ROLLING AT THE SPEED OF LIFE

ERGONOMICS & EFFICIENCY
HOW CG-MAX WHEELS DELIVER MEASURABLE VALUE

A COMPARATIVE ANALYSIS

INDEX

What do hundreds of hours in R&D material formulation, process optimization and testing produce?
MEASUREABLE RESULTS

ABSTRACT

Within industrial environments around the world, ergonomics and efficiency continue to be leading drivers for improving safety and profitability. Anywhere frequently moved materials exist, enhancements to mobility and material flow can generate measurable benefits for a company: from increased throughput to reductions in injuries and workers' comp. Countless hours of research and development go into finding and creating better ways to move equipment each year. One of the most impactful ways to positively impact these drivers is to evaluate and enhance the casters and wheels on your equipment. It is the reason Colson Group spends thousands of hours per year working on advanced mobility products and the purpose of this comparative technical paper focused on the latest ergonomic advancement of the CG-MAX Max Efficiency Wheel™.

This paper describes a method of measuring ergonomic characteristics of wheels commonly used on industrial carts and other equipment used to move objects from one location to another. This paper also compares ergonomic test results of various sizes of Colson Group's CG-MAX line of wheels with wheels of the same size from an industry-leading competitive brand and concludes with a summary of the differences.

INTRODUCTION

A key performance criteria for evaluating casters and wheels is how easy or difficult it is to move a piece of equipment or a cart that the caster or wheel is affixed to. Many factors enter into this evaluation including the size of the equipment or cart, the weight as loaded, the terrain on which the equipment or cart is being moved, the center of gravity, etc. It is therefore important to properly match the wheel performance with the application.

Many factors also affect the ergonomic performance of the wheel itself: tread material, core (or inner portion) of the wheel, bearing type, wheel diameter, wheel width, tread hardness, tread profile, etc.

When comparing the performance of different wheels for a given application, it is essential to isolate the performance of the wheel itself – removing the effects of the cart or equipment as well as the mechanical portion of the caster (or "rig") that the different wheels may be mounted in.

TEST METHODOLOGY

Casters and wheels are normally tested in accordance with known industry standards so there is some consistent basis by which data can be compared.

In North America, the default industry standard is ANSI-ICWM-2018 "Vocabulary, Performance and Testing Requirements for Casters and Wheels" published by the Institute of Caster and Wheel Manufacturers, an industry group of the Material Handling Institute. In this standard, section 4.4 describes some basic requirements for the apparatus one is to use to measure the rolling and swiveling performance of a caster at its rated load capacity. Section 6.3 of this standard describes the test procedure for industrial casters. The result of testing to this standard is for informational purposes only, as there is no established minimum acceptance criteria. It is most useful for comparing performance of different wheels assuming that any nuances to the test set up are repeated consistently.

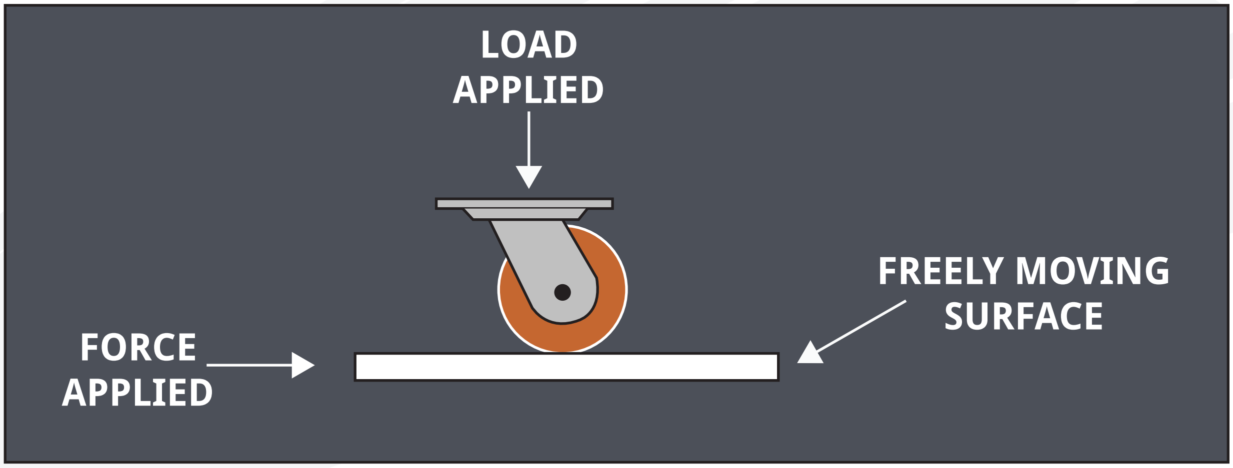
The testing conducted in this study complies with the ANSI-ICWM-2018 requirement and makes use of automated equipment to assure consistency as well as digital output of results to provide accurate data at a discernable level of resolution.

TEST EQUIPMENT

The equipment used in this study applied a direct load to the assembled caster in various increments up to and including the caster's rated load. The test surface was smooth steel and was oriented parallel to the mounting plane of the caster. The caster was oriented such that the wheels were aligned with the direction of travel.

A gradual force was applied to the movable surface in the direction of caster travel, and the point at which the wheel began rotation was noted (see Figure 1 below).

FIGURE 1



The peak force recorded at this point represents the "force to initiate roll".

For each size of wheel tested, 2 wheels were used. Wheels were mounted in the same rig for each test, thus keeping any characteristics of the rig itself constant. Three readings were taken for each test, and the average force to initiate roll was recorded. The test was completed for four to six increments (depending on wheel size) up to the rated load. Finally, the above testing was repeated using a second rig. A total of 48 to 72 (2 X 3 X 6 X 2) data points were collected to study the results across all sizes and loads (see Figure 2).

Figure 2

TEST DESIGN

	RIG 1																	
	LOAD 1			LOAD 2			LOAD 3			LOAD 4			LOAD 5			LOAD 6		
READING #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
WHEEL 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WHEEL 2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

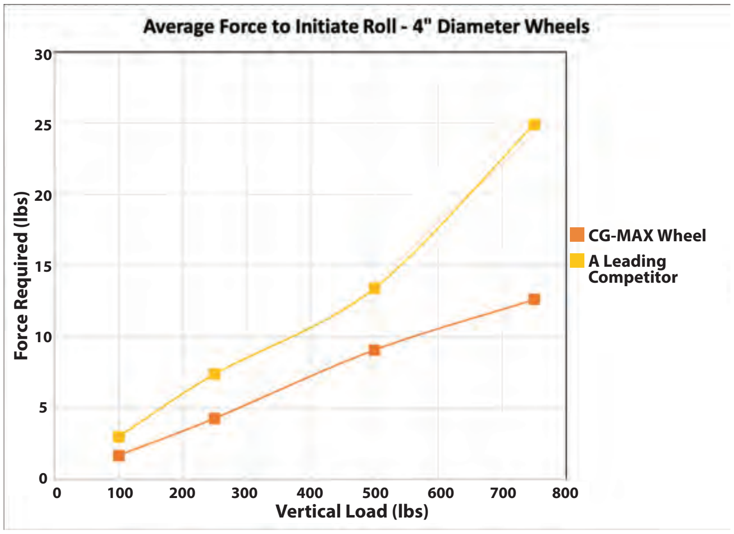
	RIG 2																	
	LOAD 1			LOAD 2			LOAD 3			LOAD 4			LOAD 5			LOAD 6		
READING #	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
WHEEL 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WHEEL 2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

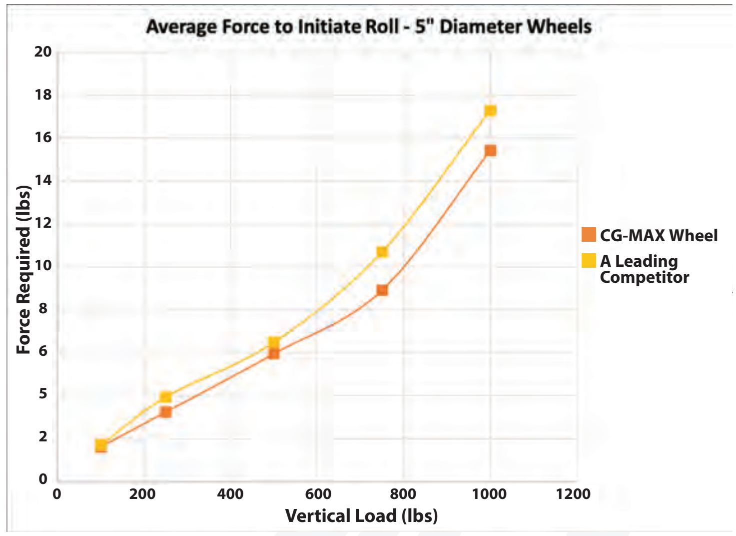
(See following page for test results)

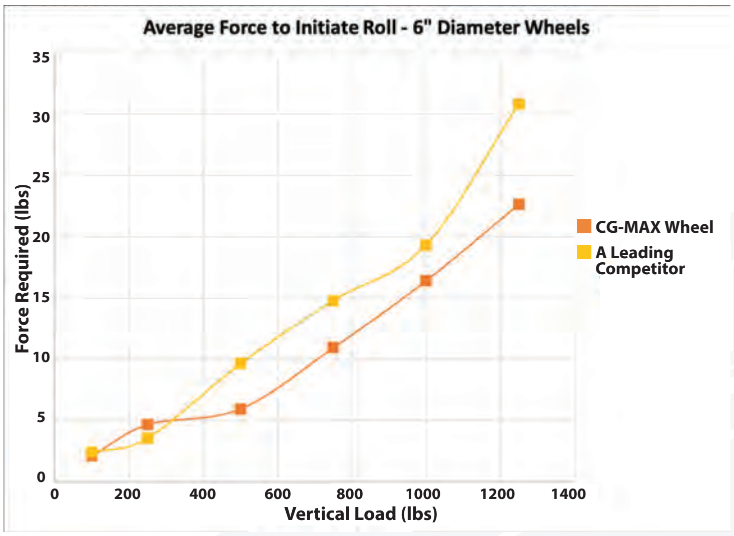
It was determined that the number of data points collected was statistically significant and the results were analyzed to assure that the data collected was representative of performance and not overly influenced by measurement error. It should be noted however that data at the lower loads is likely more influenced by measurement error than data at higher loads due to the level of discernment available. For instance, differences in data collected at lower loads may be 1-2 lbs. as opposed to differences in data at higher loads, which may be 5-10 lbs. or greater.

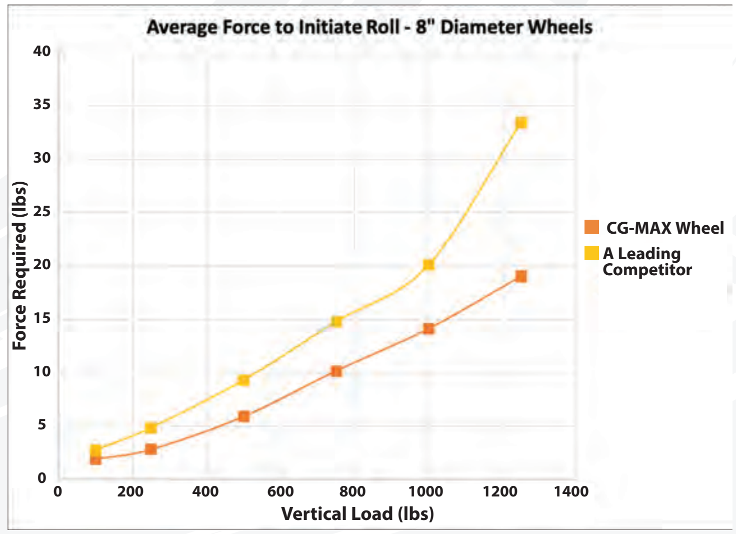
TEST RESULTS

The curves below for each wheel size summarize the data collected in the manner above.









% REDUCTION IN AVERAGE FORCE REQUIRED TO INITIATE ROLL CG-MAX vs. A TOP INDUSTRY COMPETITOR

(Per ANSI-ICWM-2018, Section 6.3)

Wheel Size	100# LOAD	250# LOAD	500# LOAD	750LOAD	1000 LOAD	1250# LOAD
4”	44%	41%	32%	49%	--	--
5”	5%	18%	8%	17%	11%	--
6”	12%	-31%	38%	26%	15%	27%
8”	30%	42%	37%	31%	30%	43%
AVG	23%	18%	29%	31%	19%	35%

Green results = % CG-MAX outperformed a top industry competitor

SUMMARY

For each of the wheel diameters studied, the required force to initiate rolling at each vertical load was less for the CG-MAX wheel than the top industry competitor wheel (with the exception of one load on the 6" diameter wheels). The difference in force required is generally minimal at lighter loads, with any differences likely resulting from some measurement error. The difference in force required generally became more pronounced as the vertical load was increased, and the effect of any measurement error in data at these loads is minimal.

On average, the CG-MAX wheel required between 18% and 35% less force to initiate rolling, depending on the vertical load applied.

When interpreting this data, it is important that one consider that in most cases at least four wheels would be used on a piece of equipment or cart. When multiplying the results above across a minimum of four wheels, the difference in the force required to initiate rolling can be quite substantial.

The **CG-MAX Max Efficiency Wheel™** is featured in both **Colson** and **Albion** flagship brands.
Click the series below to download CAD Models, Datasheets or view more information.

Colson

The Most Trusted Casters IN THE WORLD

4 Series:

Standard Kingpin
Swivel and Rigid

KINGPINLESS FOR SHOCK AND IMPACT

Enforcer
Swivel and Rigid

6 Series:

Standard Kingpin
Swivel and Rigid

KINGPINLESS FOR SHOCK AND IMPACT

Enforcer
Swivel and Rigid

MAINTENANCE-FREE

Evolution
Swivel and Rigid

ALBION

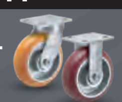
the caster experts

MEDIUM HEAVY DUTY

16 series

HEAVY DUTY

110 series



KINGPINLESS

170 series

SPRING LOADED

KINGPINLESS

141 series

MAINTENANCE FREE MEDIUM HEAVY DUTY

18 series

68 series

DUAL WHEEL

KINGPINLESS

115 series

Colson GROUP ROLLING AT THE SPEED OF LIFE

Specifications subject to change without notice