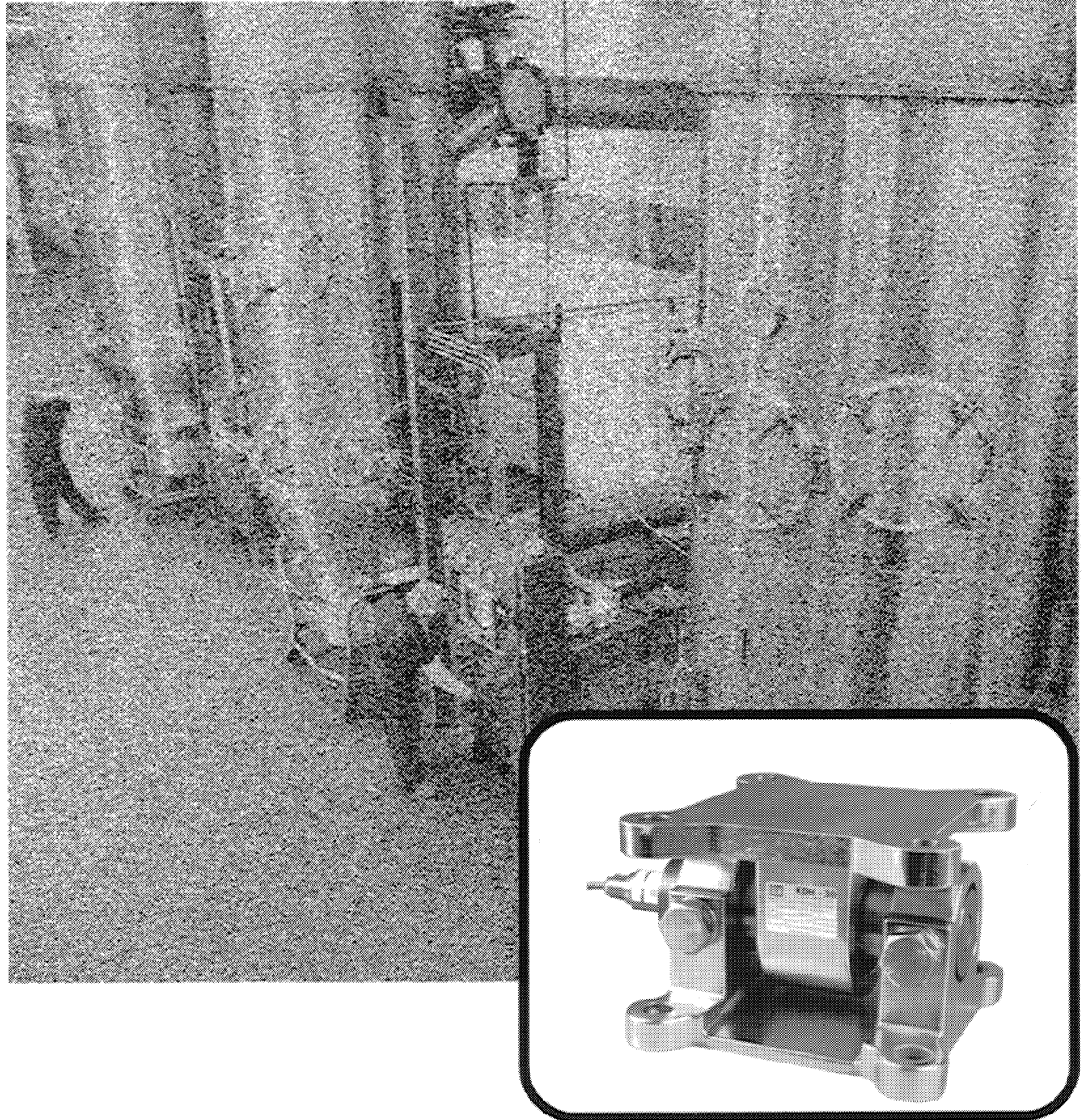


BLH NOBEL

A **VPG** Brand



KDH-3 and KDH-3B Weigh Modules Installation Instructions

NOTICE

BLH Nobel makes no representation or warranties of any kind whatsoever with respects to the contents hereof and specifically disclaims any implied warranties or merchantability or fitness for any particular purpose. BLH Nobel shall not be held liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication or its contents.

BLH Nobel reserves the right to revise this manual at any time and to make changes in the contents hereof without obligation to notify any person of such revision or changes.

Table of Contents

SECTION I General Information	Page 1-1
1.1 INTRODUCTION	Page 1-1
1.2 DESCRIPTION	Page 1-1
1.3 KDH-3 ACCESSORIES	Page 1-2
1.3.1 Simulated Weigh Modules	Page 1-2
1.3.2 Thermal Insulation Pads	Page 1-2
1.3.3 Assembly	Page 1-2
1.4 KDH-3 DIMENSIONS	Page 1-4
1.5 WARRANTY POLICY	Page 1-5
1.6 FIELD ENGINEERING	Page 1-5
SECTION II Installation	Page 2-1
2.1 GENERAL	Page 2-1
2.2 ASSEMBLY INSTRUCTIONS	Page 2-1
2.3 KDH-3 WEIGH MODULE INSTALLATION INSTRUCTIONS	Page 2-3
2.3.1 Step by Step Installation Instructions	Page 2-3
2.3.1.1 Positioning	Page 2-3
2.3.1.2 Surface Preparation - Base	Page 2-3
2.3.1.3 Surface Preparation - Top	Page 2-3
2.3.1.4 Mechanical Installation	Page 2-3
2.3.1.5 Electrical Installation	Page 2-4
2.3.2 Shimming for Load Distribution	Page 2-4
2.3.3 Installation Examples	Page 2-4
SECTION III Operation	Page 3-1
3.1 TEMPERATURE CONSIDERATIONS	Page 3-1
3.2 LOAD CONSIDERATIONS	Page 3-1
SECTION IV Maintenance	Page 4-1
4.1 CALIBRATION	Page 4-1
4.2 MAINTENANCE/TROUBLESHOOTING	Page 4-1

Page Listings for Figures and Tables

Figure 1-1. KDH-3 Weigh Module	Page 1-1
Figure 1-2. Accommodation For Thermal Expansion	Page 1-1
Figure 1-3. Cylindrical Tube Transducer	Page 1-1
Figure 1-4. Accommodation For Irregular Surfaces	Page 1-1
Figure 1-5. Simulated Weigh Module	Page 1-2
Figure 1-6. Thermal Pad Kits	Page 1-2
Figure 1-7. Thermal Pad Dimensions	Page 1-3
Figure 2-1. The KDH Weigh Module	Page 2-1
Figure 2-2. KDH-3 Assembly Instructions Steps 1-4	Page 2-2
Figure 2-3. KDH-3 Weigh Module Orientation	Page 2-3
Figure 2-4. KDH-3 Installation Assembly Diagram	Page 2-4
Table 1-1. KDH-3 Specifications	Page 1-3

SECTION I

General Information

1.1 INTRODUCTION

TM015 provides general information, installation, operating, and service information for KDH-3 and KDH-3B Weigh Modules (Figure 1-1). KDH-3 refers to 100 and 200 kN capacities while KDH-3B designates 500 kN only. Other than capacity (and capacity related specifications), there are no installation or operational differences in the two models. Hence, KDH or KDH-3 will be used to denote both models throughout this manual.

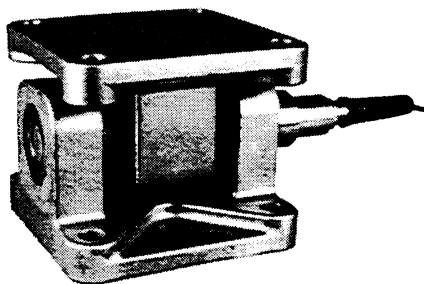


Figure 1-1. KDH-3 Weigh Module

1.2 DESCRIPTION

KDH-3 Weigh Modules are precision transducers for measurement of weight or other forces. The transducer contains bonded strain gages which are placed to measure applied shear stresses. The strain gages are wired in a Wheatstone bridge circuit that, when provided with an excitation voltage, produces changes in the electrical output proportional to the applied force.

The cylindrical double ended shear beam module is designed to measure shear stresses induced by an applied load without errors caused by thermal expansion (Figure 1-2). The combination beam and mounting hardware are ideally suited for use on large process weighing and storage vessels where temperature, process, wind, and possibly seismic forces are encountered.

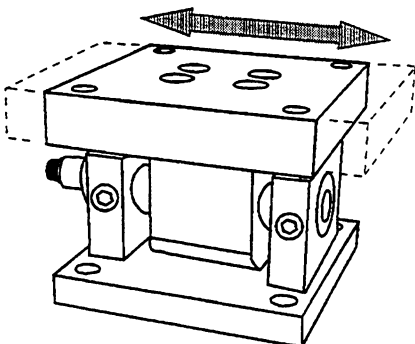


Figure 1-2. Accommodates Thermal Expansion and

The cylindrical tube type transducer offers several advantages over rectangular shear beam designs. Superior resistance to moisture contamination is accomplished by eliminating gaged pockets on the outside of the beam. Instead, the KDH uses strain gages applied to the inside wall of the tube. In addition, the cable entry is equipped with a conduit fitting for cable protection and is internally potted.

Structurally, the cylindrical tube is equally strong in both the vertical and horizontal planes (Figure 1-3). Unlike rectangular shear beams that are typically weaker in the horizontal plane, KDH modules are less affected by sideloads induced by vibration, wind, or process dynamics (Figure 1-4).

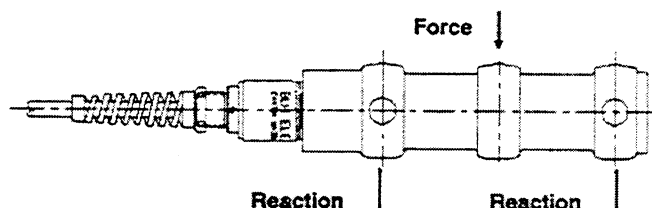


Figure 1-3. The Cylindrical Tube Transducer

The design of the mounting hardware eliminates the need for pins and/or bolts to attach the beam. This reduces the adverse effects of varying edge and point stresses and makes the overall module less susceptible to calibration changes. Low profile design, symmetrical mounting bolt patterns, and standard yoke mounting plates make KDH modules easy to install on new or existing structures and vessels.

Refer to Table 1-1 for complete KDH-3 specifications.

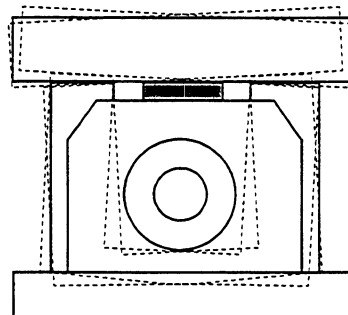


Figure 1-4. Accommodates Minor, Irregular Support Surfaces

1.3 KDH-3 ACCESSORIES

Accessories described and illustrated include the commonly used types. For information concerning special requirements, contact Vishay BLH.

1.3.1 Simulated Weigh Beams

Optional simulated (dummy) beams are used in place of actual KDH transducers during the installation process. Using simulated beams eliminates the risk of damaging the KDH transducer while welding or positioning the weigh vessel. All critical simulated beam dimensions are identical to actual KDH outline specifications.

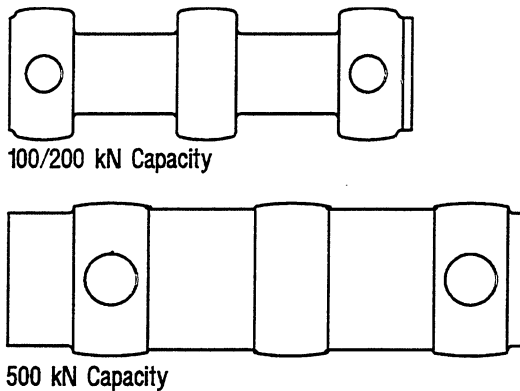


Figure 1-5. Simulated Weigh Beam

1.3.2 Thermal Insulation Pads

Thermal insulation pads (Figures 1-6, 1-7) reduce heat conduction from a heated vessel to the KDH-3 allowing beam temperature to remain close to ambient for maximum accuracy. The pads are made from rigid glass-cloth laminate with extremely low thermal conductivity. Use of the insulation kits is recommended when temperature at vessel support surface exceeds 130 degrees Fahrenheit (54 degrees Celsius).

1.3.3 Assembly

KDH-3 modules are available in kit form. Separate beam and hardware must be assembled according to instructions presented in Section II, paragraph 2-2.

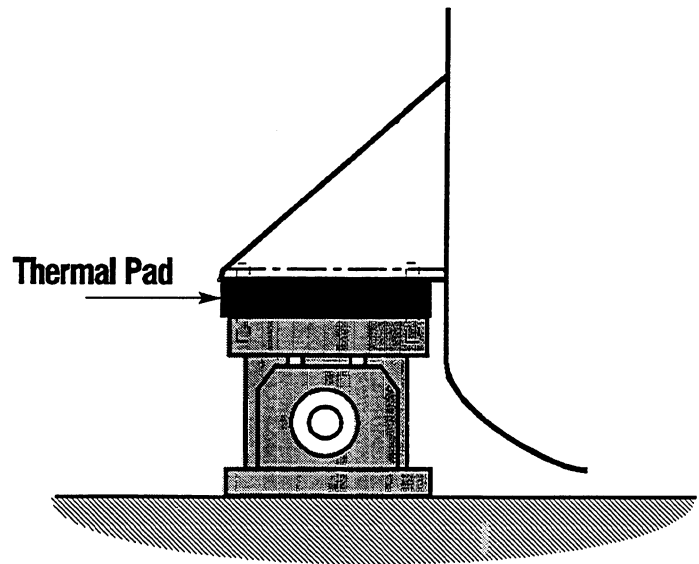


Figure 1-6. Thermal Pad Kits

Table 1-1. KDH-3 & KDH-3B Specifications

General (% of Rated Capacity):

	KDH-3	KDH-3	KDH-3B
Capacity	100kN	200kN	500 kN
Safe Load	150%	150%	150%
Ultimate Load	300%	300%	300%
Safe Uplift	150%	75%	75%
Ultimate Uplift	300%	150%	150%
Safe Sideload (Axial)	100%	50%	50%
Ultimate Sideload (Axial)	200%	100%	100%
Safe Sideload (Transverse)	100%	50%	50%
Ultimate Sideload (Trans.)	200%	100%	100%

Performance

Input Resistance	700 ohms $\pm$ 7 ohms
Output Resistance	701 ohms $\pm$ 7 ohms
Rated Output	2.0 mV/V $\pm$ 0.1% mV/V
Zero Balance	1% R.O. (Rated Output)
Combined Error (best fit)	0.10% R.O.
Creep (20 minutes)	0.05% R.O.
Repeatability	0.02% R.O.
Recommended Excitation	10 V ac or dc (20 V max.)
Safe Temperature Range	-34.4 to 104.4°C (-30 to 220°F)
Compensated Range	-1 to 54°C (30 to 130°F)
Temperature Effects (30 -130°F)	
Zero Balance	0.0025% R.O. per °F
Span	0.0015% Reading per °F

Material:

Beams & Brackets	15-5 PH or 17-4 PH Stainless Steel
Environmental Class & Moisture Protection	NEMA 4X/6, IEC IP 67 IEC 68-2-4... Test D, 200 Cycles (min)

Deflection Under Load and Unit Weight:

CAPACITY	DEFLECTION mm (in.)	WEIGHT
KDH-3 100 kN	0.51 (0.020)	45 lb
KDH-3 200 kN	0.33 (0.013)	46 lb
KDH-3B 500 kN	0.31 (0.012)	75 lb

Corrosion Protection:

KDH-3 & KDH-3B	electropolished stainless steel (mounting hardware)
----------------	--

Termination:

100, 200, 500 kN	10 m (32', 10Ø) cable with conduit fitting
------------------	---

Documentation List

Outline	Drawing # 471435-3
---------	--------------------

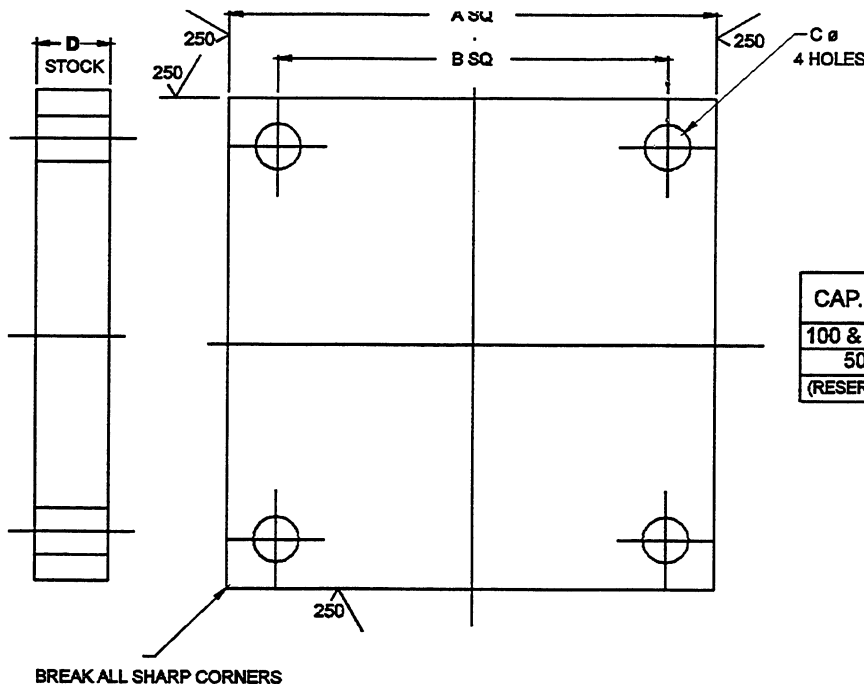
Approvals

FM (factory mutual)	3611
CSA	C22.2 (all applicable sections)

NOTE:

Many performance specifications are proven on a statistical sample basis.

Vishay BLH is continually seeking to improve product quality and performance. Specifications may change accordingly.

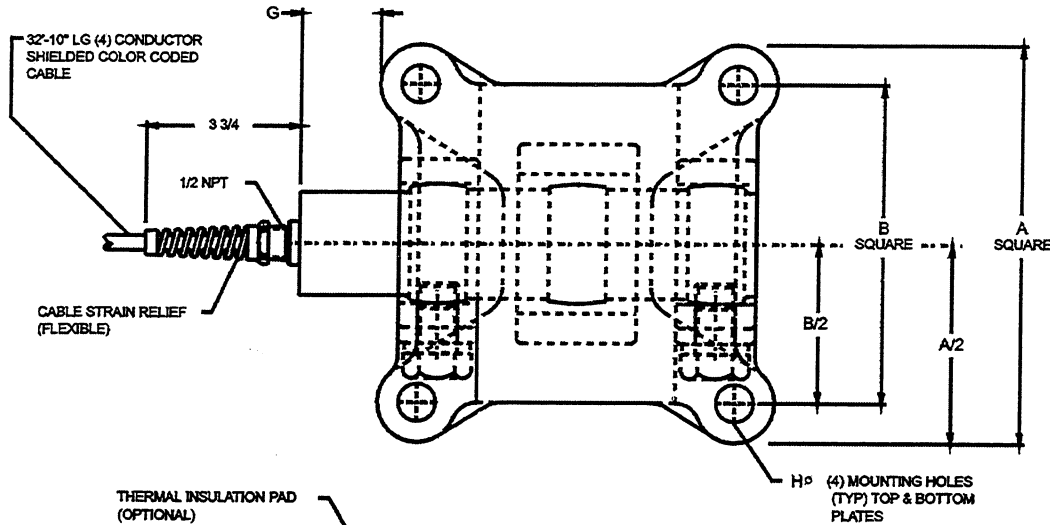


CAP. kN	A	B	C Ø	D $\pm$ 0.40	ROUGH WT
100 & 200	7	5.5	0.69	1	3.4
500	10	8	0.93		6.9
(RESERVED)	—	—	—	—	—

Figure 1-7. Thermal Pad Dimensions and Part Numbers

1.4 KDH-3 DIMENSIONS

KDH-3/3B Weigh Module Outline Dimensions

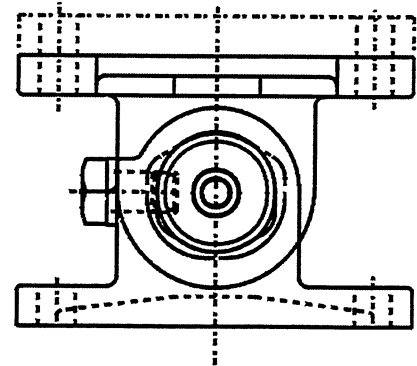
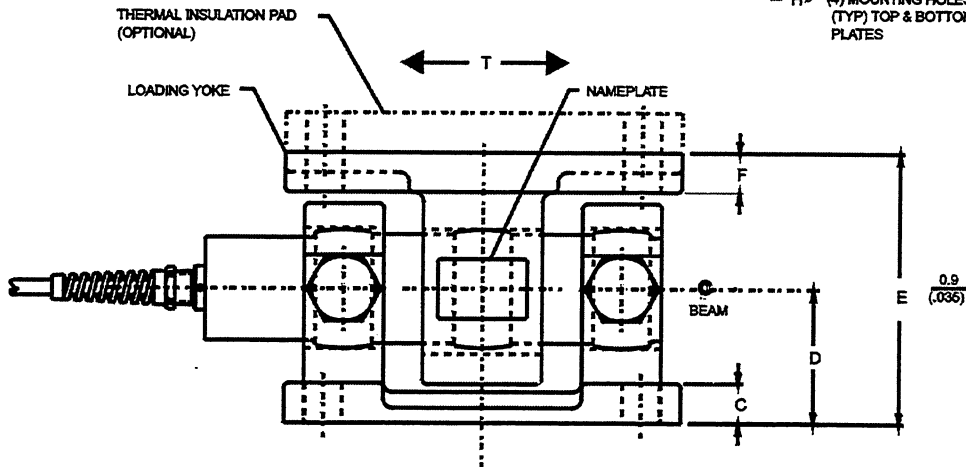


CABLE COLOR CODE

INPUT	{ GREEN + BLACK -
OUTPUT	{ WHITE + RED -

NOTES:

1. MAX ALLOWABLE TILT BETWEEN TOP & BOTTOM MTG PLATES IS $\pm 3^\circ$
2. ALLOWABLE AXIAL TRAVEL IS SHOWN BY "T" DIM.



	CAPACITY kN/Kib	A	B	C	D	E	F	G	H	T [±]	WEIGHT kg/lb
KDH-3	$\frac{100 \text{ \& } 200}{(22.5) \quad (45)}$	$\frac{178}{(7)}$	$\frac{139.7}{(5.50)}$	$\frac{25.4}{(1)}$	$\frac{71.6}{(2.82)}$	$\frac{146.5}{(5.77)}$	$\frac{25.4}{(1)}$	$\frac{66.7}{(2.62)}$	$\frac{17.5}{(.69)}$	$\frac{19}{(.75)}$	$\frac{21}{(46)}$
KDH-3B	$\frac{500}{(112)}$	$\frac{254}{(10)}$	$\frac{203.2}{(8)}$	$\frac{25.4}{(1)}$	$\frac{85.1}{(3.35)}$	$\frac{172.5}{(6.79)}$	$\frac{25.4}{(1)}$	$\frac{50.8}{(2.00)}$	$\frac{23.6}{(.93)}$	$\frac{25.4}{(1)}$	$\frac{34}{(75)}$

Dimensions shown in mm (in.)

1.5 WARRANTY POLICY

Vishay BLH warrants the products covered hereby to be free from defects in material and workmanship. Vishay 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 Vishay BLH's plant, fail because of defective workmanship or material performed or furnished by Vishay BLH. As a condition hereof, such defects must be brought to Vishay BLH's attention for verification when first discovered, and the material or parts alleged to be defective shall be returned to Vishay BLH if requested. Vishay 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. Vishay 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 Vishay BLH's plant in any way, so as in Vishay 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, Vishay 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 Vishay 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

Improper KDH-3 installation or operation may result in module, vessel, or factory damage. Please follow instructions carefully. Vishay BLH Electronics, Inc. will not accept any liability for faulty installation and/or misuse of this product. Authorized Vishay BLH Field Service Engineers are available around the world to install KDH Weigh Modules and/or train factory personnel to do so. The field service department at Vishay BLH is the most important tool to assure the best performance from your application.

**Call (Factory Number)
(781) 821-2000
Ask for Field Service**

**In the Midwest, Call
(815) 879-8818**

**Southeast
(281) 655-5041**

**Canada
(416) 251-2554 or
(800) 567-6098**

SECTION II

Installation

2-1. GENERAL

Tips, techniques, and procedures for installing total weigh systems are presented in the Electronic Weigh Systems Handbook (HDBK 002-1). This manual deals only with KDH-3 Weigh Modules.

IMPORTANT: Vishay 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 ASSEMBLY INSTRUCTIONS

(For Units in Kit Form)

When KDH-3 modules are purchased in kit form, assembly is required before installation. To assemble a KDH-3 weigh module, follow the three steps presented in Figure 2-2 (page 2-2). Once KDH-3 modules are fully assembled, proceed to paragraph 2.3 on page 2-3.

Note:
KDH-3 Weigh Modules are depicted in this manual with the yoke mounting plate above. Modules also can be installed with the beam mounting plate above (inverted 180°).

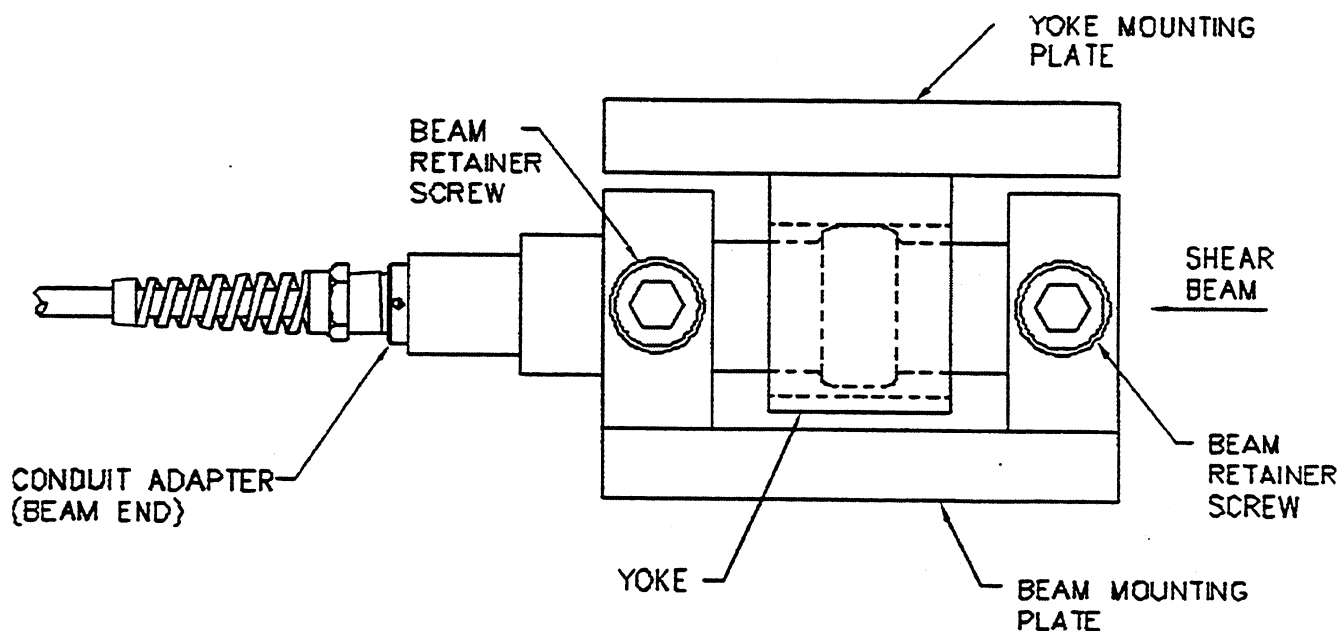
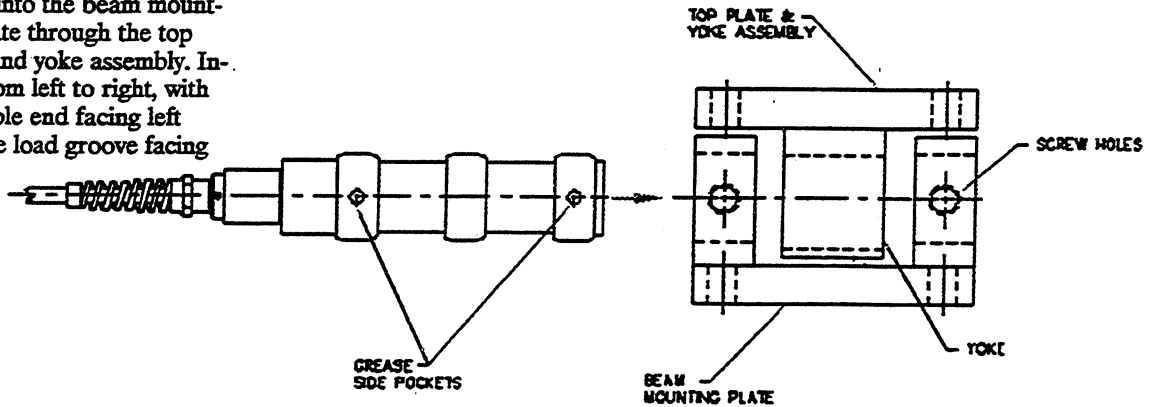
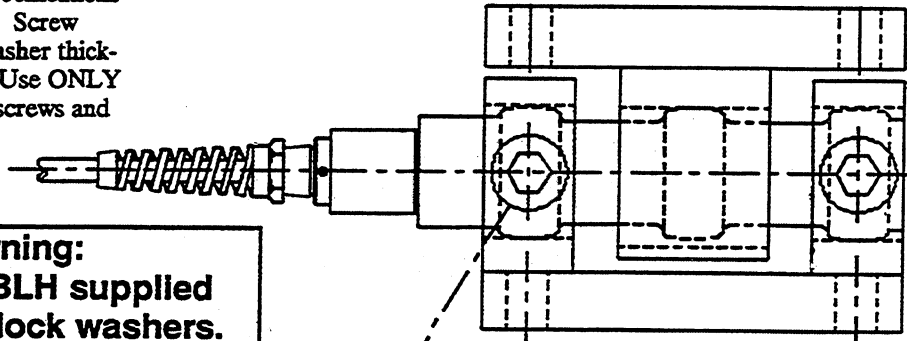


Figure 2-1. The KDH Weigh Module

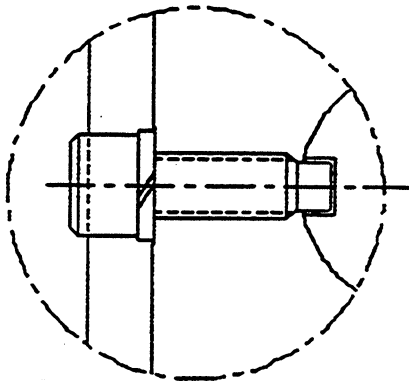
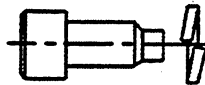
Step 1. With screw holes facing the assembler, insert the KDH beam into the beam mounting plate through the top plate and yoke assembly. Insert from left to right, with the cable end facing left and the load groove facing up.



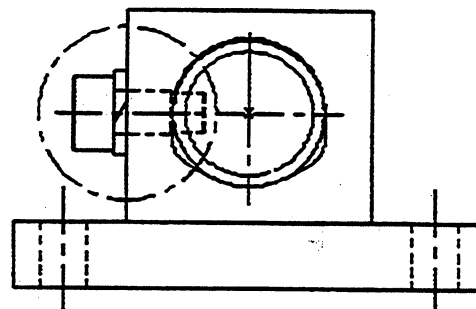
Step 2. Install beam retainer screws using torque specifications given in Step 3. Screw strength and washer thickness is critical. Use ONLY BLH supplied screws and lock washers.



Warning:
Use ONLY BLH supplied screws and lock washers.



Step 3. Line up screw holes with KDH side pockets BEFORE installing screws. Tighten screws so that lock washers 'flatten out' completely.



Warning:
Align screw holes with beam side pockets BEFORE installing screws

Screw Size	Module
3/4-10	100 kN Module
3/4-10	200 kN Module
1-8	500 kN Module

Figure 2-2. KDH-3 Assembly Instructions

2.3 KDH-3 WEIGH MODULE INSTALLATION INSTRUCTIONS

This publication provides mechanical and electrical installation instructions for KDH-3 Weigh Modules (Figure 2-1). KDH-3 Weigh Modules are low profile weight transducer devices designed for simple mechanical installation. Each module contains a double ended shear beam type transducer and mounting hardware which typically allows installation under process and inventory vessels without stay and check rods. Four bolts (customer supplied) secure the KDH-3 module to a foundation or base, and four bolts (customer supplied) attach the module to the vessel/device. Customer supplied bolts should be ANSI grade 8.8 or stronger.

KDH-3 installation instructions refer to specific parts of the KDH-3 Weigh Module. Use the KDH-3 module diagram (Figure 2-1) to identify parts and part locations.

2.3.1 Step by Step Installation Instructions

2.3.1.1 Positioning: KDH-3 Weigh Modules should be oriented so that the main axis of the module is in line with the diagonals of the vessel or structure. For example; on an upright cylindrical vessel, the direction of free movement of the mounting plate should face the center of the vessel. On horizontal vessels, the direction of free movement of the mounting plate should be parallel to the main axis of the tank. Orienting the modules in this way provides a checkless installation while allowing thermal expansion/contraction of the vessel (See Figure 2-3).

2.3.1.2 Base Mounting Surface Preparation: The base of the weigh module must be uniformly supported and level. 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. Grade 8.8 (or stronger) studs or bolts must be used. Do not weld the weigh modules in place.

2.3.1.3 Top Mounting Surface Preparation: Pre-drill holes in the leg or gusset of the vessel to match the bolt pattern of the mounting plate (see 1.4 KDH-3 Dimensions). Allow for normal bolt clearance and adjustment. Use grade 8.8 (or stronger) bolts of sufficient length. Beam and yoke mounting plates are drilled but NOT tapped. Mounting plates require nuts and through bolts. Do not weld mounting plates to the vessel leg or gusset.

2.3.1.4 Mechanical Installation (Figure 2-4, next page): Raise the vessel and install the weigh modules in place on the base mounting surfaces. Before bolting down, be sure that the base surface of the weigh module is uniformly supported and level. Lower the vessel onto the KDH-3 mounting plates and bolt in place. Avoid dropping the vessel or applying an impact load to the weigh modules. 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.

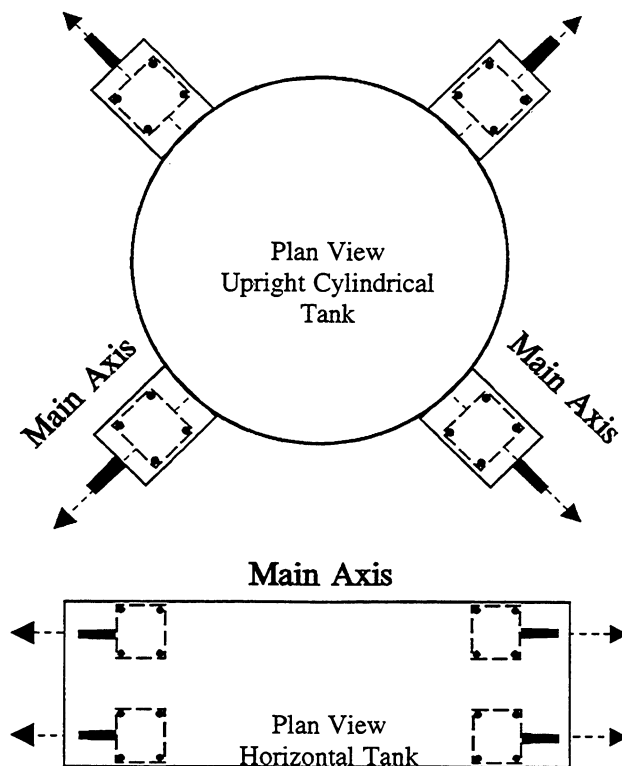


Figure 2-3. KDH Weigh Module Orientation

2.3.1.5 Electrical Installation: The wiring color code is presented in Section 1.4 KDH-3 Dimensions. KDH-3 Weigh Modules are equipped with 1/2-14 NPT threaded fittings for conduit connection, if desired. The standard ten meter KDH-3 cable contains four conductors with an overall foil shield. Each conductor has tinned leads for easy connection to a Vishay 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, Vishay BLH recommends a ground strap between the vessel and earth ground.

Any module with output less than an equivalent 10% of vessel weight must be shimmed between the upper mounting plate and vessel mounting point. If gap exists between KDH-3 and beam, determine gap size, raise vessel, loosen mounting bolts, and add shim material equal to measured gap plus .015-.030. Tighten mounting bolts and lower vessel GENTLY onto module. Recheck electrical output for proper distribution and insert 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.

2.3.3 Installation Examples

Pages 2-5 and 2-6 provide examples of horizontal and vertical tank installations.

These instructions are typical for weigh system applications with industrial weigh vessels, such as tanks, bins, or hoppers. However, the procedures are also applicable, in part, to the use of KDH-3 modules in weigh frames and scales.

2.3.2 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 empty vessel. Readings would normally be from 1-10mVdc. No module should indicate less than 10% of empty vessel weight; ideally, each module should carry an identical share (vessel weight/number of modules) of total weight.

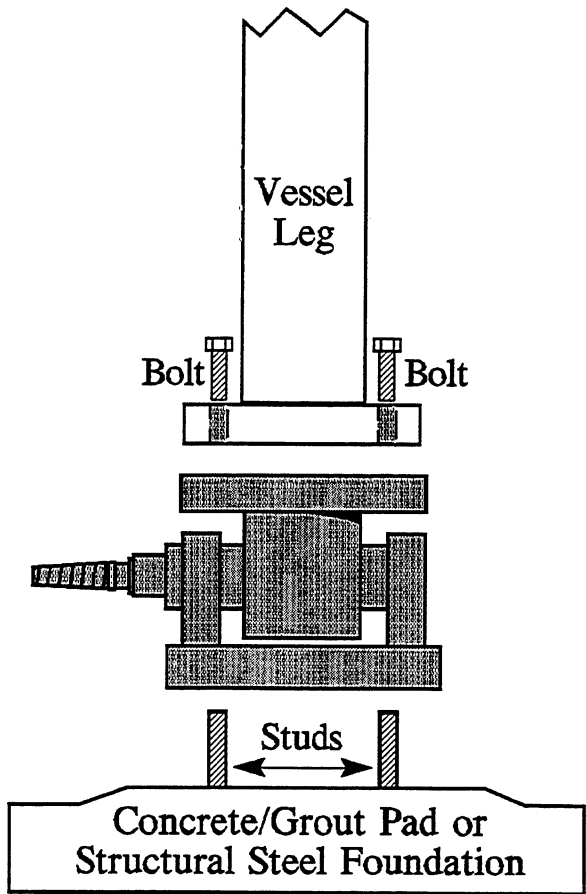
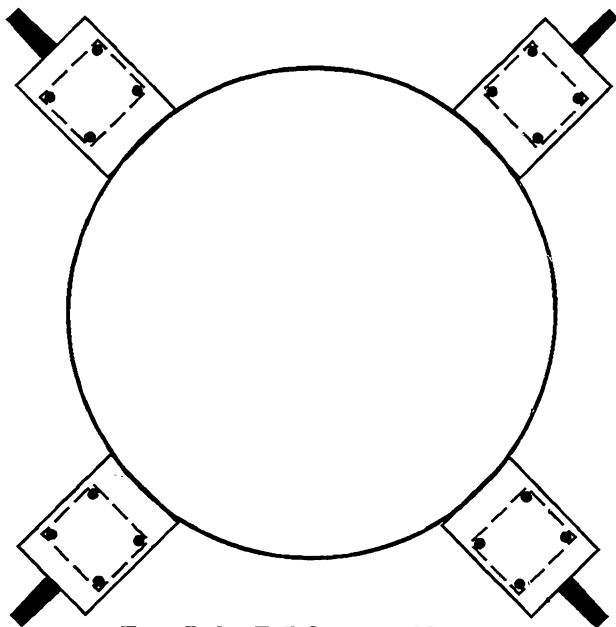
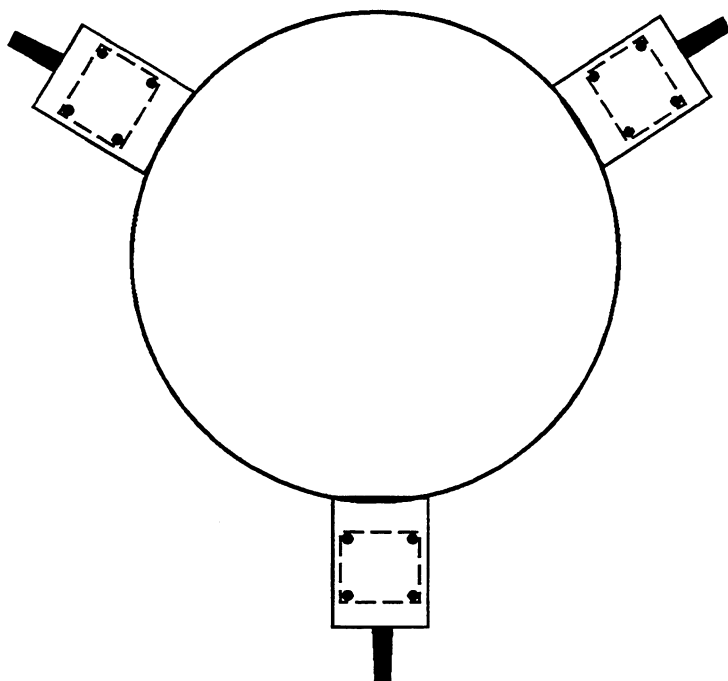
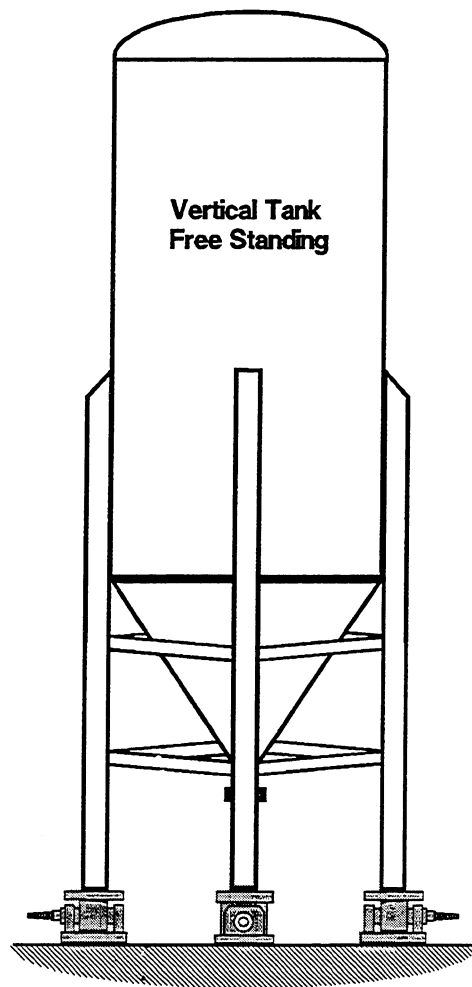


Figure 2-4. KDH Installation Assembly Diagram

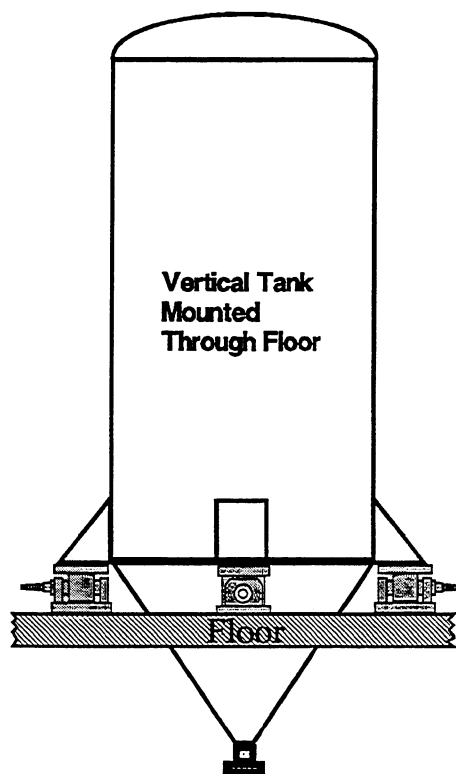
Vertical Tank Installation



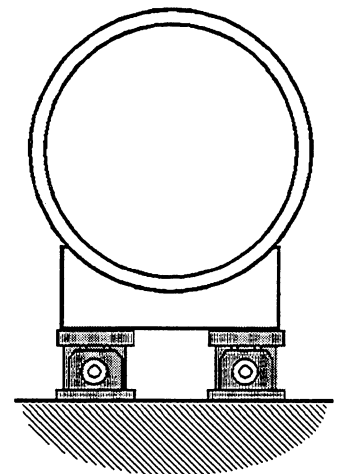
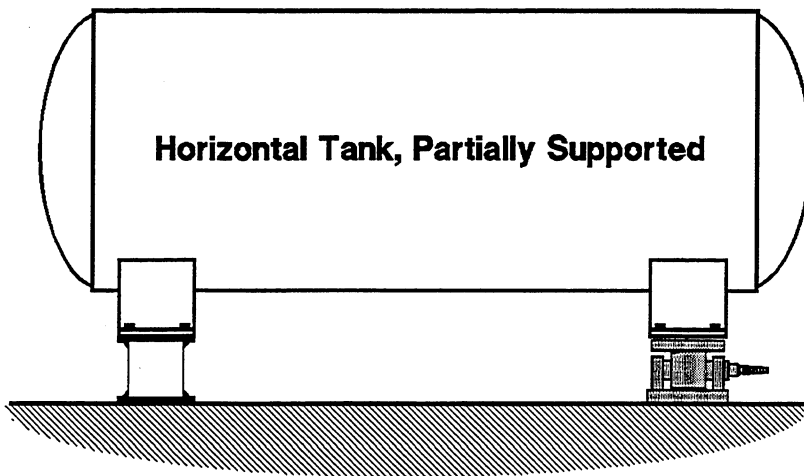
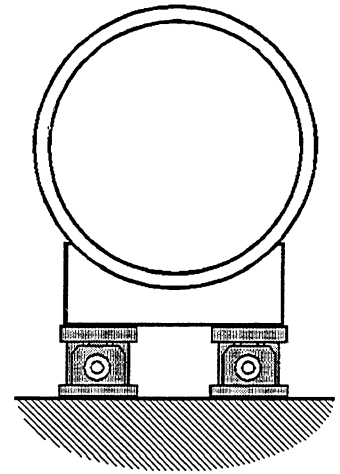
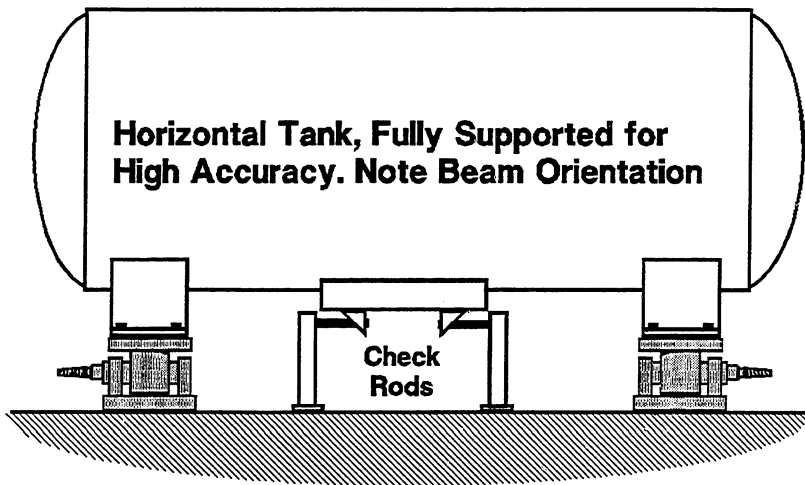
**Four Point Full Support, Modules
Positioned at 90° Intervals**



**Three Point Full Support, Modules
Positioned at 120° Intervals**



Horizontal Tank Installation



SECTION III

Operation

3.1 TEMPERATURE CONSIDERATIONS

KDH-3 weigh modules perform best when operated within their compensated temperature range of +30 to +130 degrees fahrenheit. Maximum operating temperature range without damage is -40 to +220 degrees fahrenheit.

When ambient temperatures at the KDH-3 weigh module exceed 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. 1.3.2)

3.2 LOAD CONSIDERATIONS

KDH-3 weigh modules can be periodically loaded up to 150% of rated load without adverse effects.

CAUTION

A static overload in excess of the Overload Rating may permanently affect the accuracy and performance of the module. Peak vibratory loading 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 beyond repair.

Warning: 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 beyond repair.

SECTION IV

Maintenance

4.1 CALIBRATION

KDH-3 modules are carefully checked and calibrated at Vishay BLH before shipment. The accuracy of the instruments and standards used for calibration are traceable to NIST. A data and calibration sheet is furnished with each KDH-3 module supplied by Vishay 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 KDH-3 performance cannot be changed through external adjustments and any module displaying calibration error should be returned to Vishay 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 KDH-3 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 0-30 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: KDH-3 must be disconnected for leakage test (measured values should exceed 5×10^9 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 Vishay 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.

BLH NOBEL

A **VPG** Brand

blhnobel.com