduction gears, pneumatic equipment, hydraulic transmission systems and starter motors.

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 (Please refer to specific data sheet). An electromagnetic clutch will automatically switches off at the maximum speed of the PB Powder Dynamometer and automatically switches on at zero speed. Once the system is working over the PB Powder Dynamometer speed limit, the clutch cannot be switched on before the system being at 0 rpm (no longer rotating).

DUAL - DOUBLE WB DYNAMOMETER IN TANDEM

For application requiring higher power in a dedicated speed range, Magtrol offers some of the Eddy Current Dynamometer mounted in line on a common base. This would be for example the models 2WB 65 + 2WB 65 (rated torque 40 N·m, max speed 24 000 rpm, max power 24 kW) or 2WB 115 + 2WB 115 (rated torque 200 N·m, max speed 15 000 rpm, max power 60 kW).

OPTICAL SPEED SENSOR

Each TANDEM has an optical speed sensor delivered as standard. TANDEM 43 has an optical speed sensor with 30 PPR (Pulses Per Revolution); TANDEM 65, TANDEM 115 & TANDEM 15 has an optical speed sensor with a 60 PPR encoder.

TANDEM CONFIGURATIONS

The Dynamometers can be complemented by various electronic modules such as the DES Series (Power Supply), TSC401 (Torque/Speed Conditioner) and DSP7000 (High Speed Programmable Dynamometer Controller).

accurate torque and speed measurement with high noise immunity. For a dynamic, high-precision system, the torque transducer can be mounted in line between the unit under test and the dynamometer, providing a torque accuracy of 0.1%.

Magtrol also offers In-Line Torque Transducers (TS Series or TMSeries) or Torque Flange (TF Series) for extremely

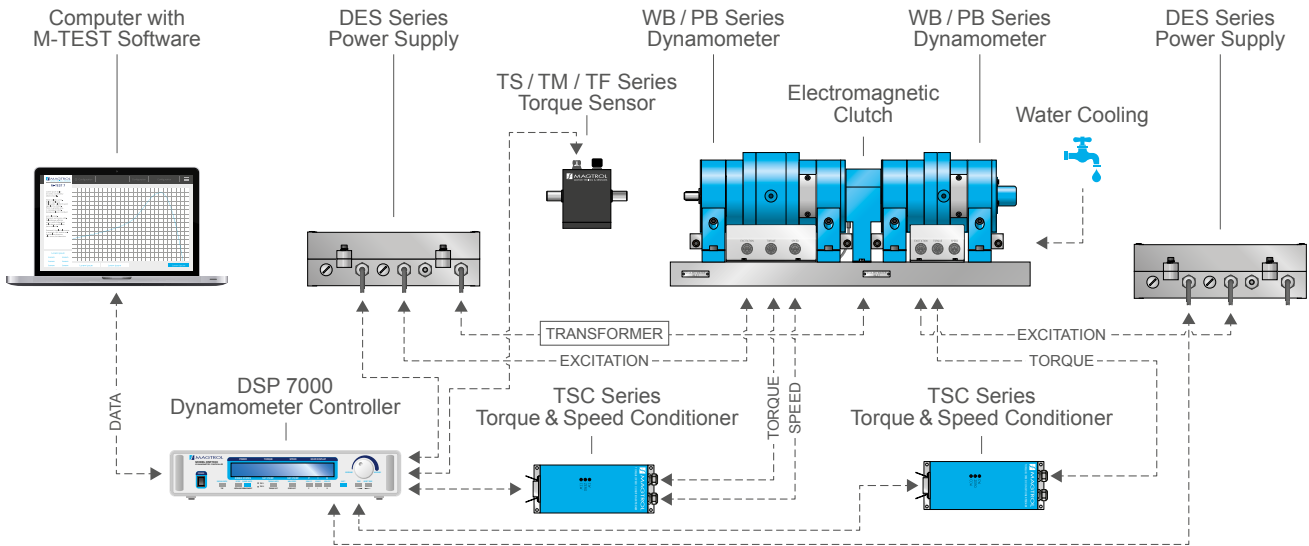


Fig.2: Configuration of the TANDEM Series Dynamometer with its accessories

SPECIFICATIONS

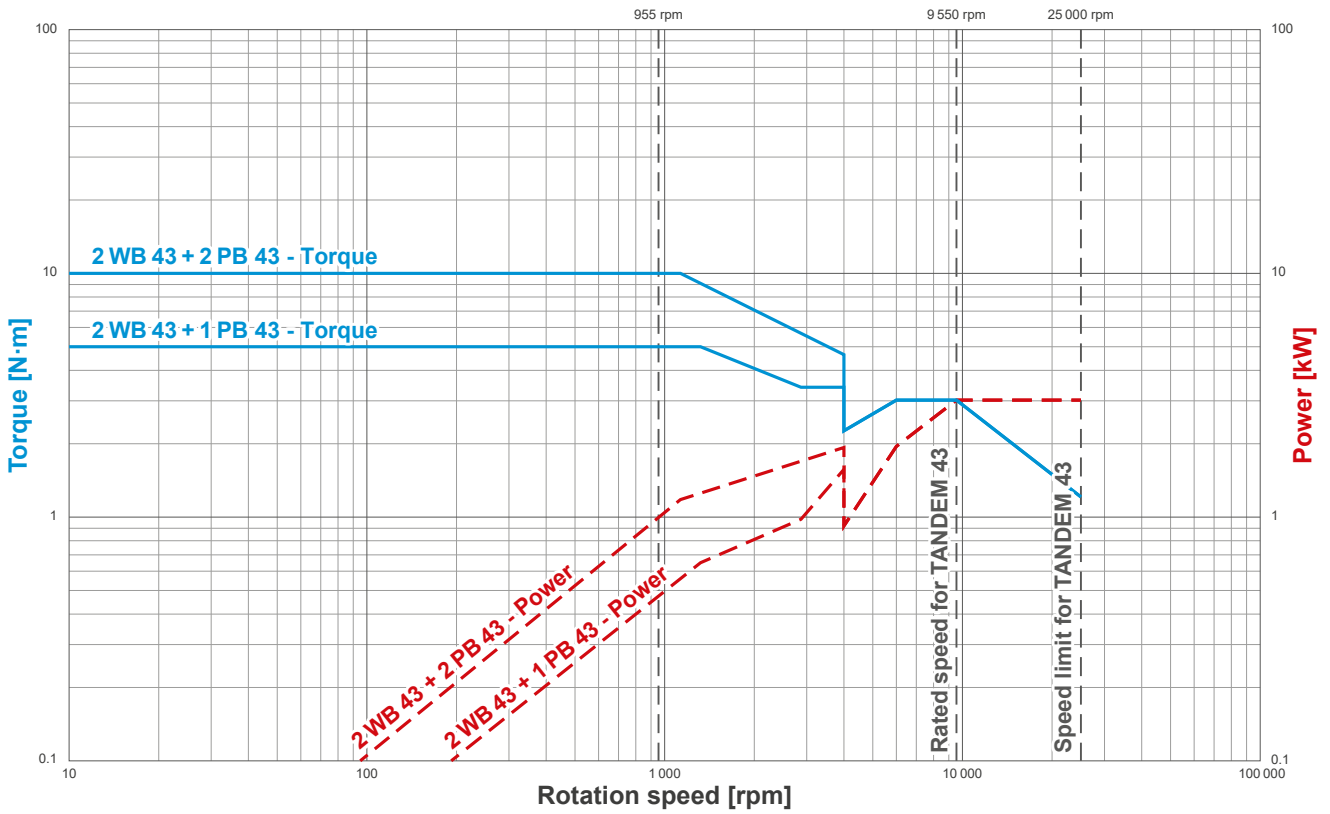
NOTE: For continuous operating (≥ 2 hours) at constant torque or power, please consider 20% reserve in both torque & power

NOTE: For excitation current, please refer to respective datasheets of the dynamometers.

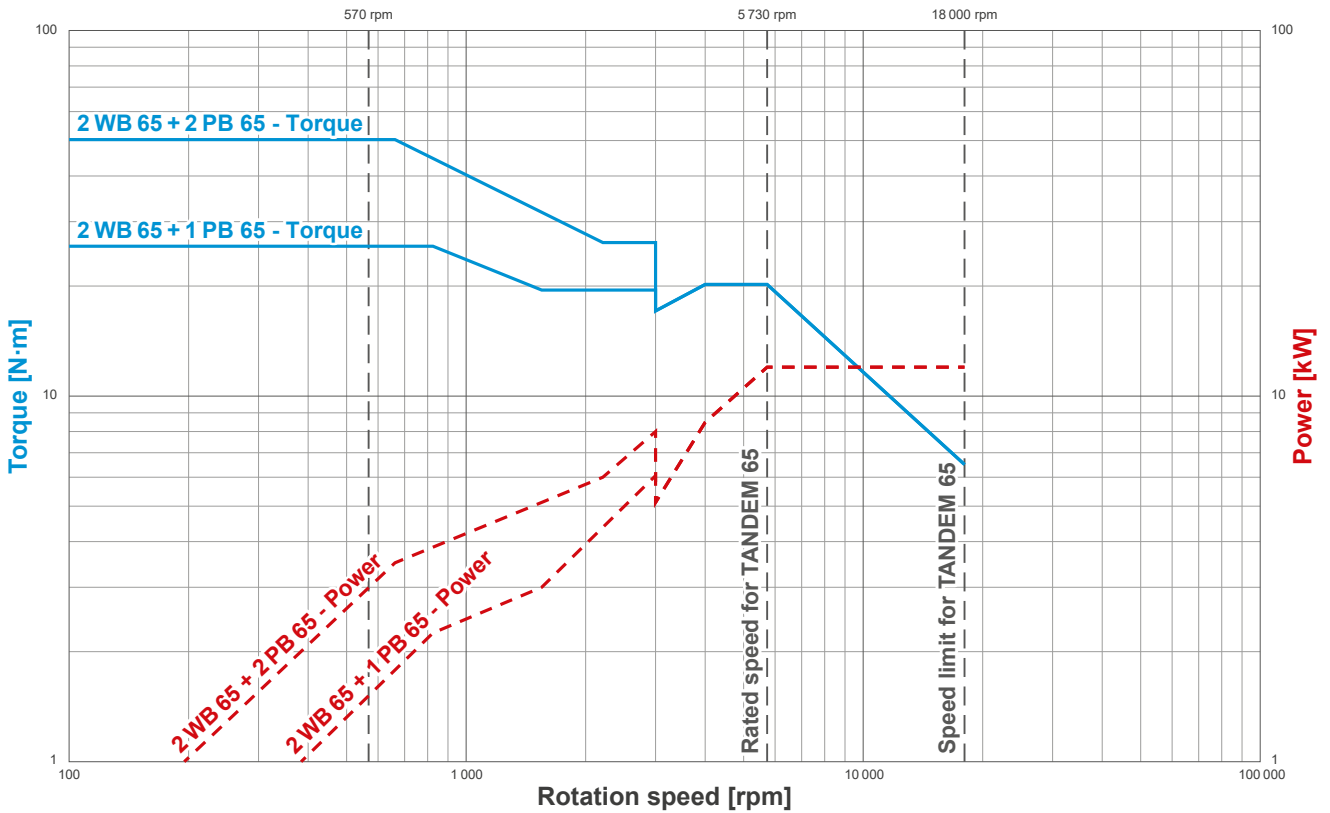
MODEL	RATED TORQUE		DRAG TORQUE DE-ENERGIZED		NOMINAL INPUT INERTIA		RATED POWER	RATED SPEED	MAX. SPEED	MAX. EXCITED SPEED OF PB ^{a)}
	N·m	lb·ft	N·m	lb·in	kg·m ²	lb·ft·s ²				
2WB43+1PB43	5	3.6	0.13	1.15	4.82×10^{-4}	3.56×10^{-4}	3	9550	25000	4000
2WB43+2PB43	10	7.3	0.23	2.03	5.81×10^{-4}	4.28×10^{-4}				
2WB65+1PB65	25	18.4	0.7	6.19	3.19×10^{-3}	2.35×10^{-3}	12	5730	18000	3000
2WB65+2PB65	50	36.8	1.2	10.62	3.98×10^{-3}	2.93×10^{-3}				
2WB115+1PB115	100	73.7	3.0	26.5	4.18×10^{-2}	3.08×10^{-2}	30	2865	15000	3000
2WB115+2PB115	200	147.5	5.0	44.2	5.44×10^{-2}	4.01×10^{-2}				
2WB115+2WB115	200	147.5	2.0	17.7	5.51×10^{-2}	4.07×10^{-2}	60			
2WB15+1PB15	300	221.0	8.8	77.0	1.77×10^{-1}	1.31×10^{-1}	70	2390	7500	2000
2WB15+2PB15	600	442.0	14.8	130.0	2.31×10^{-1}	1.70×10^{-1}				
2WB15+4PB15	1200	885.0	26.8	237.0	3.39×10^{-1}	2.50×10^{-1}	140	2390	7500	2000
4WB15+1PB15	300	221.0	11.6	102.0	2.77×10^{-1}	2.04×10^{-1}				
4WB15+2PB15	600	442.0	17.6	155.0	3.31×10^{-1}	2.44×10^{-1}				
4WB15+4PB15	1200	885.0	29.6	261.0	4.39×10^{-1}	3.23×10^{-1}				

a) Corresponds to the speed at which the clutch will be disconnected

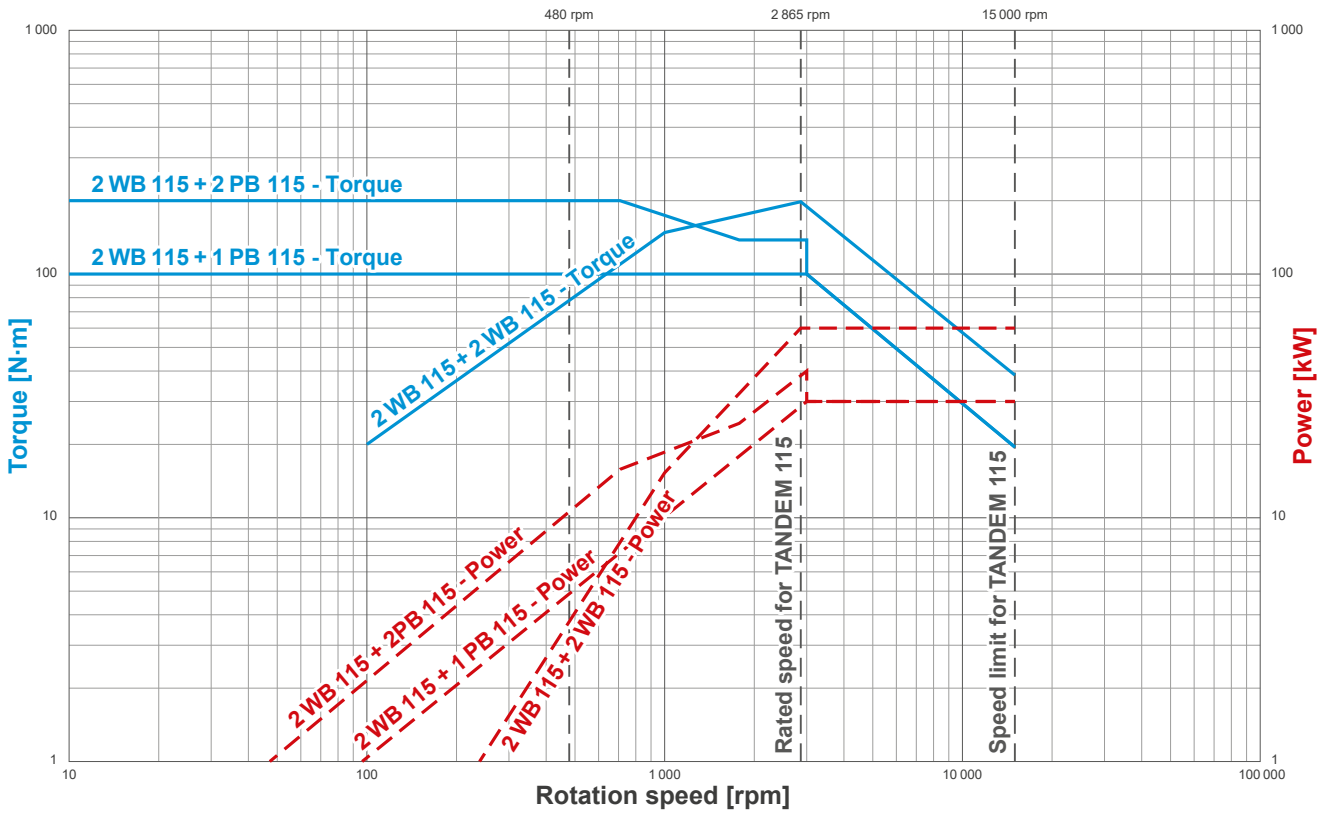
TANDEM 43 TORQUE-SPEED-POWER CURVES



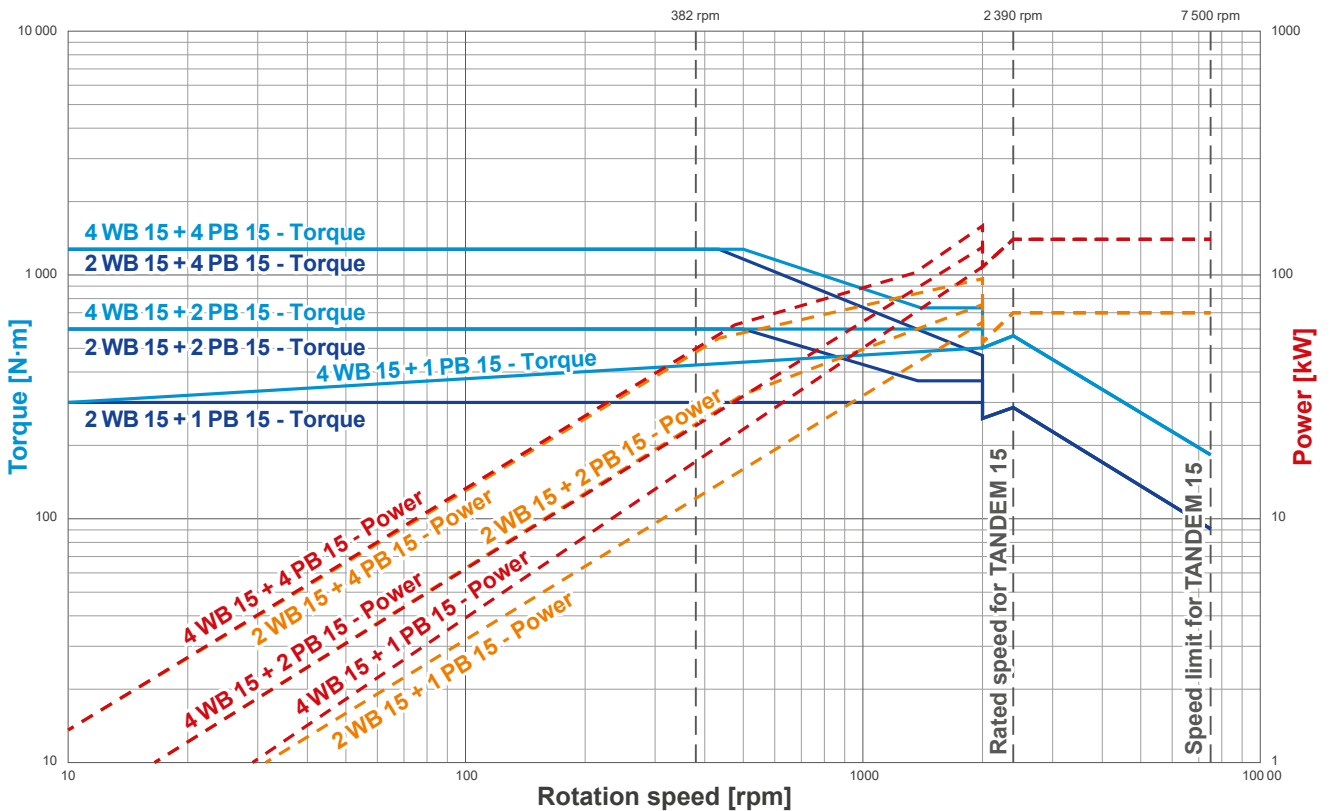
TANDEM 65 TORQUE-SPEED-POWER CURVES



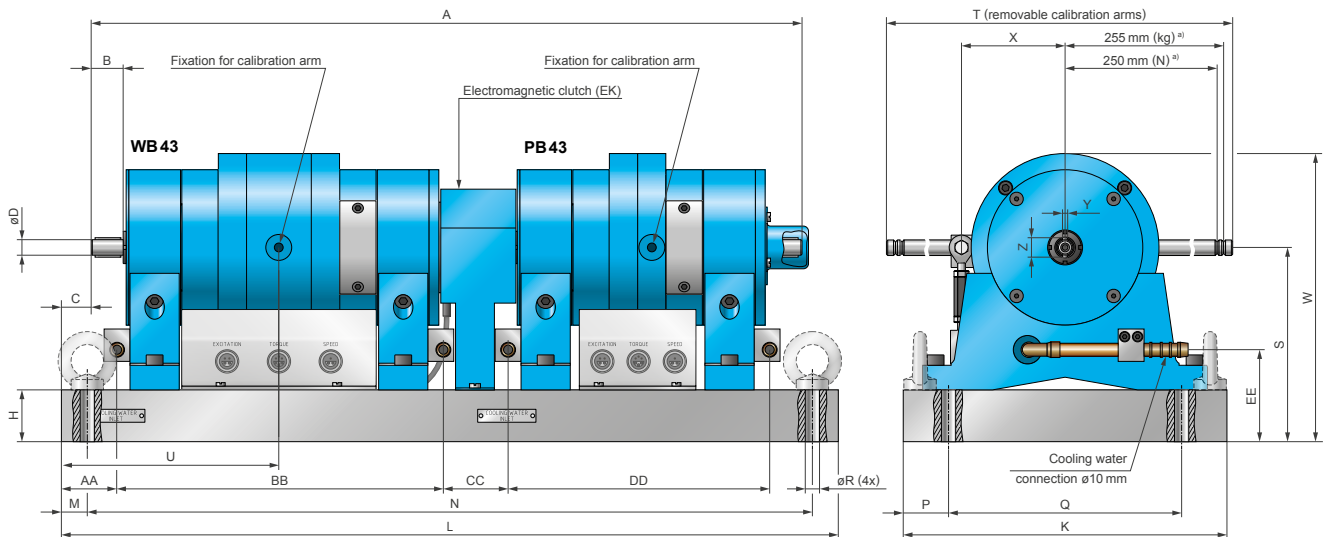
TANDEM 115 TORQUE-SPEED-POWER CURVES



TANDEM 15 TORQUE-SPEED-POWER CURVES



TANDEM 43 DIMENSIONS



CAUTION: All TANDEM Series Dynamometers must be water cooled.

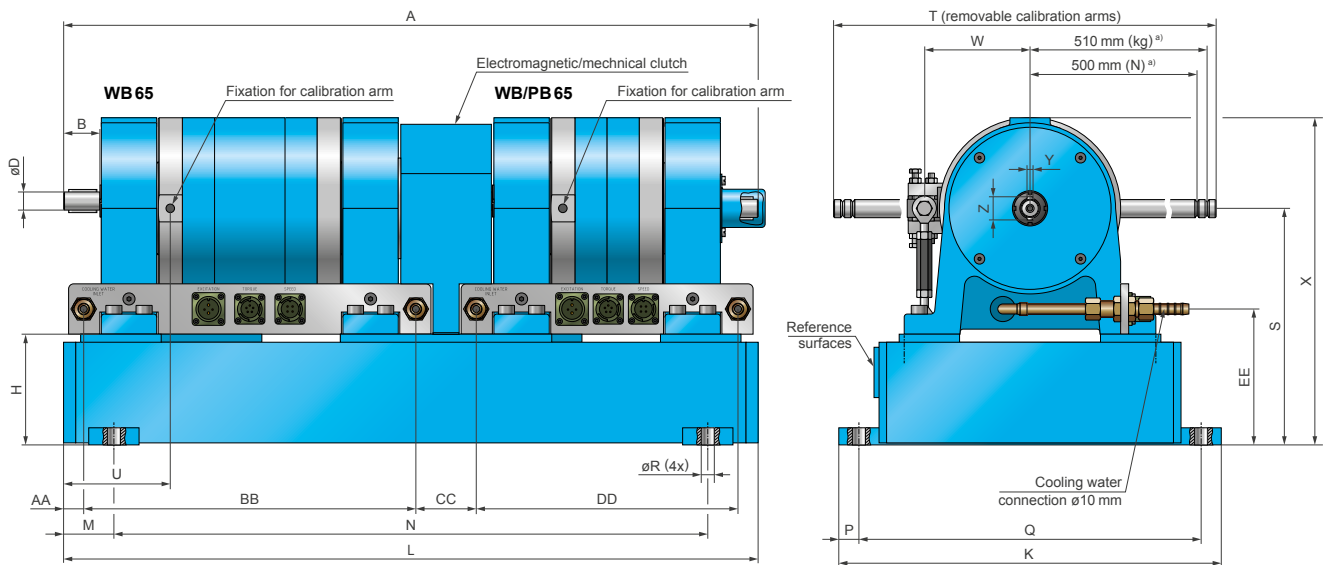
NOTE: Original dimensions are in Metric units. Dimensions converted to English units have been rounded up to 3 decimal places.

MODEL	units	A	øD	E	F	H	K	L	M	N	P	Q	øR	S
2WB43+1PB43	mm	542	12 h6	23	25	40	250	600	20	560	35	180	11	140±0.03
	in	21.34	0.4724 0.4721	0.91	0.98	1.57	9.85	23.62	0.79	22.05	1.38	7.09	0.43	5.513 5.511
2WB43+2PB43	mm	592	12 h6	23	25	40	250	650	20	610	35	180	11	140±0.03
	in	23.31	0.4724 0.4721	0.91	0.98	1.57	9.85	25.59	0.79	24.02	1.38	7.09	0.43	5.513 5.511
MODEL	units	T	U	W	X	Y	Z	AA	BB	CC	DD	EE	Weight	
2WB43+1PB43	mm	524	168	222.5	80	4 h9	15	43	250	52	200	61	~ 55 kg	
	in	20.63	6.61	8.76	3.15	0.1574 0.1563	0.59	1.69	7.87	2.05	7.87	2.40	~ 122 lb	
2WB43+2PB43	mm	524	168	222.5	80	4 h9	15	43	250	52	250	61	~ 65 kg	
	in	20.63	6.61	8.76	3.15	0.1574 0.1563	0.59	1.69	7.87	2.05	9.84	2.40	~ 144 lb	

a) 255 mm for a calibration in N·m with weight in kg (use outer groove); 250 mm for calibration in N·m with weight in N (use inner groove)

NOTE: 3D STEP files of most of our products are available on our website: www.magtrol.com ; other files are available on request.

TANDEM 65 DIMENSIONS



CAUTION: All TANDEM Series Dynamometers must be water cooled.

NOTE: Original dimensions are in metric units. Dimensions converted to English units have been rounded up to 3 decimal places.

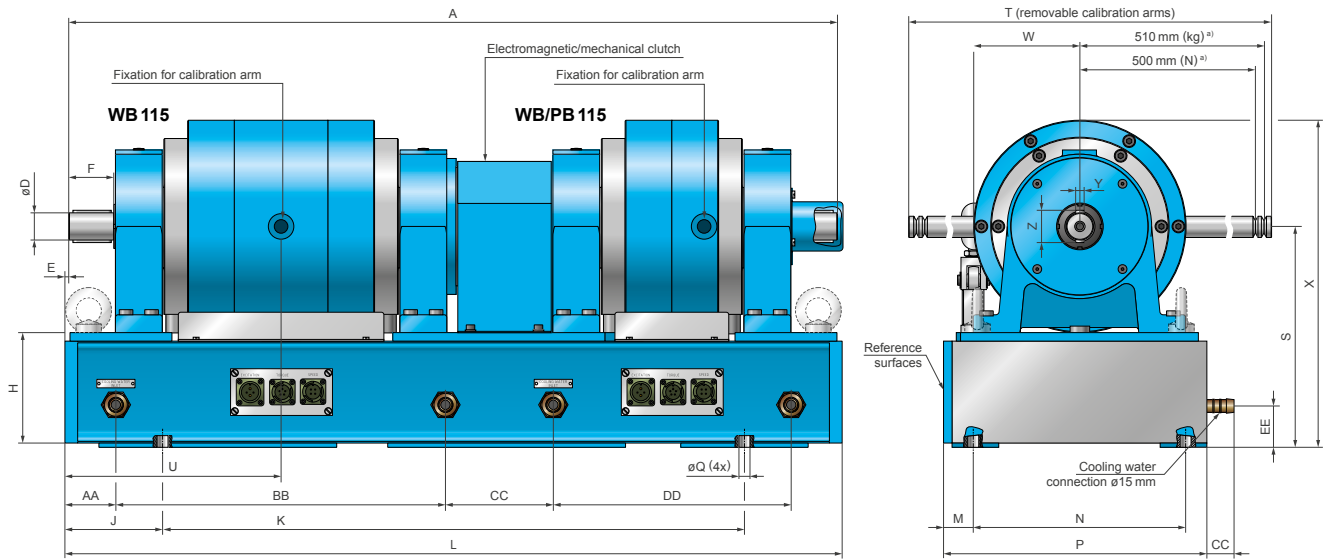
MODEL	units	A	B	øD ^{a)}	H	K	L	M	N	P	Q	øR	S
2 WB 65 + 1 PB 65	mm	690	36	18 h6	110	380	690	50	590	20	340	13	235±0.02
	in	27.17	1.42	0.7086 0.7083	4.33	14.96	27.17	1.97	23.23	0.79	13.39	0.51	9.260 9.244
2 WB 65 + 2 PB 65	mm	760	36	18 h6	110	380	760	50	660	20	340	13	235±0.02
	in	29.92	1.42	0.7086 0.7083	4.33	14.96	29.92	1.97	25.98	0.79	13.39	0.51	9.260 9.244

MODEL	units	T	U	W	X	Y	Z	AA	BB	CC	DD	EE	Weight
2 WB 65 + 1 PB 65	mm	1034	106	105	325	6 h9	23	20	330	60	260	135	~ 135 kg
	in	40.71	4.174	4.13	12.8	0.2362 0.2351	0.91	0.79	12.99	2.36	10.24	5.31	~ 298 lb
2 WB 65 + 2 PB 65	mm	1034	106	105	325	6 h9	23	20	330	60	330	135	~ 150 kg
	in	40.71	4.174	4.13	12.8	0.2362 0.2351	0.91	0.79	12.99	2.36	12.99	5.31	~ 331 lb

a) 510 mm for a calibration in N·m with weight in kg (use outer groove); 500 mm for a calibration in N·m with weight in N (use inner groove).

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TANDEM 115 DIMENSIONS



CAUTION: All TANDEM Series Dynamometers must be water cooled.

NOTE: Original dimensions are in metric units. Dimensions converted to imperial units have been rounded up to 4 decimal places.

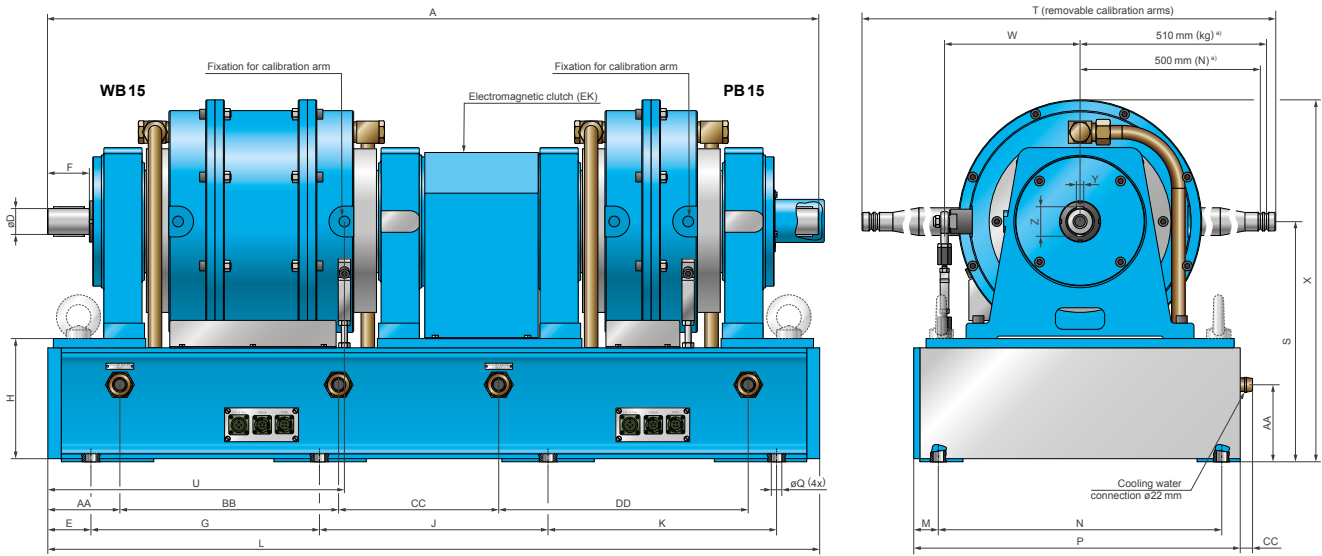
MODEL	units	A	øD	E	F	H	J	K	L	M	N	P	øQ	S
2WB 115+ 1PB 115	mm	905	32 h6	4	54	135	115	685	915	35	250	310	13	260 ^{±0.1}
	in	35.63	1.2598 1.2593	0.16	2.13	5.31	4.53	26.97	6.02	1.38	9.84	12.20	0.51	10.244 10.228
2WB 115+2PB 115	mm	1015	32 h6	4	54	135	115	795	1025	35	250	310	13	260 ^{±0.1}
	in	39.96	1.2598 1.2593	0.16	2.13	5.31	4.53	31.30	40.35	1.38	9.84	12.20	0.51	10.244 10.228
2WB 115+2WB 115	mm	1015	32 h6	4.5	53	135	115	795	1025	35	250	310	13	260 ^{±0.1}
	in	39.96	1.2598 1.2593	0.18	2.09	5.31	4.53	31.30	40.35	1.38	9.84	12.20	0.51	10.244 10.228

MODEL	units	T	U	W	X	Y	Z	AA	BB	CC	DD	EE	Weight
2WB 115+ 1PB 115	mm	1038	254.5	125	385	10 h9	38	60	388	127	280	50	~ 214 kg
	in	40.87	10.02	4.92	15.15	0.3937 0.3932	1.50	2.36	15.28	5.00	11.02	1.97	~ 472 lb
2WB 115+2PB 115	mm	1038	254.5	125	385	10 h9	38	60	388	127	390	50	~ 582 kg
	in	40.87	10.02	4.92	15.15	0.3937 0.3932	1.50	2.36	15.28	5.00	15.35	1.97	~ 264 lb
2WB 115+2WB 115	mm	1038	254.5	125	385	10 h9	38	60	388	127	390	50	~ 582 kg
	in	40.87	10.02	4.92	15.15	0.3937 0.3932	1.50	2.36	15.28	5.00	15.35	1.97	~ 264 lb

a) 510 mm for a calibration in N·m with weight in kg (use outer groove); 500 mm for a calibration in N·m with weight in N (use inner groove).

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TANDEM 15 DIMENSIONS



CAUTION: All TANDEM Series Dynamometers must be water cooled.

NOTE: Original dimensions are in metric units. Dimensions converted to imperial units have been rounded up to 3 decimal places.

MODEL	units	A	øD	E	F	G	H	J	K	L	M	N	P	øQ
2WB 15+1PB 15	mm	1252	42 g6	70	68	371	200	371	371	1253	40	460	530	17
	in	49.29	1.6531 1.6526	2.76	2.68	14.61	7.87	14.61	14.61	49.33	1.57	18.11	20.87	0.67
2WB 15+2PB 15	mm	1402	42 g6	70	68	371	200	421	471	1403	40	460	530	17
	in	55.20	1.6531 1.6526	2.76	2.68	14.61	7.87	16.57	18.54	55.24	1.57	18.11	20.87	0.67
2WB 15+4PB 15	mm	1702	42 g6	70	68	521	200	521	521	1703	40	460	530	17
	in	67.01	1.6531 1.6526	2.76	2.68	20.51	7.87	20.51	20.51	67.05	1.57	18.11	20.87	0.67
4WB 15+1PB 15	mm	1552	42 g6	70	68	521	200	421	471	1553	40	460	530	17
	in	61.10	1.6531 1.6526	2.76	2.68	20.51	7.87	16.57	18.54	61.14	1.57	18.11	20.87	0.67
4WB 15+2PB 15	mm	1702	42 g6	70	68	521	200	521	521	1703	40	460	530	17
	in	67.01	1.6531 1.6526	2.76	2.68	20.51	7.87	20.51	20.51	67.5	1.57	18.11	20.87	0.67
4WB 15+4PB 15	mm	2002	42 g6	70	68	590	200	683	590	2003	40	460	530	17
	in	78.82	1.6531 1.6526	2.76	2.68	23.23	7.87	26.89	23.23	78.86	1.57	18.11	20.87	0.67

MODEL	units	S	T	U	W	X	Y	Z	AA	BB	CC	DD	EE	Weight
2WB 15+1PB 15	mm	390±0.2	1030		225	588	12	48	117	355	260	405	125	~ 485 kg
	in	15.362 15.346	40.55		8.86	23.15	0.47	1.89	4.61	13.98	10.24	15.94	4.92	~ 1070 lb
2WB 15+2PB 15	mm	390±0.2	1030		225	588	12	48	117	355	260	555	125	~ 590 kg
	in	15.362 15.346	40.55		8.86	23.15	0.47	1.89	4.61	13.98	10.24	21.85	4.92	~ 1301 lb
2WB 15+4PB 15	mm	390±0.2	1030		225	588	12	48	117	355	260	855	125	~ 820 kg
	in	15.362 15.346	40.55		8.86	23.15	0.47	1.89	4.61	13.98	10.24	33.66	4.92	~ 1808 lb
4WB 15+1PB 15	mm	390±0.2	1030		225	588	12	48	117	655	260	405	125	~ 715 kg
	in	15.362 15.346	40.55		8.86	23.15	0.47	1.89	4.61	25.79	10.24	15.94	4.92	~ 1577 lb
4WB 15+2PB 15	mm	390±0.2	1030		225	588	12	48	117	655	260	555	125	~ 820 kg
	in	15.362 15.346	40.55		8.86	23.15	0.47	1.89	4.61	25.79	10.24	21.85	4.92	~ 1808 lb
4WB 15+4PB 15	mm	390±0.2	1030		225	588	12	48	117	655	260	855	125	~ 1050 kg
	in	15.362 15.346	40.55		8.86	23.15	0.47	1.89	4.61	25.79	10.24	33.66	4.92	~ 2315 lb

a) 510mm for a calibration in N·m with weight in kg (use outer groove); 500mm for a calibration in N·m with weight in N (use inner groove).

NOTE: 3D STEP files of most of our products are available on our website: www.magtrol.com ; other files are available on request.

RELATED PRODUCTS

WB SERIES - EDDY-CURRENT DYNAMOMETER



Fig. 3: 1 WB43 | Eddy-Current Dynamometer

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).

PB SERIES - POWDER DYNAMOMETER



Fig. 4: 1 PB 115 | Powder Dynamometer

The PB Series 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.

DYNAMOMETER OPTIONS

Tandem brakes consist of two brakes, each with its own specific options (see specific datasheet). Depending on the configuration of the tandem it is possible to add some options (e.g.Speed Encoder,...) Please, contact our sales technicians for technical information and specific dimensional drawing.

ORDERING INFORMATION

ORDERING NUMBER	-	WB	---	+	-	---	---
2, 4 : Model number							
43, 65, 115, 15 : Model number							
1, 2, 4 : Model number							
WB, PB : Type							
43, 65, 115, 15 : Model number							

Examples:
 2WB43 & 1PB43 TANDEM Dynamometer would be ordered as **2WB43+1PB43**
 2WB15 & 4PB15 TANDEM Dynamometer, would be ordered as **2WB15+4PB15**
 2WB115 DUAL Dynamometer would be ordered as **2WB115+2WB115**

SYSTEM OPTIONS AND ACCESSORIES

DSP 7000 - HIGH-SPEED PROGRAMMABLE DYNAMOMETER CONTROLLERS

Magtrol's Model DSP7000 High Speed Programmable Dynamometer Controller employs state-of-the-art Digital Signal Processing Technology to provide superior motor testing capabilities. Designed for use with any Magtrol Hysteresis, Eddy-Current or Powder Dynamometer, Magtrol In-Line Torque Transducer or auxiliary instrumentation, the DSP7000 can provide complete PC control via the USB or optional IEEE-488 or RS-232 interface. With up to 500 readings per second, the DSP7000 is ideally suited for both the test lab and the production line.



Fig. 5: DSP 7001 | Programmable Dynamometer Controllers

MODEL 7500 SERIES - POWER ANALYZERS

The Magtrol MODEL 7500 Series Power Analyzer is an easy-to-use instrument ideal for numerous power measurement applications. From DC to 80kHzAC, the MODEL 7500 Series measures volts, amps, watts, volt-amps, frequency, crest factor, Vpeak, Apeak and power factor in one convenient display. They may be used either as stand-alone instruments or in conjunction with any Magtrol Hysteresis, Eddy-Current or Powder Brake Dynamometer; any Magtrol Dynamometer Controller and M-TEST Software for more demanding motor test applications.



Fig. 7: MODEL 7510 | Power Analyzers

TSC 401 - TORQUE/SPEED CONDITIONER

The TSC401 is the Torque/Speed Conditioner used to connect Magtrol Eddy-Current (WB Series) or Powder (PB Series) Dynamometers to the DSP7000 Controller. Powered by the DSP7000, and based on a precision instrumentation amplifier, the unit amplifies and filters the torque signal. It also provides power supply and connections for the speed pickup sensor which is located in the dynamometer.

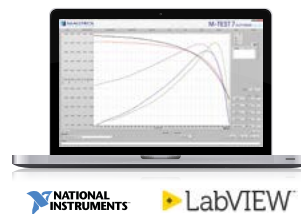
DES SERIES - POWER SUPPLIES

DES Series Power Supplies are specially designed for the full range of Magtrol's Eddy-current and Powder brake dynamometers with the design goal providing the best response time. The DES Series supplies are packaged in an industrial housing made of cast aluminum. This housing must be installed directly on the test bench, ideally on a thermal conductive surface.



Fig. 6: Custom Motor Test System with WB brake

M-TEST - MOTOR TESTING SOFTWARE



Magtrol M-TEST is an advanced motor testing software (Windows® based) for data acquisition. Used with a Magtrol Programmable Dynamometer Controller (e.g. DSP7000), M-TEST works with any Magtrol

Dynamometer or In-Line Torque Transducer to help determine the performance characteristics of a motor under test. Up to 63 parameters are calculated and displayed utilizing M-TEST's feature-rich testing and graphing capabilities.

An integral component of any Magtrol Motor Test System, M-TEST performs ramp, curve, manual, pass/fail, coast and overload to trip tests in a manner best suited to the overall efficiency of the test rig. Written in LabVIEW™, M-TEST has the flexibility to test a variety of motors in a multitude of configurations. The data generated from this user-friendly program can be stored, displayed and printed in tabular or graphical formats, and is easily imported into a spreadsheet.

Magtrol can also make custom modifications to the software to meet additional motor testing requirements.

CMTS - CUSTOM MOTOR TEST SYSTEMS

MAGTROL provides motor testing components to turnkey solutions for all your motor testing needs. Typical test benches include: dynamometers, 4-Quadrant loading motors, tables, fixtures, control racks, power supplies, power analyzers, ohmmeters, temperature measurement and dedicated M-TEST software. Other sensors can be integrated upon request.