# Bolt-on Sensor Quantity & Placement Guide

The design and type of vessel impacts the number of bolt-on sensors and the specific placement of them. The quantity and placement of each sensor is important in order to get the most accurate and consistent measurements.

Bolt-on sensors can only be used on metal supports and should always be installed in pairs. By having two sensors on the same support, the changes in the vessel due to natural bending of the metal structure are canceled out and a true reading of the weight is given.

This document is only a reference guide, and the sensors are only one part of the whole weighing system. For configurations not shown, please contact Kistler-Morse Application Support for assistance.

## Legged Vessels

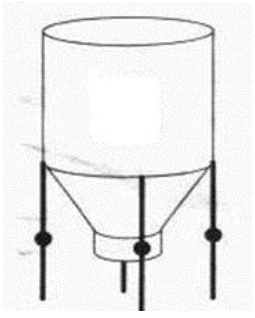
Legged vessels are some of the most common types of silos; these are simply held up by a leg structure. The primary factor in separating legged vessels into different groups is the number of braces between the legs or supports. A brace is designed to make the stucture stronger and more sturdy, usually being able to hold more weight.

NO BRACES - If there are no braces between the supports, there are no additional factors to consider in determining mounting location of the sensors. Therefore, the number of legs determines the number of sensor pairs that would be required; two sensors per leg. For example, a four legged silo would need 8 bolt-on sensors (4 pairs).

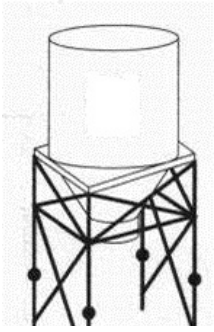
SINGLE OR DUAL LEVELS OF BRACING - If the vessel structure includes single or dual levels of bracing supports, it will be important to learn more about the structure to determine where and how many bolt-on sensors will be the most effective. For more than two layers of bracing, contact Kistler-Morse Application Support for assistance.

Questions that may be asked to identify the optimal number of sensors and placement on vessels with braces:

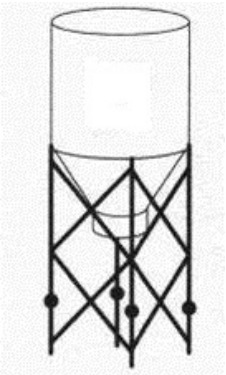
- What is the size of the cross brace?
- Where are the cross braces connected to the vessel or each other
- How are the cross braces connected - welded, bolted, etc



NO BRACING



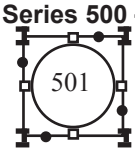
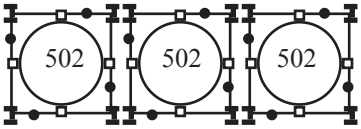
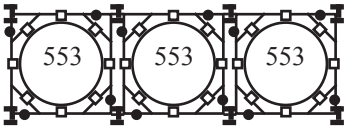
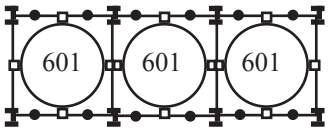
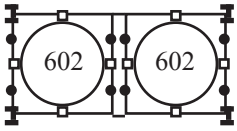
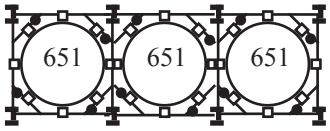
DUAL LEVEL BRACING



MULTI-LAYER BRACING

## Horizontal Beam/Shear Vessels

If a vessel is supported by horizontal beams which are connected to vertical legs, it is considered a horizontal beam or a shear application. The weight forces of the vessel are being distributed to the horizontal beams. The horizontal beam connection to a vertical leg creates the shear force in the horizontal beam. The shear force is what is being measured by the sensor in order to determine the weight of the material. The number of support points for each vessel is critical in determining how many and where bolt-on sensors should be used.

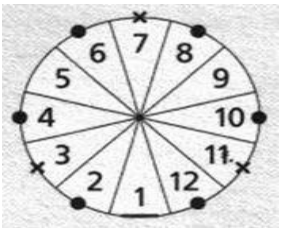
| SAMPLE VESSEL/SENSOR CONFIGURATIONS (TOP VIEW) | VESSEL CONSTRUCTION DESCRIPTION | SUPPORT POINTS PER-VESSEL | # OF SENSORS PER VESSEL |
|---|---|---|---|
| **Series 500 — Independent Beams** | | | |
|  | Single vessel — no diagonal beam supports | 4 | 8 |
|  | Multiple vessels — no diagonal beam supports, no common beams or common vertical legs | 4 | 8 |
|  | Single vessel — diagonal beam supports, weight supported by diagonal beams only | 4 | 8 |
|  | Single vessel — diagonal beam supports, weight supported by horizontal and diagonal beams | 8 | 8 |
|  | Multiple vessels — diagonal beam supports, weight supported by horizontal and diagonal beams, no common beams, common vertical legs | 8* | 8 |
| **Series 600 — Common Horizontal Lateral and/or Longitudinal Beams** | | | |
|  | Multiple vessels — no diagonal beam supports, common internal lateral beams, common internal vertical legs | 4 | 8 |
|  | Multiple vessels — no diagonal beam supports, independent internal lateral beams, common longitudinal beams | 4 | 8 |
|  | Multiple vessels — diagonal beam supports, weight supported by horizontal and diagonal beams, common internal lateral beams, common internal vertical legs | 8 | 8 |

Legend:
- I = vertical leg
- □ = vessel support point
- ● = mounting location for Microcell set

*Note*: Illustrations for Series 501, 502, 551, 552, 553, and 651 show Microcells to left of load points. If obstructions prevent use of these locations, locate **all** Microcells to right of load points on indicated beams.

## SKIRTED SILOS

Skirted silos have a weight bearing metal wall or ‘skirt’ around the material container. Skirted silos can either be welded together, where panels are used to construct the vessel or can be bolted together. The construction type does impact the placement of the sensor pairs; the sensors need to be placed around the silo so that it is balanced for proper, consistent measurements.

| Vessel Diameter | Number of Sensor Pairs | Spacing between Sensors Bolted (Rings) Vessels | Spacing Between Sensors Welded (Panels) Vessels |
|---|---|---|---|
| 9 ft (2.7 m) | 3 | 9 ft 5 in. (2.9 m) | Every other panel (Black Dot)   |
| 12 ft (3.7 m) | 4 | 9 ft 5 in. (2.9 m) | |
| 15 ft (4.6 m) | 5 | 9 ft 5 in. (2.9 m) | |
| 18 ft (5.5 m) | 6 | 9 ft 5 in. (2.9 m) | |
| 21 ft (6.4 m) | 7 | 9 ft 5 in. (2.9 m) | |
| 24 ft (7.3 m) | 8 | 9 ft 5 in. (2.9 m) | |
| 26 ft (7.9 m) | 8 | 9 ft 5 in. (2.9 m) | |
| 28 ft (8.5 m) | 10 | 8 ft 10 in. (2.7 m) | |

KM KISTLER-MORSE® Measure of Success
150 Venture Boulevard
Spartanburg, SC 29306
Tel: (800) 426-9010
Tel: (864) 574-2763 [Local]
Fax: (864) 574-8063
sales@kistlermorse.com
www.kistlermorse.com

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