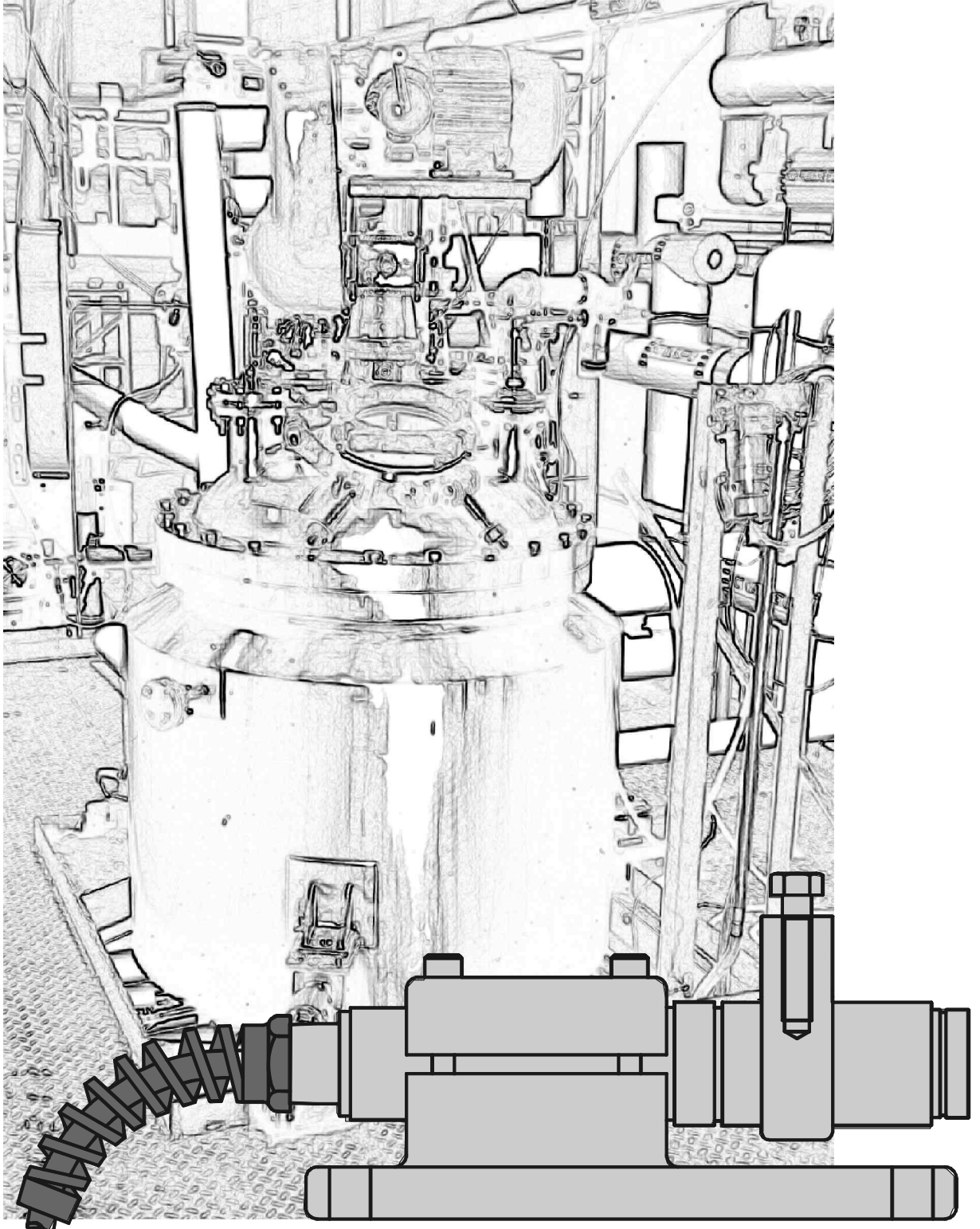




# KIS Weigh Modules

Installation and Operator's Manual



## BLH Electronics, Inc.

— A Spectra-Physics Company —

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# SECTION I Introduction

## 1.1 INTRODUCTION

This manual provides general information, installation, operating, and service information for BLH KIS-1, -2, and -3, Load Beam transducers. Primary attention will be given to the KIS Weigh Module (Figure 1-1), which is a combination of the KIS Load Beam and associated mounting hardware.

## 1.2 PRODUCT DESCRIPTION

### 1.2.1 The KIS Beam

BLH KIS Beams are precision transducers for measurement of weight and other forces. The beams contain bonded strain gages which are stressed by applied shear forces. The strain gages produce changes in the electrical output proportional to the applied force.

KIS Beams offer the inherent advantage of all strain gage devices—excellent stability, high accuracy, reliability, and infinite resolution. They contain no moving parts or fluids; and are environmentally protected against dust and liquids. The beams are available with full-scale ranges from 0.5 - 500kN (110 - 112,500 lbs). The load bearing elements are machined from high strength steel and are designed for a uniform, repeatable stress distribution where the strain gages are bonded to the beam.

The KIS Load Beam design incorporates an outer 'sleeve' that can be viewed as a second cantilever (Figure 1-2), rigidly attached to the free end of the first cantilever. This unique 'double cantilever' design gives the KIS beam many advantages over conventional bending and shear beam designs. Rather than applying force at the free end of the beam, the load point is brought back to a position directly over the gaged area. This results in a bending 'moment' very close to zero across the gaged area. Since a shear beam is designed to measure shear force, not bending force, any reduction in bending moment stress increases the accuracy of the measurement. The second cantilever also is effective at isolating load application point stresses from the active element.

Small deflection, double cantilever design, and absence of moving parts give BLH KIS Beams excellent high frequency response for dynamic force measurements.

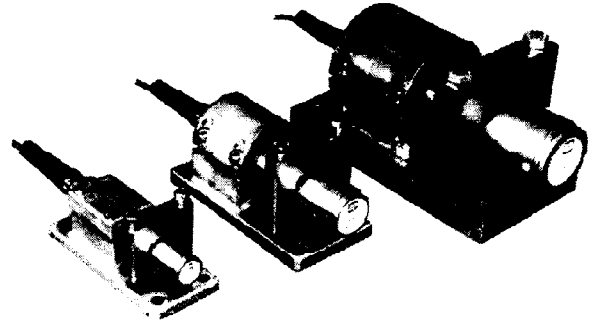


Figure 1-1. KIS Weigh Module Configurations

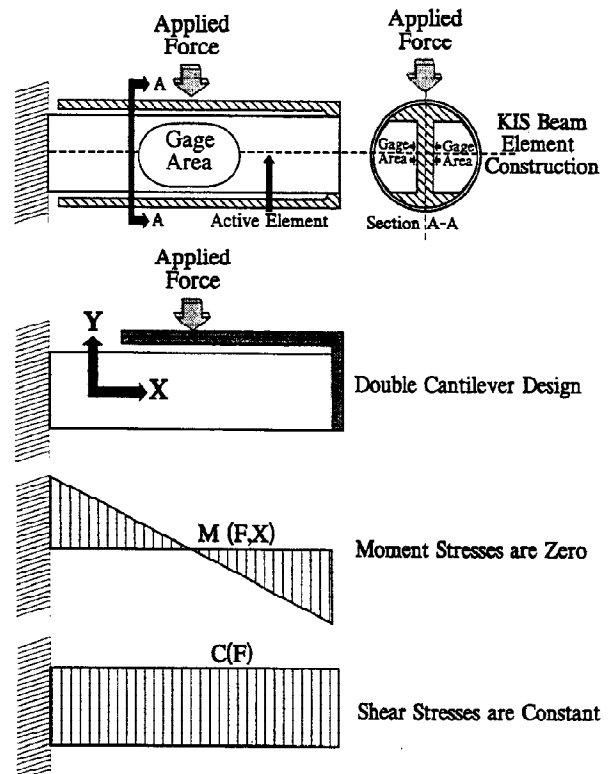


Figure 1-2. Double Cantilever Design

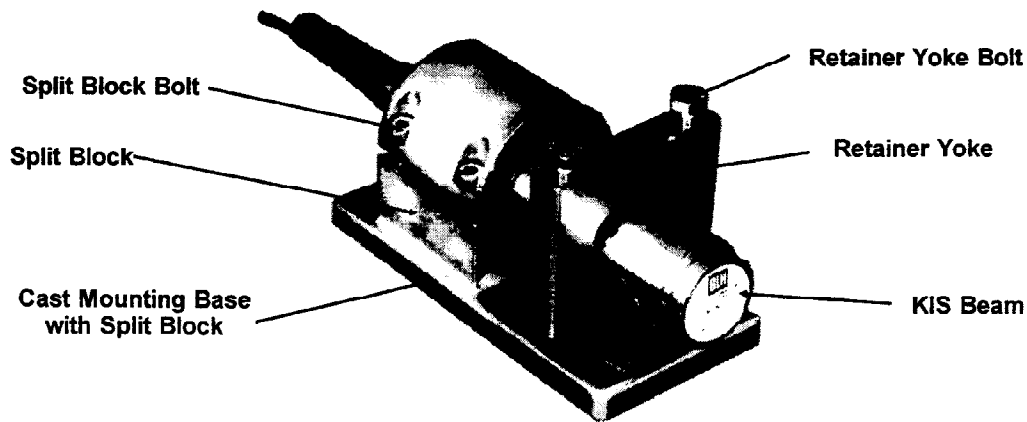


Figure 1-3. KIS Weigh Module Components

### 1.2.2 Mounting Hardware

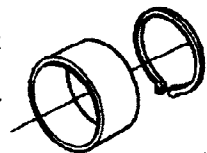
KIS Weigh Module mounting hardware consists of a single piece cast mounting base and a retainer-yoke (Figure 1-3). The KIS Load Beam is installed in the base and turned to orient the arrow on the wrench flat (at the cable end of the beam) with the applied load. Typically, the load is vertical (tank, bin, hopper, etc.) and orientation is made with a spirit level across the reference plane. Rotate Beam to level and clamp with the bolts in the mounting base, split block. The retainer-yoke is positioned at, or as close as possible, to the recommended load point on the KIS Load Beam and bolted to the vessel being weighed. Mounting hardware design simplifies installation while eliminating the need for vessel stay and check rods.

### 1.3 KIS BEAM ACCESSORIES.

Accessories described and illustrated are typically used for industrial process weighing. For information concerning special requirements, contact BLH.

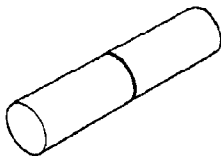
#### 1.3.1 Safety Stop Spacer

Supplied as a kit (spacer and retaining ring, Figure 1-6) Safety Stop Spacers correspond in size to the selected KIS Beam. Spacer tubes limit travel of the retainer-yoke and structure being weighed, but allowing normal thermal expansion of tank or vessel.



#### 1.3.2 Dummy Beams.

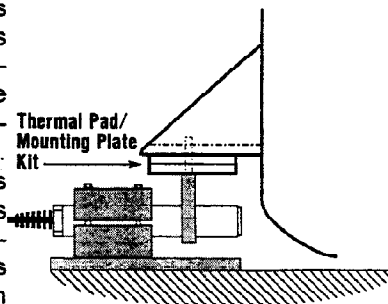
Dummy beams are solid steel shafts with the same dimensions as the corresponding KIS Beam, used in place of the KIS Beam during the installation process. Use of a Dummy Beam eliminates the risk of damage to the precision KIS Beam due to stray welding currents and/or mechanical impact.



#### 1.3.3 Thermal Insulation Kits

Thermal insulation kits (pad, plate, and mounting hardware) reduce heat conduction from a heated vessel to the KIS Load Beam allowing beam temperatures to remain close to ambient for maximum accuracy. The pads are made of rigid laminate with extremely low conductivity.

BLH recommends using insulation kits if the vessel mounting surface temperature exceeds 52C (130F). Figure 1-7 provides outline dimensions for thermal insulation kits. One kit is required for each system weigh module.



#### 1.3.4 Mounting Plate Kits

BLH sells weigh module mounting plates to simplify KIS installation. A mounting plate kit is identical to the thermal insulation kit, without the thermal pad. All mounting plate dimensions are presented in Figure 1-5 (all dimensions apply except 'F', for correct 'H' subtract 'F'). Each kit includes a painted steel plate and mounting hardware. One kit is required for each system weigh module.

See thermal pad kit outline Figure 1-7 for standard dimensions.

# 1.4 KIS WEIGH MODULE SPECIFICATIONS

Available Capacities	KIS-1	50 kN - 500 kN
	KIS-2	0.5 kN - 50 kN
	KIS-3*	1 kN - 20 kN
Excitation Voltage-	10 Vac-dc recommended 18 Vac-dc maximum	
Input Resistance	350 ± 3.0 ohms	
Output Resistance	350 ± 3.0 (±0.5, KIS-3) ohms	
Insulation Resistance	4 G-ohms minimum	
Rated Output (RO)	2.0394 mV/V ±0.1% (±.25% KIS - 2)	
Zero Balance - %RO	KIS-1	1.0
	KIS-2	5.0
	KIS-3	1.0
Error - Max. - %RO (best fit through zero)	KIS-1	0.03 (Combined error)
	KIS-2	0.05 (Combined error)
	KIS-3	0.02 (Combined error)
Creep - %RO (Minutes)	KIS-1	±0.02 (5)
	KIS 2	±0.02 (5)
	KIS-3	±0.0075 (5)
Load Point Shift Error Compensated Temp.	0.005%/mm -10 to +50°C (+15 to +120°F)	
Safe Temp.	-40 to +105°C (-40 to 220°F)	
Temperature Effects: Zero Balance - %RO	KIS-1	0.003/°C (0.0017/°F)
	KIS-2	0.0014/°C (0.0008/°F)
	KIS-3	0.0014/°C (0.0008/°F)
Output - % Reading	KIS-1	0.0015/°C (0.0008/°F)
	KIS-2	0.0033/°C (0.0018/°F)
	KIS-3	0.0014/°C (0.0008/°F)
Repeatability	KIS-1,2,3	0.01% Rated Capacity

Approvals  
 FM (Factory Mutual) 3611 (Class I, II, III;  
 Div.1,2; Groups A-G)  
 CSA C22.2 (Class I, II, III;  
 Div.1,2; Groups A-G)

Strength Factors	.5-50kN	100/200kN	500kN
Safe Load - %Rated Capacity	150	150	150
Ultimate Load - %Rated Capacity	300	300	300
Safe Sideload - %Rated Capacity	100	100	55
Ultimate Sideload - %Rated Capacity	200	175	75
Safe Uplift - %Rated Capacity	100	70	70
Ultimate Uplift - %Rated Capacity	120	85	85

Deflection - mm (in.)	1 kN	0.101 (0.004)
(Beam Specifications Only)	2 kN	0.101 (0.004)
	5 kN	0.152 (0.006)
	10 kN	0.203 (0.008)
	20 kN	0.304 (0.012)
	50 kN	0.457 (0.018)
	100 kN	0.558 (0.022)
	200 kN	0.812 (0.032)

Connection-4-Cond. Cable KIS-1, 2, 3 10 m (32 ft. 10 in.)

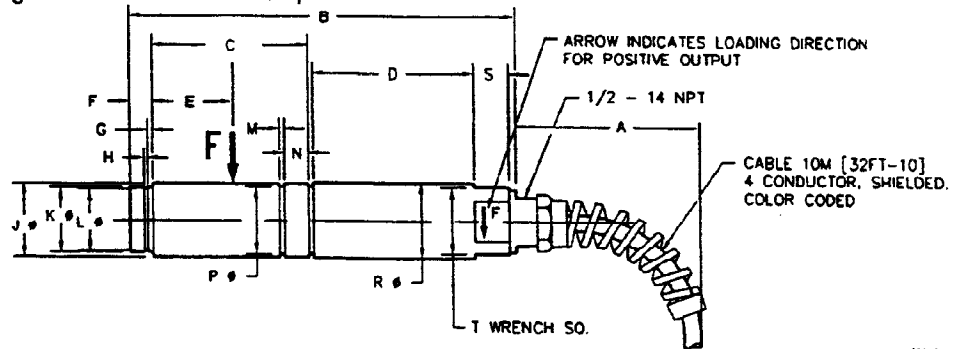
Surface Conditioning/  
 Material KIS-1 = Alloy Steel with  
 Zinc Chromate Coating  
 KIS-2, 3 = Electropolished  
 Stainless Steel (15-5PH)  
 (Optional)\*\* KIS-1 Environmental Coating(EC)  
 Moisture Protection IEC IP67

\*KIS 3 Weigh Modules are designed for applications requiring ultra-high accuracy, as reflected by their superior specifications. NTEP certificate of conformance number 87-061 has been issued for KIS 3, 2-20 kN beams.

\*\* A synergistic coating consisting of a nickel alloy plating infused with polymers, designed to withstand 500 hours in ASTM B-117 salt spray. BLH uses NEDOX® (General Magnaplate Co.) or equivalent.

# 1.5 OUTLINE DIMENSIONS

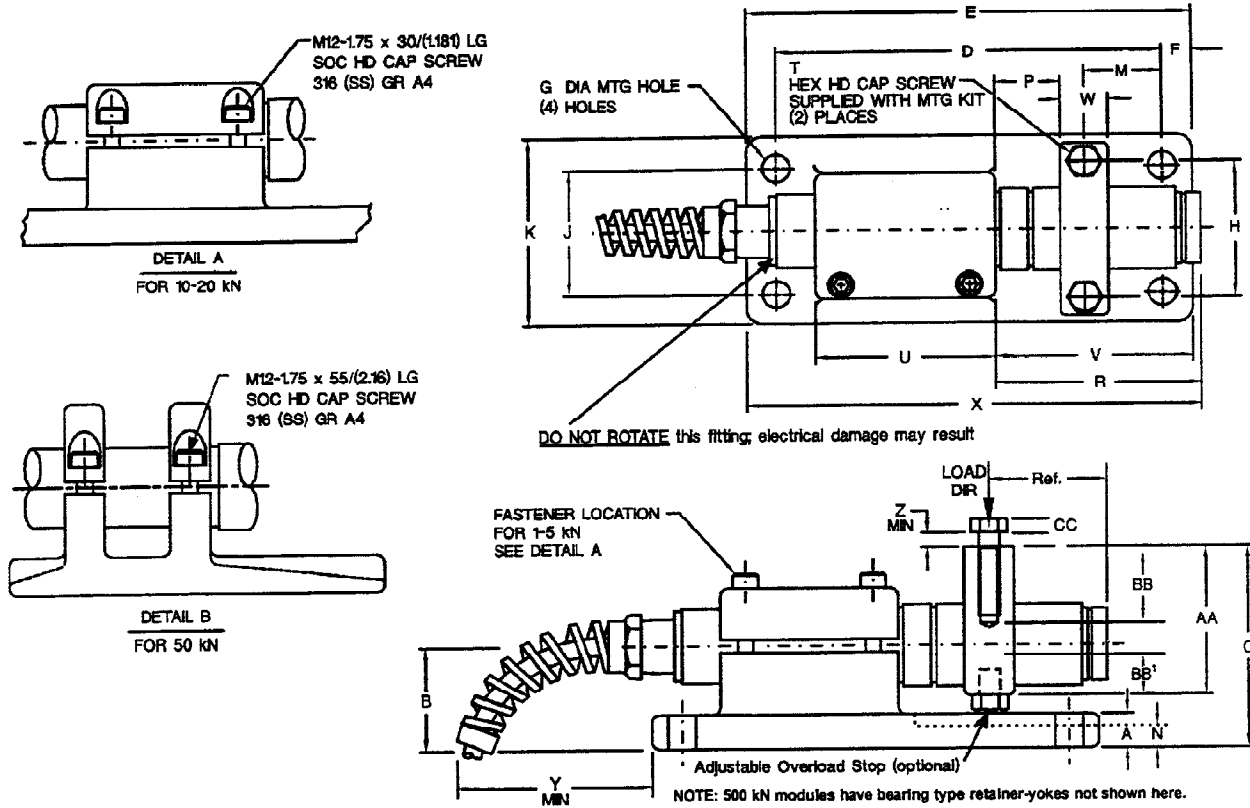
Figure 1-4 shows the outline dimensions for the KIS beam and Figure 1-5 gives dimensions for complete KIS Weigh Modules.



Capacity kN	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	Weight kg/(lb)
0.5-1-2-5 kN	169 (6.65)	69 (2.72)	70 (2.75)	36 (1.42)	10 (.394)	2.5 (.098)	1.6 (.063)	33 (1.30)	29 (1.14)	27.6 (1.09)				34 (1.33)	15 (.591)	30 (1.18)	1.36 (3)
10-20 kN	213 (8.38)	100 (3.94)	75 (2.96)	47 (1.85)	13 (.512)	4 (.158)	1.85 (.728)	50 (1.96)	45 (1.77)	42.5 (1.67)	2.15 (.084)	13 (.512)	47 (1.85)	51 (2.0)	20 (.787)	46 (1.81)	3.18 (7)
50 kN	265 (11.6)	144 (5.7)	110 (4.33)	81 (3.2)	12 (.472)	6 (.197)	2.65 (.104)	75 (2.95)	70 (2.75)	67 (2.64)	2.65 (.104)	12 (.472)	72 (2.83)	76.1 (3.03)	20 (.787)	80 (3.15)	9.54 (21)
100 kN	319 (12.6)	155 (6.1)	120 (4.72)	92 (3.6)	15 (.591)	8 (.236)	2.65 (.104)	90 (3.54)	82 (3.23)	78.5 (3.09)	3.15 (.124)	12 (.472)	86.5 (3.40)	91.9 (3.62)	20 (.787)	70 (2.75)	15 (33)
200 kN	350 (13.8)	175 (6.9)	130 (5.12)	113 (4.4)	15 (.591)	8 (.236)	3.15 (.124)	100 (3.93)	90 (3.54)	86.5 (3.40)	3.15 (.124)	12 (.472)	96.5 (3.80)	100.1 (3.97)	20 (.787)	80 (3.15)	20 (44)
500 kN	454 (17.9)	202 (7.9)	180 (7.1)	130 (5.12)	35 (1.38)	20 (.787)	4.15 (.163)	140 (5.5)	130 (5.12)	126 (4.96)	4.15 (.163)		138 (5.43)	142 (5.60)	27 (1.06)		52.2 (115)

A for all beams = 57.2 - (2.25) Dimensions are shown in mm above and (inches) below

Figure 1-4. KIS Beam Outline Dimensions



Capacity kN(lb)	A	B	C	D	E	F	G	H	J	K	L	M	N	WT - lb
1-2-5 (225-450-1125)	12.7 (0.50)	41.5 (1.63)	81.5 (3.21)	151 (5.94)	173 (6.8)	12 (0.47)	12 (0.47)	55 (2.16)	51 (2.01)	76.2 (3.0)	—	31 (1.22)	—	7
10-20 (2200-4400)	17.8 (0.700)	56.4 (2.22)	107 (4.23)	180 (7.09)	204 (8.03)	12 (0.47)	13 (0.512)	75 (2.95)	76 (2.99)	102 (4.0)	—	32 (1.26)	—	14
50 (11250)	28.6 (1.125)	82.5 (3.25)	151.9 (5.98)	245 (9.65)	279 (11.0)	17.5 (0.69)	17.5 (0.69)	115 (4.53)	115 (4.53)	152.4 (6.0)	18 (0.71)	45.7 (1.80)	—	28
100 (22500)	40 (1.58)	93 (3.66)	173 (6.81)	270 (10.63)	310 (12.20)	20 (0.79)	22 (0.87)	126 (4.96)	130 (5.12)	170 (6.69)	22 (0.87)	63 (2.48)	26 (1.02)	53
200 (45000)	50 (1.97)	108 (4.25)	199 (7.83)	300 (11.81)	340 (13.39)	20 (0.79)	25 (0.98)	146 (5.75)	140 (5.51)	180 (7.09)	25 (0.98)	71 (2.80)	32 (1.26)	73
500 (112500)	60 (2.36)	180 (7.09)	315 (12.40)	420 (16.54)	480 (18.9)	30 (1.18)	33 (1.30)	240 (9.45)	220 (8.66)	280 (11.02)	26 (1.02)	108 (4.25)	—	187
Capacity kN(lb)	P	R	T	U	V	W	X	Y	Z	AA	BB	CC	REF	
1-2-5 (225-450-1125)	25 (0.99)	81 (3.19)	M8 1.25x35	60 (2.36)	78 (3.063)	19 (0.75)	178 (7.01)	45 (1.77)	9.60 (0.378)	60.0 (2.361)	25.4 (1.0)	5.5 (0.22)	46.4 (1.82)	
10-20 (2200-4400)	45 (1.79)	115 (4.53)	M10 1.5x65	75 (2.95)	99 (3.89)	19 (0.75)	220 (8.66)	47 (1.85)	14.2 (0.559)	80.5 (3.171)	50.8 (2.0)	7 (0.27)	60 (2.375)	
50 (11250)	50 (1.97)	158 (6.22)	M16 2x80	109 (4.29)	128 (5.04)	31.8 (1.25)	310 (12.2)	57.2 (2.25)	—	115 (4.53)	115 (4.53)	9.9 (0.39)	93 (3.661)	
100 (22500)	45 (1.77)	172 (6.77)	M20 2.5x140	120 (4.72)	148 (5.827)	40 (1.575)	334 (13.15)	35 (1.38)	—	135 (5.32)	26 (1.024)	13 (0.52)	107 (4.212)	
200 (45000)	40 (1.58)	193 (7.60)	M24 3x160	129 (5.07)	156 (6.142)	50 (1.969)	377 (14.85)	23 (0.90)	—	152 (5.98)	26 (1.024)	15 (0.59)	128 (5.038)	
500 (112500)	40 (1.58)	240 (9.50)	M24 3x200	180 (7.09)	213 (8.39)	70 (2.76)	507 (19.96)	—	—	—	—	—	165 (6.494)	

**NOTES:**

L = diameter of YOKE through holes for modules with split block (retainer/yoke) mounting hardware.

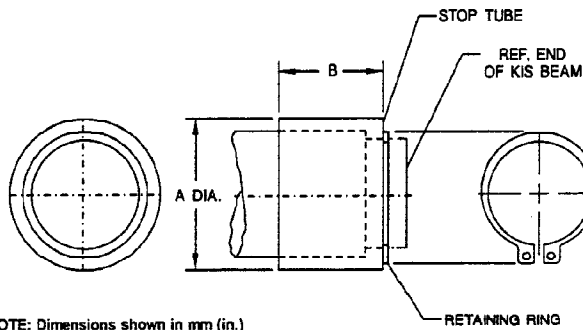
N = dimension of mounting base "step" on 100/200 kN modules

BB = Thread depth of cast yoke 1-50 kN and BB<sup>1</sup> = thread depth of split block retainer 100, 200 kN

Weight of KIS 2 machined 50 kN mounting hardware = 36 lb

BLH supplied retainer-yoke bolts (T) have a minimum tensile strength of 100,000 psi.

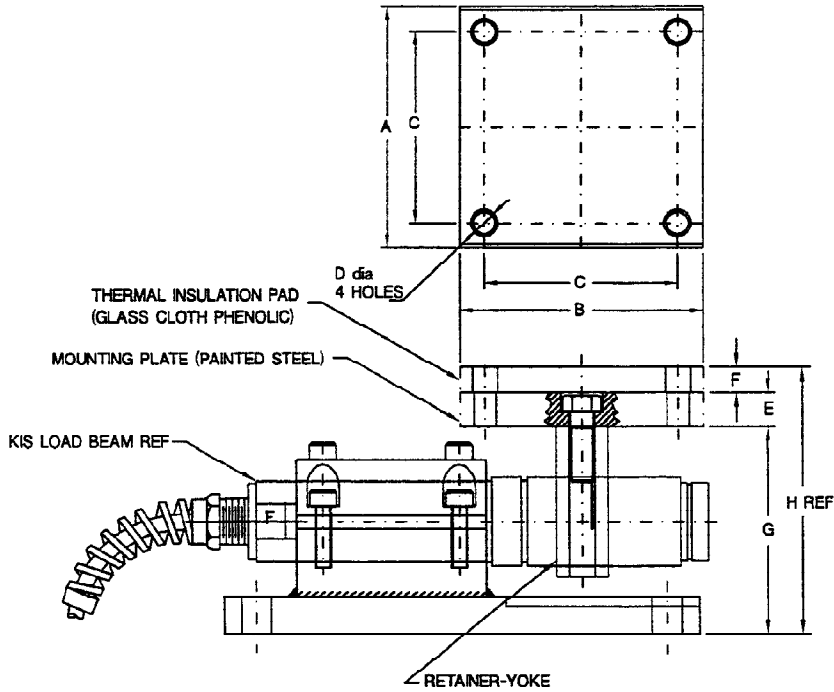
**Figure 1-5. KIS Weigh Module Outline Dimensions**



NOTE: Dimensions shown in mm (in.)

CAPACITY kN (lb)	STOP TUBE MATERIAL	RETAINING RING MATERIAL	A DIA.	B
1-5 (2225-1124)	STAIN STL	SPRING STL PHOSPHATED	41 +/- 0.3 (1614 +/- 0.012)	185 +/- 0.3 (728 +/- 0.012)
10-20 (2248-4496)	STAIN STL	SPRING STL PHOSPHATED	58 +/- 0.3 (2284 +/- 0.012)	30.5 +/- 0.3 (1201 +/- 0.012)
50 11240	STEEL ZN PLATED	SPRING STL PHOSPHATED	89 +/- 0.3 (3504 +/- 0.012)	61 +/- 0.3 (2402 +/- 0.012)
100 (22480)	STEEL ZN PLATED	SPRING STL PHOSPHATED	102 +/- 0.3 (4015 +/- 0.012)	68 +/- 0.3 (2677 +/- 0.012)
200 (44960)	STEEL ZN PLATED	SPRING STL PHOSPHATED	111 +/- 0.3 (437 +/- 0.012)	84 +/- 0.3 (3307 +/- 0.012)

Figure 1-6. Safety Stop Kit Outline and Materials



NOTE: 500 kN thermal pad kits are included with the bearing-yoke option. For dimensions, request BLH drawing number 469886-2

TYPE OF MTG KIT CUSTOMER HAS:	CAPACITY kN/lb	A	B	C	D dia	E	F	G	H
MTG KIT WITH CAST 1-PIECE YOKE AND RETAINER	0.5-5 (110-1124)	101.6 (4)	101.6 (4)	76.2 (3)	9.5 (.38)	19 (.75)		81.5 (3.21)	125.9 (4.96)
	10-20 (2248-4496)	101.6 (4)	101.6 (4)	76.2 (3)	9.5 (.38)	25.4 (1)		108 (4.25)	158.8 (6.25)
OR MTG KIT WITH PLAIN YOKE AND RETAINER	50 (11240)	152.4 (6)	152.4 (6)	127 (5)	11.1 (.44)	28.6 (1.13)	25.4 (1)	152 (5.98)	206 (8.11)
	100 (22480)	160.3 (6.31)	152.4 (6)	127 (5)	14.3 (.56)	31.8 (1.25)		173 (6.81)	230.2 (9.06)
	200 (44960)	190.5 (7.5)	190.5 (7.5)	152.4 (6)	14.3 (.56)	3.5 (1.38)		199 (7.83)	259.4 (10.21)

Dimensions shown in kN/(lb) and mm/(in.)

Figure 1-7. Thermal Pad/Mtg. Plate Kit Outline Dimensions

## 1.5 WARRANTY POLICY

BLH warrants the products covered hereby to be free from defects in material and workmanship. BLH's liability under this guarantee shall be limited to repairing or furnishing parts to replace, f.o.b. point of manufacture, any parts which, within one (1) year from date of shipment of said product(s) from BLH's plant, fail because of defective workmanship or material performed or furnished by BLH. As a condition hereof, such defects must be brought to BLH's attention for verification when first discovered, and the material or parts alleged to be defective shall be returned to BLH if requested. BLH shall not be liable for transportation or installation charges, for expenses of Buyer for repairs or replacements or for any damages from delay or loss of use for other indirect or consequential damages of any kind. BLH may use improved designs of the parts to be replaced. This guarantee shall not apply to any material which shall have been repaired or altered outside of BLH's plant in any way, so as in BLH's judgment, to affect its strength, performance, or reliability, or to any defect due in any part to misuse, negligence, accident or any cause other than normal and reasonable use, nor shall it apply beyond their normal span of life to any materials whose normal span of life is shorter than the applicable period stated herein. In consideration of the forgoing guarantees, all implied warranties are waived by the Buyer, BLH does not guarantee quality of material or parts specified or furnished by Buyer, or by other parties designated by buyer, if not manufactured by BLH. If any modifications or repairs are made to this equipment without prior factory approval, the above warranty can become null and void.

## 1.6 FIELD ENGINEERING

Authorized BLH Field Service Engineers are available around the world to install KIS Weigh Modules and/or train factory personnel to do so. The field service department at BLH is the most important tool to assure the best performance from your application. Field service phone numbers are listed below.

Factory: (Main Number) (781) 821-2000 ex.215

Midwest: (614) 476-6453

Southeast: (803) 851-7470

Canada: (416) 251-2690 or (800) 567-6098 in Canada

# SECTION II Installation

## 2-1. GENERAL

Tips, techniques, and procedures for installing total weigh systems are presented in the BLH Electronic Weigh Systems Handbook (HDBK 002-1). This manual deals only with KIS Weigh Modules.

**IMPORTANT:** BLH strongly recommends that the user read this section completely prior to starting installation as each successive step depends upon satisfactory completion of all prior procedures.

## 2.2 KIS WEIGH MODULE INSTALLATION INSTRUCTIONS

This publication provides mechanical and electrical installation instructions for KIS Weigh Modules (Figure 1-1). KIS Weigh Modules are low profile weight transducer devices designed for simple mechanical installation. Each module contains a double cantilever type transducer and mounting hardware which typically allows installation under process and inventory vessels without stay and check rods. Four studs/bolts (customer supplied) secure the KIS module to a foundation or base, and two bolts\* (BLH supplied) attach the retainer-yoke to the weigh vessel leg or gusset. Customer supplied bolts should be grade 8.8 or stronger.

### 2.2.1 Mechanical Installation

KIS installation instructions refer to specific parts of the KIS Weigh Module. Use the KIS module diagram shown in Figure 1-3 to identify parts and part locations.

### 2.2.2 Step by Step Installation Instructions

- (1) **Positioning:** On vertical tanks, bins, or hoppers, KIS Weigh Modules should be oriented to face radially inward or outward. For horizontal vessels, modules mount parallel to the longitudinal axis in opposing directions. Orienting modules as described provides a safe, checkless installation while allowing thermal expansion and contraction of the vessel.
- (2) **Mounting Base Surface Preparation:** The mounting base of the weigh module must be uniformly supported and level (Figure 2-1). On a structural steel support using through bolts, or a concrete pad using studs, the bolt spacing should be accurate to within 0.05 in. of the bolt pattern specified in the outline drawing dimensions (Figure 1-5). Grade 8.8 (or stronger) studs or bolts must be used. Do not weld the weigh modules in place.

\* Four bolts if using thermal pad or mounting plate kits

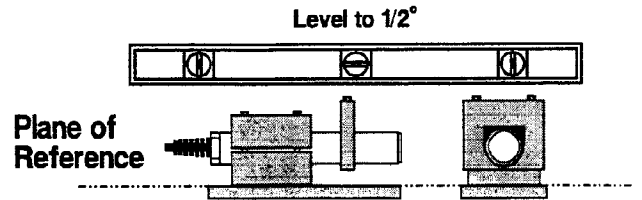


Figure 2-1. KIS Module Level Considerations

- (3) **Weigh Vessel Preparation:** Pre-drill holes in the leg or gusset of the vessel to match the retainer-yoke bolt pattern (see Figure 1-5). If optional thermal pad or mounting plate kits are being installed, use dimensions presented in Figure 1-7. Allow for normal bolt clearance and adjustment. Consult Figure 1-5, specification 'Z' for vessel leg/gusset minimum thickness specifications. Although there is no maximum thickness specification, bolts should achieve four full threads of engagement in the retainer-yoke. Do not weld the retainer-yoke to the vessel leg or gusset.

- (4) **Mechanical Installation** (Figure 2-3):

- a). Raise the vessel and install the weigh module mounting bases in place on the prepared base mounting surfaces. Before bolting down, be sure that the base surface of the weigh module is uniformly supported and level.

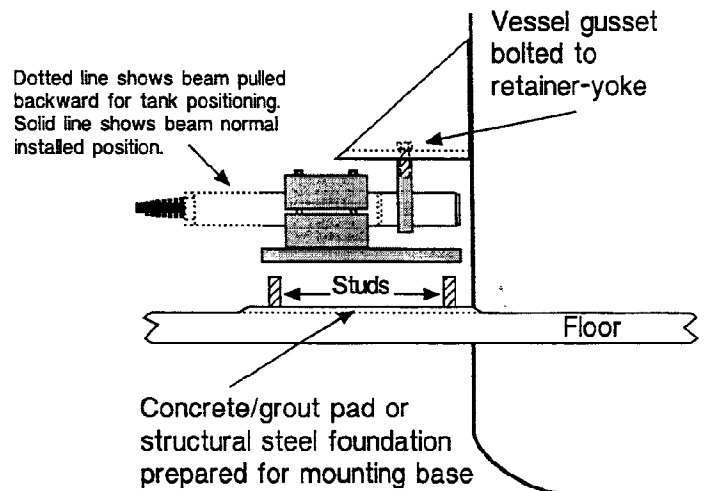


Figure 2-3. KIS Installation Arrangements

- b). Bolt retainer-yokes to the vessel legs/gussets (see Table 2-1 for torque specifications). Mounting bolts are inserted from the vessel side into the threaded retainer-yoke. When thermal pad kits are used, bolt the thermal plate to the retainer-yoke and then bolt the thermal pad/plate to the vessel leg/gusset (reference Figure 2-2).
- c). Slide the KIS/dummy beams backward into the split-block until the vessel is lowered.
- d). Lower the vessel into position maintaining enough height for the KIS/dummy beams to slide easily into the retainer-yokes.
- e). Slide the KIS/dummy beams forward into the retainer-yokes. Make certain that the distance from the split-block to the retainer-yoke coincides with specification 'P' in Figure 1-5, on all modules.
- f). Orient (rotate) the KIS Beam in the split block so that load is applied in the optimal force direction (typically in-line with the force arrow on the beam wrench flat). Tighten the integral split-block bolts to inhibit any further rotation or sliding of the KIS Beams (see Table 2-1 for torque specifications).
- g). Lower the vessel fully onto the KIS/dummy beams. Avoid dropping the vessel or applying an impact load to the beams. Tighten mounting bolts to the bolt manufacturer's recommended torque specification. Following installation, do not perform arc welding on the vessel or any support structure electrically in contact with the weigh module.

(5) **Electrical Installation:** The standard ten meter KIS beam cable contains four conductors with integral shielding. The wiring color code is presented in the table below. Each conductor has tinned leads for easy connection to a BLH summing junction box or transmitter. Excess cable can be coiled up inside the summing unit or transmitter enclosure. If the cable length is cut, the rated output increases by approximately 0.003% per foot at 70F. To achieve extra protection from lightening damage, BLH recommends a ground strap between the vessel and earth ground.

Capacity	0.5 - 200 kN	500 kN
Red Lead	- Signal	+ Excitation
Black Lead	- Excitation	- Excitation
Green Lead	+ Excitation	+ Signal
White Lead	+ Signal	- Signal

These instructions are typical for KIS weigh system applications with weigh vessels, such as tanks, bins, or hoppers.

**NOTE:** When adding/removing conduit to KIS Beam, use spanner wrench to keep the beam end fitting stationary. Rotating the fitting may cause electrical damage.

**Table 2-1. Retainer & Split Block Bolt Torque Specifications**

Capacity	0.5 - 5 kN KIS-2/3	10 - 20 kN KIS-2/3	50 kN KIS-2/3	50 kN KIS-1	100 kN KIS-1	200 kN KIS-1	500 kN KIS-1
<b>Split Block</b>							
Bolt Size	M6	M8	M10	M10	M12	M16	M20
Recommended Torque	5 ft/lb	12 ft/lb	18 ft/lb	29 ft/lb	52 ft/lb	126 ft/lb	172 ft/lb
<b>Yoke</b>							
Bolt Size	M8	M10	M16	M16	M20	M24	M24
Recommended Torque	12 ft/lb	22 ft/lb	60 ft/lb	88 ft/lb	172 ft/lb	199 ft/lb	199 ft/lb

NOTE 1: All KIS-2/3 bolts are stainless steel

NOTE 2: All bolts are grade 8.8 or greater

### 2.2.3 Shimming for Load Distribution

With empty vessel weight resting on the modules and excitation voltage applied, measure output of each module with a DVM (digital volt meter). Each module must indicate some output representing weight of the empty vessel. Readings would normally be from 1-10 mV dc. No module should indicate less than 10% of empty vessel weight; ideally a proportionate share (vessel weight/number of modules) should be 'seen' by each module.

Any module with output less than an equivalent 10% of vessel weight must be shimmed. If a gap exists between the KIS Beam and retainer-yoke, determine the gap size, raise the vessel, loosen the mounting bolts, and add shim material equal to the measured gap plus .015-.030 (Figure 2-4). Tighten the mounting bolts and lower vessel GENTLY onto the beams. Recheck the electrical output for proper distribution and continue inserting shims wherever needed.

If no gap was measured as described above, but 1 or 2 modules had little or no output, insert a trial shim of .015-.030 thickness at module with lowest output and recheck all modules for proper weight distribution.

Repeat shimming process until all modules have outputs within 20-30% of each other.

### 2.2.4 Installation Examples

Pages 2-4 and 2-5 provide examples of horizontal and vertical tank installations.

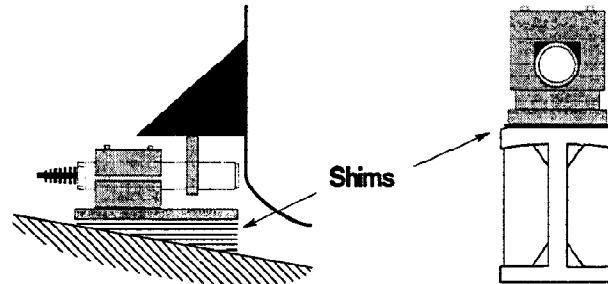
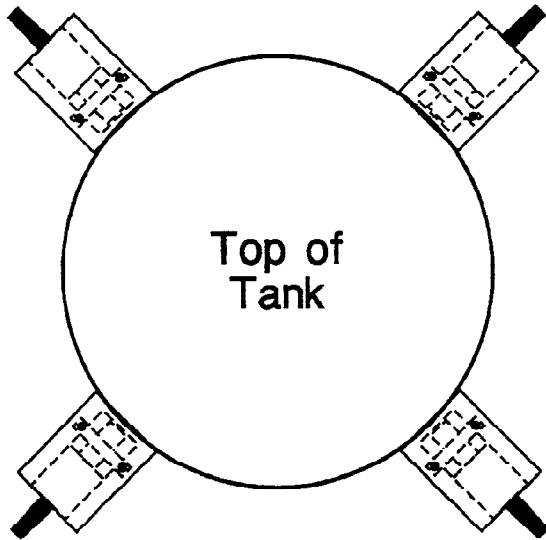
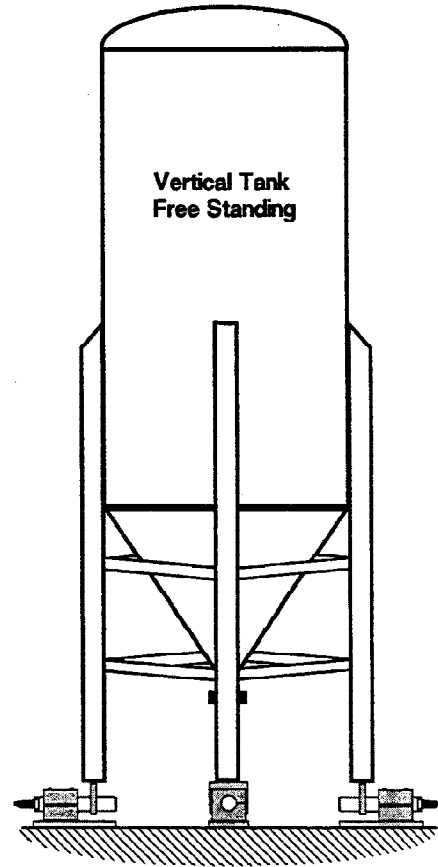


Figure 2-4. KIS Weigh Module Shimming

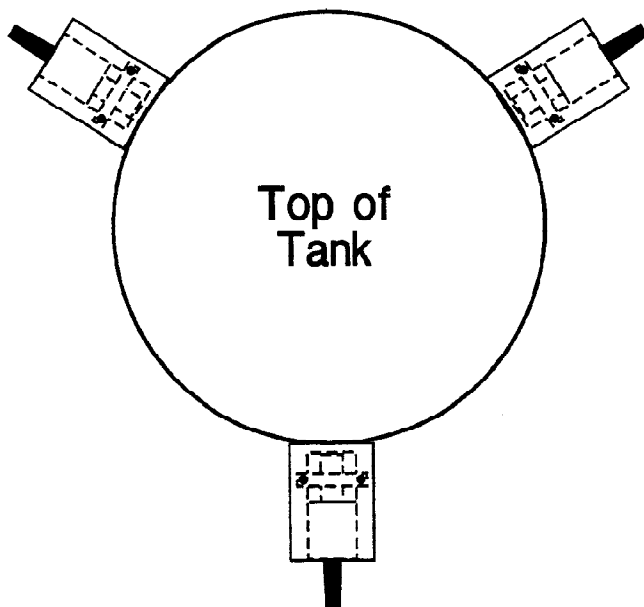
# Vertical Tank Installation



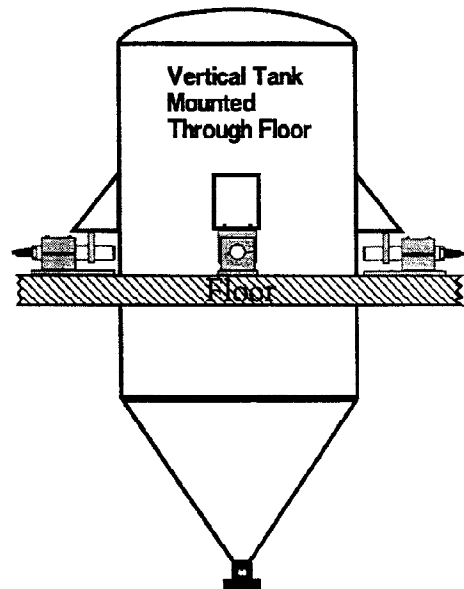
Four Point Full Support, Modules Mounted Radially Inward at 90°



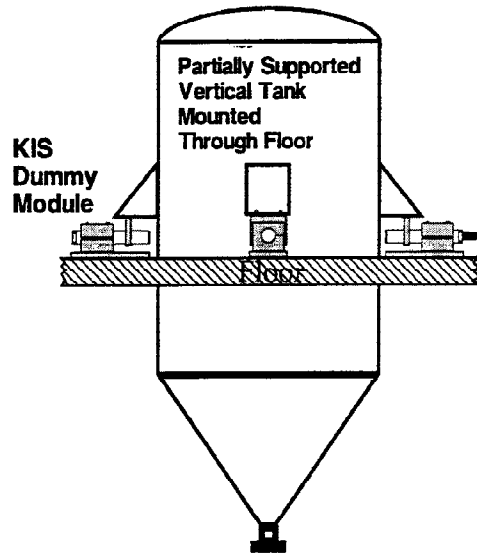
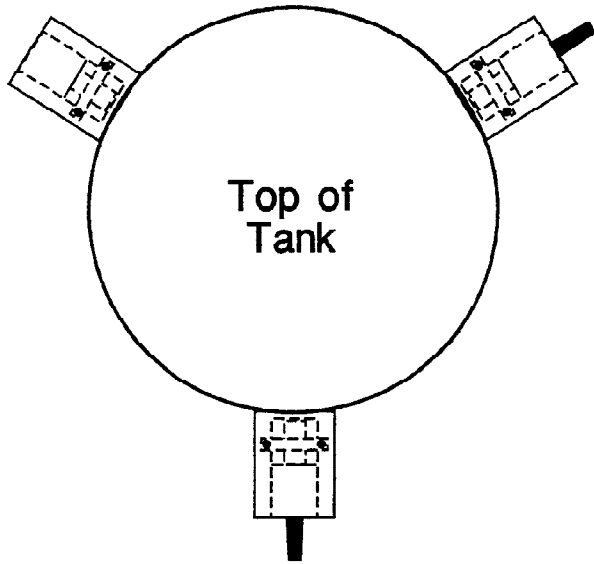
## High Accuracy, Full Support Configurations



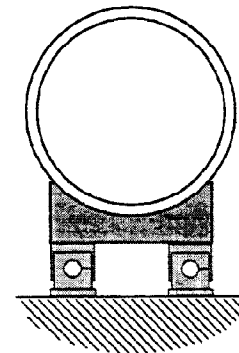
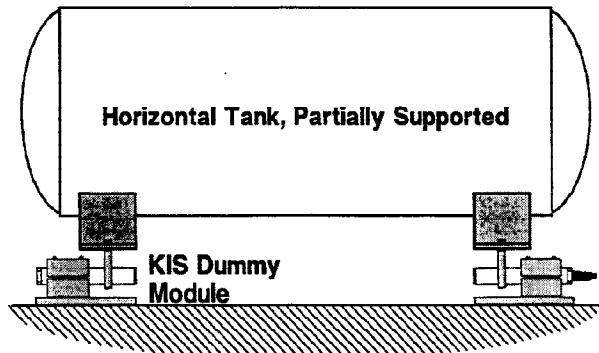
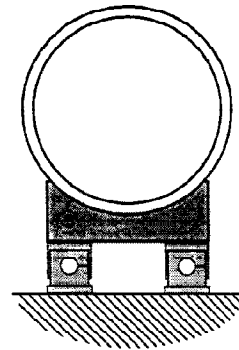
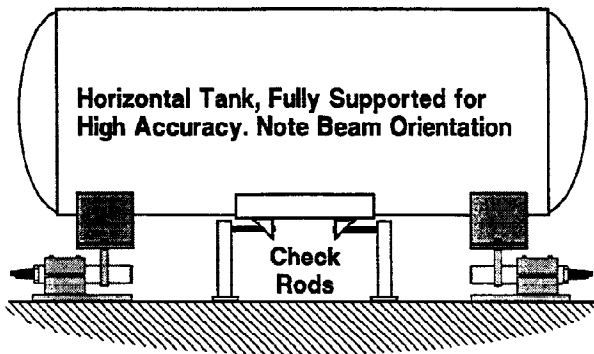
Three Point Full Support, Modules Mounted Radially Inward at 120°



## Vertical Tank, Partially Supported



## Horizontal Tank Installation



## SECTION III Operation

### 3.1 TEMPERATURE CONSIDERATIONS

KIS Weigh Modules perform best when operated within their compensated temperature range of + 15 to + 120 degrees fahrenheit. Maximum operating temperature range without damage is -40 to + 220 degrees fahrenheit.

When ambient temperature exceeds the compensated temperature range, special precautions must be taken to ensure that actual module temperature is held within specified limits. These precautions are necessary whether or not the module is being operated. Thermal pads can be used to reduce conductive heating. (Ref. para. 1.3.3)

### CAUTION

A static overload in excess of the specified overload rating may permanently affect the accuracy and performance of the module. Peak vibratory loadings should be limited to 100% of rated capacity to preclude premature fatigue failure of the module. Shock loads should be avoided or otherwise attenuated by means of resilient pads or mounts. Weigh systems designed without regard to significant shock loads may lose calibration or even damage the module(s) beyond repair.

## SECTION IV Maintenance

### 4.1 CALIBRATION

KIS modules are carefully checked and calibrated at BLH before shipment. The accuracy of BLH instruments and standards used for calibration are traceable to the National Institute of Standards Technology (NIST). A data and calibration sheet is furnished with each module supplied by BLH. The data included on this sheet can be used as a reference where independent calibration checks are performed.

Calibration can be accurately checked by applying the rated load to the module and then comparing the output with the original data on the calibration certificate. Calibration should be checked whenever the beam is thought to have been overloaded beyond its safe overload rating (150%). Note that the module performance cannot be changed through external adjustments and any module displaying calibration error should be returned to BLH for service.

System calibration instructions are included in the digital indicator/transmitter operator's manual.

### 4.2 MAINTENANCE/TROUBLESHOOTING

When it is necessary to determine if a KIS module circuit is operative, the vessel does not have to be lifted off the module in question. Simply read across the output leads (red & white) with a digital voltmeter with power applied to the module. The readings should be somewhat similar, normally in the 5-30 mV range. Any radical departure from these figures are usually indicative of a failure.

To determine the cause of incorrect operation of the measuring system, perform the following inspections:

- a. Check instrument power and fuses.
- b. Check that connections to the instrument are correct and tight.
- c. Check instrument performance independently following recommended procedure.
- d. Check continuity of interconnecting leads.
- e. Check junction box connections (where used).
- f. Check for proper excitation voltage.
- g. Check output of each module for comparable output levels.
- h. Insulation resistance checks: KIS Beams must be disconnected for leakage test (measured values should exceed 5000 m-ohms).
  - 1) Ground to a lead of the interconnecting cable.
  - 2) Module case to a lead of the cable.
  - 3) Module case to the shield of the cable.
- j. Input/Output resistance check. Disconnect the module cable leads from the instrument or junction box. Measure the resistance between the input leads and between the output leads. Resistance should be as specified. OHMMETER USED SHOULD NOT APPLY MORE THAN 20 VOLTS TO THE BEAM BRIDGE.

Resistance readings other than those listed in the specifications indicate a failure within the unit. DO NOT attempt to repair; faulty modules require factory service. Contact the local sales office or BLH directly for RETURN AUTHORIZATION. Upon examination of the module at the factory, a full report on the condition with a quotation on repair cost and delivery will be submitted to the customer.