

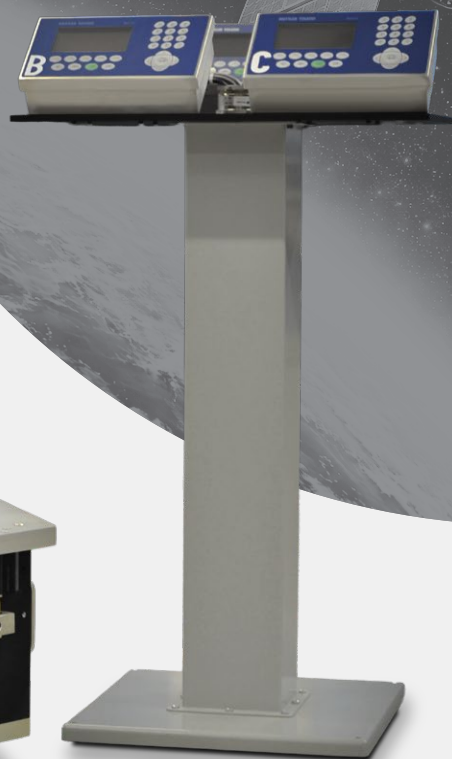
WCG Series

Weight Center of Gravity is measured with high accuracy on items up to 2,850 lb (1,300 kg) with our WCG Series Measurement Instruments.

These instruments use the multi-point mass weighing method to simultaneously measure both mass (weight) and center of gravity (CG). Less than one minute is required to make a measurement, so these instruments are ideally suited to high volume production. This type of instrument is often used to measure “black boxes” used in aircraft and missiles.



WCG Series



Weight and Center of Gravity Measurement Instruments

WCG Series Measurement Concept

An object is lowered onto the Mass (or Weight) and Center of Gravity (CG) table and positioned relative to the machine zero (fixturing may be required). The center of gravity location and weight of the object are then determined by the computer which reads the force transducers and performs the necessary algebraic calculations. Mass (weight) is calculated by summing the output of the force transducers. CG is calculated using an equation involving the spacing of the transducers, and the distribution of force. For example, if the weight of the test item is applied equally to all transducers, then the CG of the test item is at the midpoint between the transducers. These instruments measure two axis CG. The third CG coordinate may be measured after rolling the object 90 degrees.

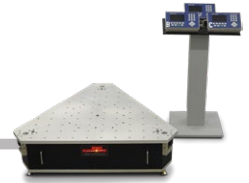
Safety Features

The test table is electrically grounded to the instrument frame for static protection. Optional Class I, Group D or Class II, Div 2, Groups E, F, G explosion proofing can be provided.

Test Fixtures

The instrument mounting surface is a precision grid plate (see photo to the left). Rectangular objects with at least one flat surface may be mounted directly on the table, eliminating the need for a custom fixture in many instances. This mounting surface is a flat rectangular plate with numerous holes in a grid pattern with known relationship to the table origin. The holes are equally spaced and allow for mounting test parts so they have a known location with respect to the machine's reference axes. For test parts which are basically rectangular in shape, a fence and one pin (or 3 pins) which are supplied with the instrument, are installed on the grid plate to make contact with the test part and establish a datum corner. The measurement software provided automatically calculates CG results relative to this defined datum corner. For test parts that are cylindrical or irregularly shaped, a precision fixture is needed to locate the test item so its nominal CG is close to the machine zero.

Weight and CG Measurement Instruments



The machine accuracy is only as good as the accuracy and repeatability of this fixture. Fixture position error can be minimized by calibrating the machine with a precision test mass that contacts the fixture at the same location as the part. Space Electronics manufactures a number of vee block fixtures which are designed to hold cylindrical test items. Custom fixturing may be required for other shapes. Whenever possible, test items should be fixtured so the longest dimension is horizontal, to minimize center of gravity height. It should also be noted, when measuring radial CG offset of cylindrical parts, accuracy can be greatly improved by providing a fixture in which the test object can be rolled 180 degrees about its longitudinal axis. This technique gives two CG offset measurements which can be averaged to eliminate fixturing and leveling error.

Software

For these instruments is provided so that any Windows compatible PC with an available RS-232 port may be used. All instructions for use are given on screen. The measurement software supplied prompts the operator, reads the transducers, calculates weight and CG location, and prints a report. There is a provision for keying in the description or serial number of the object under test, so that the data report can be used to document a series of tests on different objects. Optional custom software calculates the ballast weights required to shift CG location to meet certain specifications.

Center of Gravity Accuracy

CG accuracy is a function of test object weight, center of gravity height, fixture accuracy, and the care with which the instrument is leveled. These instruments are less accurate than our KSR series gas bearing pivot type instruments.

- **Standard Series WCG** series instruments can detect changes in CG as small as a few thousandths of an inch for test items which are near the weight limit of the instrument. To calculate the sensitivity to CG change, divide the instrument moment sensitivity (lb-inch) by test item weight (lb). The accuracy limitation with this type of instrument is due to a lack of definite zero reference.
- **KSR instruments**, zero is the center of rotation of the gas bearing and can easily be related to the position of the test item by a dial indicator. On this type of instrument, the zero reference is affected by the dimensional accuracy of the fixture and the leveling accuracy (on rotary table pivot type instruments such as our KSR series, leveling error is eliminated automatically). These errors can be minimized by calibrating the instrument with a test mass whose CG location is precisely known. This test mass must interface with the fixture in precisely the same manner as the item being measured. A different test mass is required for each fixture.

Technical Specifications - Standard Dual Axis Instruments for General Purpose (C-Series)

Model No.	Instrument Type	Payload Weight Capacity		Moment Sensitivity		Weight Sensitivity	
WCG75C	Dual axis, standard accuracy	75 lb	35 kg	0.5 lb-in	0.58 kg-cm	0.06 lb	30 g
WCG175C	Dual axis, standard accuracy	175 lb	79 kg	1.25 lb-in	1.44 kg-cm	0.1 lb	45 g
WCG455C	Dual axis, standard accuracy	455 lb	205 kg	3.0 lb-in	3.45 kg-cm	0.24 lb	110 g
WCG1380C	Dual axis, standard accuracy	1,380 lb	625 kg	8.0 lb-in	9.2 kg-cm	0.6 lb	275 g
WCG2850C	Dual axis, standard accuracy	2,850 lb	1,290 kg	10.0 lb-in	11.5 kg-cm	1.2 lb	550 g

Custom Instruments with High Accuracy for Dedicated Payloads – a Few Examples

Model No.	Instrument Type	Payload Weight Capacity		Moment Sensitivity		Weight Sensitivity	
WCG500	Dual axis, high accuracy	500 lb	225 kg	0.5 lb-in	0.58 kg-cm	0.5 lb	250 g
SE9601	Single axis	200 lb	90 kg	2.0 lb-in	2.3 kg-cm	0.1 lb	50 g

Alternate weight capacities and accuracies are available. Custom interfaces are also available. NIST traceable calibration hardware is included with all our instruments.