

Lode Ergometry Manager has been extended with the spectacular new Expansion Module “Wingate Test <sup>Plus</sup>”. Based on the actual processor speed and new Lode ergometer technology, the software is able to correct the moment of inertia based on 1 pedal revolution. Because of these developments and collection of data prior to the Wingate phase combined with Lodes long-term experience of Wingate testing, significant improvement of the calculation of the Peak Power and Time to Peak has been achieved.

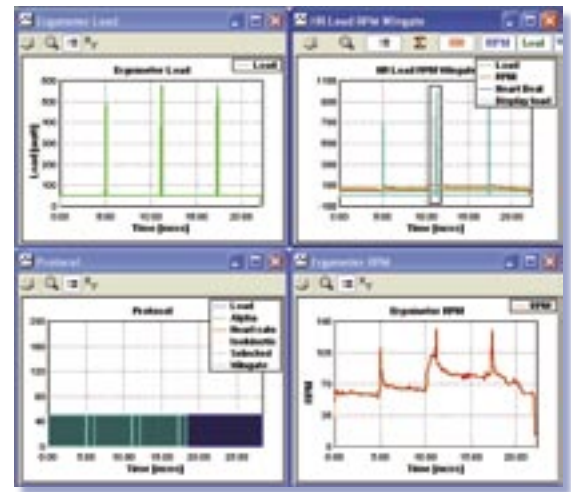
The software provides new insights into the first phase of a sprint test and enables, for the first time, an “interval sprint test”. This makes it possible to define the optimal Torque setting for an athlete more precisely and allows new research in the field of anaerobic capacity and sprint testing.

Because the Wingate Test <sup>Plus</sup> is a LEM module, it can be combined with other LEM modules, such as Export and Pedal Force Measurement. In combination with the unique module Pedal Force Measurement, a complete left/right analysis can be performed. Research has shown that this can lead to considerable improvements in the efficiency of cycling.

The Wingate Anaerobic Test is the most popular test for assessing a person’s anaerobic capacity. Because anaerobic performance is important for many athletes, the most well-known application of the Wingate test is in sports medicine. But there is more! The Wingate test is especially useful for children with chronic diseases like Cystic Fibrosis, Diabetes and Muscle Dystrophy. Another application is to test the increasing obese population.

The LEM Wingate Test <sup>Plus</sup> is a pre-programmed test protocol of the commonly known Wingate Anaerobic Test with specific visualisations, analysis and reports. The most important visualizations are:

- **Peak Power (PP)** is the highest mechanical power achieved at any stage of the test. It represents the explosive characteristics of a person’s muscle power.
- **Mean Power (MP)** represents the average local muscle endurance throughout the Wingate test.
- **Rate of Fatigue** is the drop in power from Peak Power to the lowest power, and is presented in %.



Multiple Wingate Test Visualisations

The image shows a 'Test subject properties' dialog box with the following fields and values:

<input type="checkbox"/> Anonymous	Weight (kg)	67
ID: 12345	Height (cm)	189
Name: Test	Date of birth:	4/26/1966
First name: Subject	Max HR (1/min)	200
Initials: S.T.	Max BP (mmHg)	250
Gender: <input checked="" type="radio"/> Male <input type="radio"/> Female	Max delta BP (mmHg)	30
	Torque factor (Nm/kg)	6.78
	Torque (Nm)	67.86
Street: Zerkapark	No:	18
City: Groningen	Zip code:	9747AA
Phone: +31-(0)6-5712811		
Mobile:	email:	sub@lode.nl

Additional information:  
defining Torque for Wingate test

Defining Torque settings for a test subject

Besides these results, the LEM Wingate Test <sup>Plus</sup> offers;

- Time to PP,
- Time to RPM max,
- RPM start,
- RPM max and RPM at PP values,
- Fatigue slope in W/sec,
- PP/body mass,
- MP/body mass.

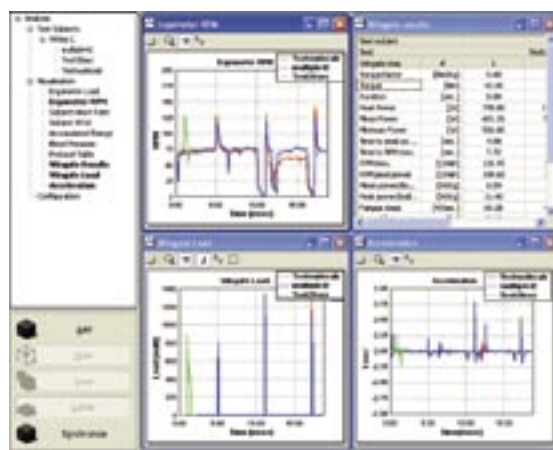
**Features**

Besides the above mentioned, the new Wingate Test <sup>Plus</sup> offers the following features:

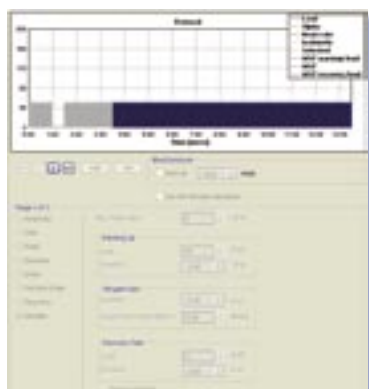
- Registration of pre-Wingate data for more accurate results
- Compatible with other LEM modules
  - Pedal Force Measurement
  - Export for exporting the raw data
  - One database
- Automatic Wingate calculations on all Wingate steps in the protocol
- Defining custom-made Wingate steps
- Switching on/off the correction of the moment of inertia during the test and/or analysis
- Possibility of Multiple Wingate Test
- Wingate Test with flexible Torque and duration
- Define the personal optimal Torque
- Manual calculation of results by defining areas of interest with coordinates
- Comparison of inter- and intra-individual Wingate results
- File import from former Lode Wingate software

Wingate step	#	1	2	3
Torque factor	[Nm/kg]	0.60	0.60	0.60
Torque	[Nm]	42.00	42.00	42.00
Duration	[sec]	5.00	5.00	5.00
Peak Power	[W]	1306.12	792.75	822.03
Mean Power	[W]	374.25	1342.45	1132.00
Maximum Power	[W]	483.20	970.80	884.80
Time to peak power	[sec]	2.56	3.02	2.90
Time to 80% max	[sec]	4.70	5.87	4.52
RPM start	[1/min]	43.27	43.62	45.69
RPM max	[1/min]	120.40	120.40	120.40
RPM peak power	[1/min]	112.08	115.04	122.44
Mean power/bodymass	[W/kg]	18.08	16.52	17.76
Peak power/bodymass	[W/kg]	17.43	15.23	16.13
Fatigue slope	[W/sec]	70.76	200.90	93.94
Rate of fatigue	[%]	42.51	57.01	41.24
Total work	[J]	4704.90	4001.20	4940.07
Work in PP/bodymass	[J/kg]	25.45	33.45	23.73
Work in PP/bodymass	[J/kg]	40.83	106.34	67.97

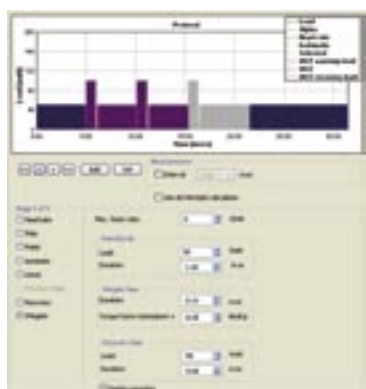
Wingate data



Comparison of Test Results



Default Wingate protocol



A Wingate protocol with 3 stages

Test subject	Test	#	1	2	3	Test time, sec	Power, W/kg
Subject 1	Torque factor	[Nm/kg]	0.60	0.60	0.60	0.60	0.70
	Torque	[Nm]	42.00	42.00	42.00	42.00	42.00
	Duration	[sec]	5.00	5.00	5.00	5.00	5.00
	Peak Power	[W]	1306.12	1342.45	1332.40	1304.80	1327.00
	Mean Power	[W]	374.25	762.45	822.03	480.90	682.74
	Maximum Power	[W]	483.20	970.80	884.80	740.80	740.80
	Time to peak power	[sec]	2.56	3.02	2.90	1.07	4.00
	Time to 80% max	[sec]	4.70	4.90	4.22	4.51	4.80
	Minimum	[1/min]	120.40	120.40	120.40	120.40	120.40
	Maximum power	[1/min]	108.40	108.40	110.00	112.07	89.80
	Mean power/bodymass	[W/kg]	18.08	16.52	17.76	9.37	18.80
	Peak power/bodymass	[W/kg]	17.43	15.23	16.13	17.76	17.12
Fatigue slope	[W/sec]	70.76	200.90	93.94	28.52	109.42	
Rate of fatigue	[%]	42.51	57.01	41.24	48.27	27.76	
Total work	[J]	4704.90	4001.20	4000.07	14420.77	4942.00	
Work in PP/bodymass	[J/kg]	25.45	33.45	19.74	44.80	36.36	
Work in PP/bodymass	[J/kg]	40.83	96.34	67.97	189.74	109.40	
Work in PP	[J]	408.30	963.40	679.70	1897.40	1094.00	

Wingate results of various test subjects and protocols

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 ISO 13485:2003 certified