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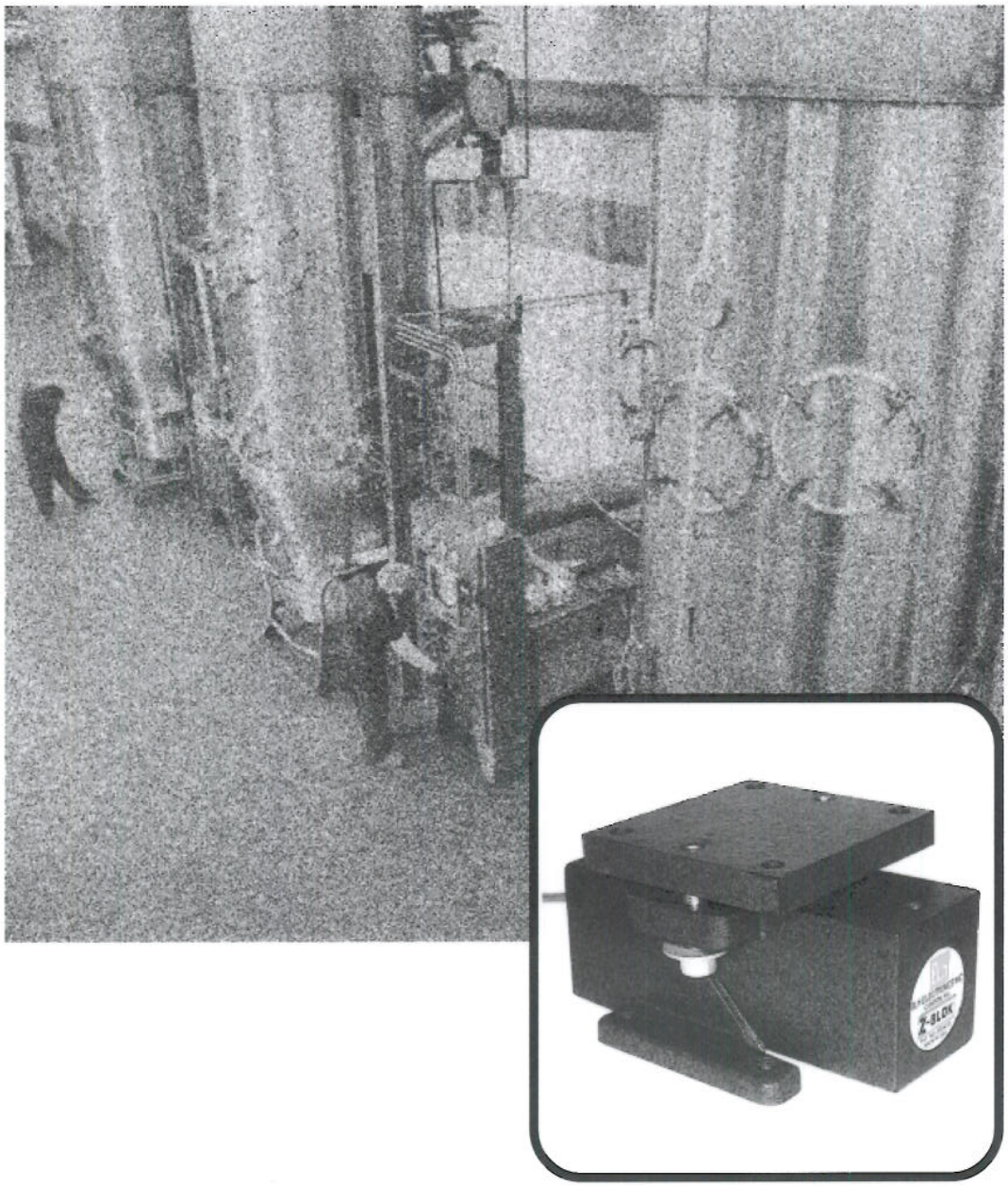

Z-BLOK Weigh Modules
Installation Instructions

TM003 Rev. B - January, 2004

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SECTION I
General Information

1.1 INTRODUCTION

1.1.1 Scope
This manual provides general information, installation, operating, and service information for Vishay BLH Z-BLOK Weigh Modules.

1.2 DESCRIPTION

Vishay BLH Z-BLOK Weigh Modules are precision transducers for measurement of weight and other forces. The modules contain 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.

Z-BLOK Weigh Modules offer the inherent advantage of all strain gage devices - excellent stability, accuracy, reliability, and infinite resolution. They contain no moving parts or fluids, and are environmentally protected against dust and liquids. The modules are available with full-scale ranges from 1000 - 100,000 lb (454 - 45,400 kg).

The transducer elements are machined from high strength stainless steel and are designed for a uniform, repeatable stress distribution where the strain gages are bonded to the module. The gages are initially selected to match the thermal expansion co-efficient of the element material, matched for resistance, then wired to form a Wheatstone bridge. The bridge is electrically compensated for precise temperature and modulus compensation over a broad range of operating temperatures.

Small deflection, low mass design and absence of moving parts give Vishay BLH Z-BLOKS excellent high frequency response for dynamic force measurements.

Refer to table 1-1 for complete Z-BLOK specifications.

1.3 Z-BLOK ACCESSORIES

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

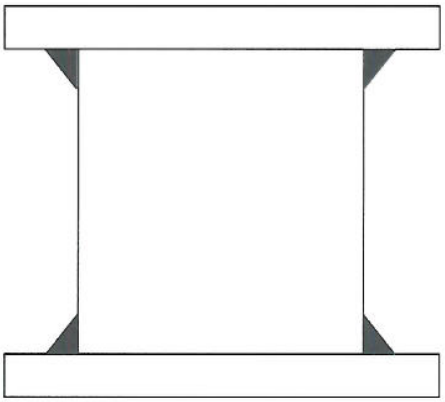


Figure 1-1. Z-BLOK Simulated Weigh Module

1.3.1 Simulated Weigh Modules
Simulated Weigh Modules are steel weldments with the same dimensions as the corresponding Z-BLOK to be used in place of the Z-BLOK during the installation process (Figure 1-1). Use of a Simulated Weigh Module eliminates the risk of damage to the precision Z-BLOK due to stray welding currents and/or mechanical impact.

1.3.2 Thermal Insulation Pads
Thermal insulation pads (Figures 1-2, 1-3) reduce heat conduction from a heated vessel to the Z-BLOK 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 (52 degrees celsius).

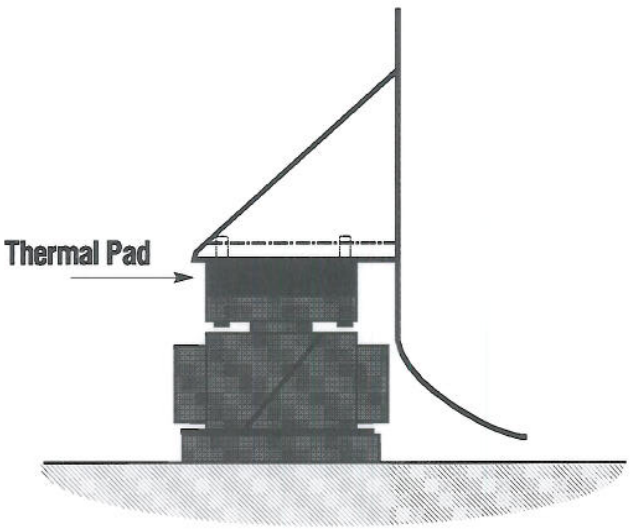


Figure 1-2. Thermal Pad Kits

Table 1-1. Z-BLOK Specifications

General:

Capacity	500 - 50K lb (7 ranges)
Input Resistance	350 ohms ±3 ohms
Output Resistance	350 ohms ±3 ohms
Rated Output	2.0 mV/V ±0.1% mV/V
Zero Balance	5% R.O. (Rated Output)
Combined Error (best fit)	0.10% R.O. (0.25% for 100,000 lb)
Creep (20 minutes)	0.03% R.O.
Temperature Range	-40 to 102°C (-40 to 220°F)
Compensated Temp. Range	-1 to 54°C (30 to 130°F)
Repeatability	0.01% R.O.
Recommended Excitation	10 or 15 Vdc
Temperature Effects:	
Zero Balance	0.0017% R.O. per °F
Output	0.0020% Reading per oF
Safe Load	150% Rated Capacity
Ultimate Load[1]	300% Rated Capacity
Sideload	100% Rated Capacity

Material:

Beam	15-5PH Stainless Steel
Brackets	Ductile Iron with Enamel Paint
Environmental Class	NEMA 4/IP65 & IP67
Moisture Protection	IEC Recommendation 68-2-4... Test D, 100 Cycles

Deflection Under Load and Unit Weight

CAPACITY	DEFLECTION	WEIGHT
500 lb	0.012 in.	10 lb
1K lb	0.012 in.	10 lb
2K lb	0.013 in.	15 lb
5K lb	0.027 in.	15 lb
10K lb	0.023 in.	35 lb
20K lb	0.047 in.	50 lb
50K lb	0.066 in.	75 lb

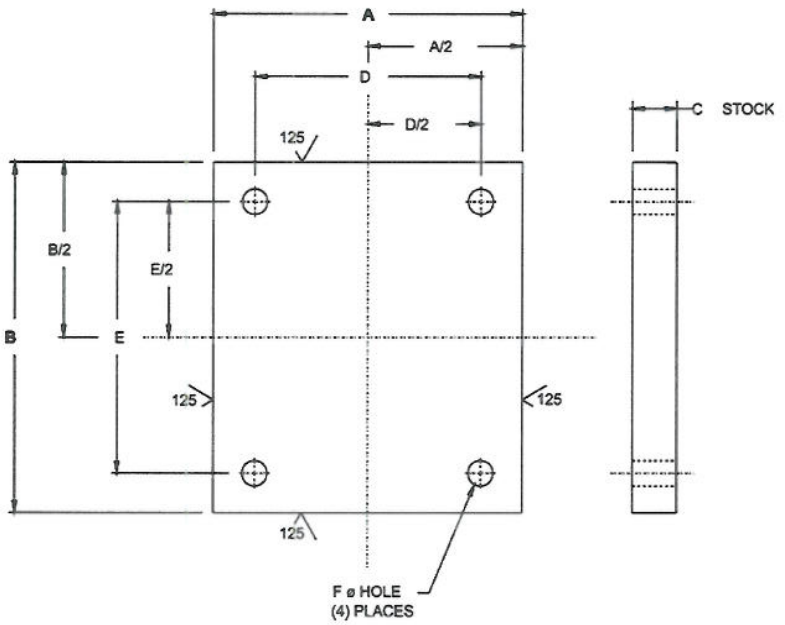
Termination:

500, 1K, 2K, 5K, 10K, 20K, and 50K Modules	10 m (32', 10") cable with conduit fitting

FM Approval

FM Approved Intrinsically Safe for Class I, II, and III, Div 1 & 2, Groups A-G When Installed in Accordance with Vishay BLH Drawing #449255-3.

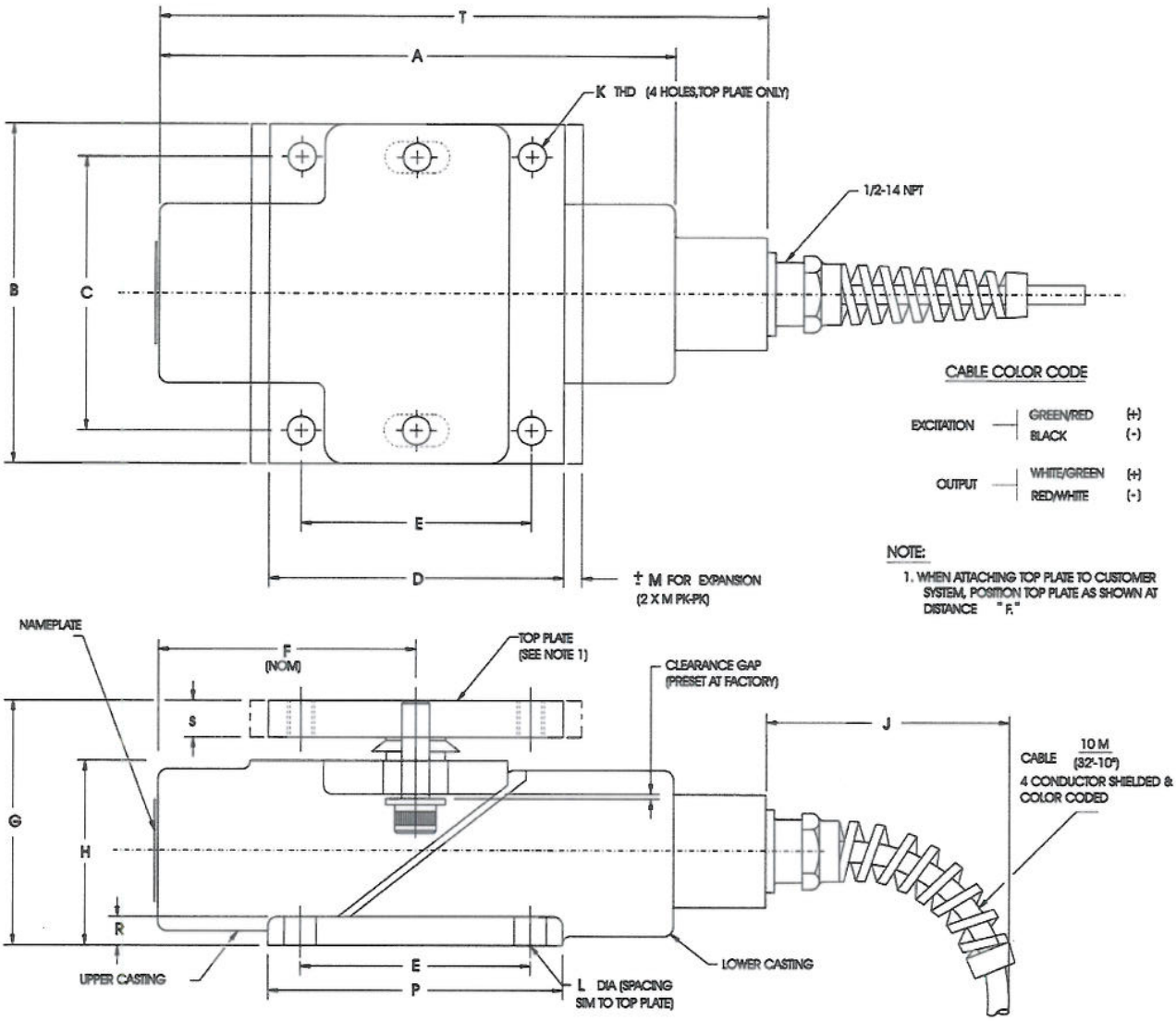
NOTE:
1. Design specification only.



PART NUMBER	CAPACITY (LBS)	A 1/16	B 1/16	C	D	E .049	F
464393	500 / 1,000	3 1/2	3 7/8	1	2.56	3.00	.31
464394	2,000 / 5,000	4	4 1/2	1	3.12	3.62	.43
464395	10,000	5	5 1/2	1	3.92	4.42	.56
464396	20,000	5 1/2	6 3/8	1	4.18	5.06	.68
464397	50,000	7	7 1/2	1	5.00	6.00	.81

Figure 1-3. Thermal Pad Dimensions and Part Numbers

1.4 Z-BLOK DIMENSIONS



PART NO.	CAPACITY (lb)	A	B	C	D	E	F	G	H	J	K	L	M	P	R	S	T
468528-4	Reserved																
468529-4	Reserved																
468530-4	500	152.4 (6.0)	98.4 (3.875)	76.2 (3.0)	88.9 (3.50)	66.0 (2.56)	76.2 (3.0)	68.3 (2.69)	50.5 (1.99)	76.2 (3)	1/4-20	8.13 (.32)	2.2 (.09)	89 (3.5)	7.9 (.31)	9.1 (.36)	190.5 (7.50)
462795-4	1,000																
462796-4	2,000	177.8 (7.0)	114.3 (4.50)	91.95 (3.62)	101.6 (4.0)	79.2 (3.12)	88.9 (3.50)	88.1 (3.47)	63.2 (2.49)		3/8-16	10.9 (.43)	4.0 (.16)	101.6 (4.0)	9.7 (.38)	12.4 (.49)	209.6 (8.25)
462797-4	5,000																
462798-4	10,000	228.6 (9.0)	139.7 (5.50)	112.3 (4.42)	127.0 (5.0)	99.6 (3.92)	114.3 (4.50)	115.6 (4.55)	85.3 (3.36)		1/2-13	10.9 (.43)	4.5 (.18)	127 (5.0)	14.2 (.56)	18.5 (.73)	—
462799-4	20,000	254.0 (10.0)	(162.0) (6.38)	128.5 (5.06)	139.7 (5.50)	106.2 (4.18)	127.0 (5.0)	137.0 (5.39)	99.6 (3.92)		5/8-11	12.7 (.50)	4.8 (.19)	139.7 (5.5)	19.1 (.75)	21.8 (.86)	—
462800-4	50,000	305.1 (12.01)	190.5 (7.50)	152.4 (6.0)	177.8 (7.0)	127.0 (5.0)	152.4 (6.0)	177.3 (6.98)	126.5 (4.98)		3/4-10	17.5 (.69)	6.3 (.25)	165.1 (6.5)	25.4 (1.0)	24.9 (.98)	—

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

The field service department at Vishay BLH is the most important tool to assure the best performance from your application. The expertise and understanding of Vishay BLH's Field Engineers can solve even the most perplexing installation problem. Precise calibration and start-up procedures, performed by a qualified, experienced field engineer, assure not only the reliability of Vishay BLH components, but the integrity of the entire weigh system.

Call (Factory Number)
(781) 821-2000

Ask for Field Service

SECTION II
Installation

2-1. GENERAL

Tips, techniques, and procedures for installing total weigh systems are presented in the Vishay BLH Electronic Weigh Systems Handbook (HDBK 002-1). TM003 deals only with Z-BLOK 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 Z-BLOK WEIGH MODULE INSTALLATION INSTRUCTIONS

This publication provides mechanical and electrical installation instructions for Z-BLOK Weigh Modules (Figure 2-1). Z-BLOK 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 bolts (customer supplied) secure the Z-BLOK module to a foundation or base, and four bolts (customer supplied) attach the vessel/device to the expansion retainer plate. Customer supplied bolts should be grade 8.8 or stronger.

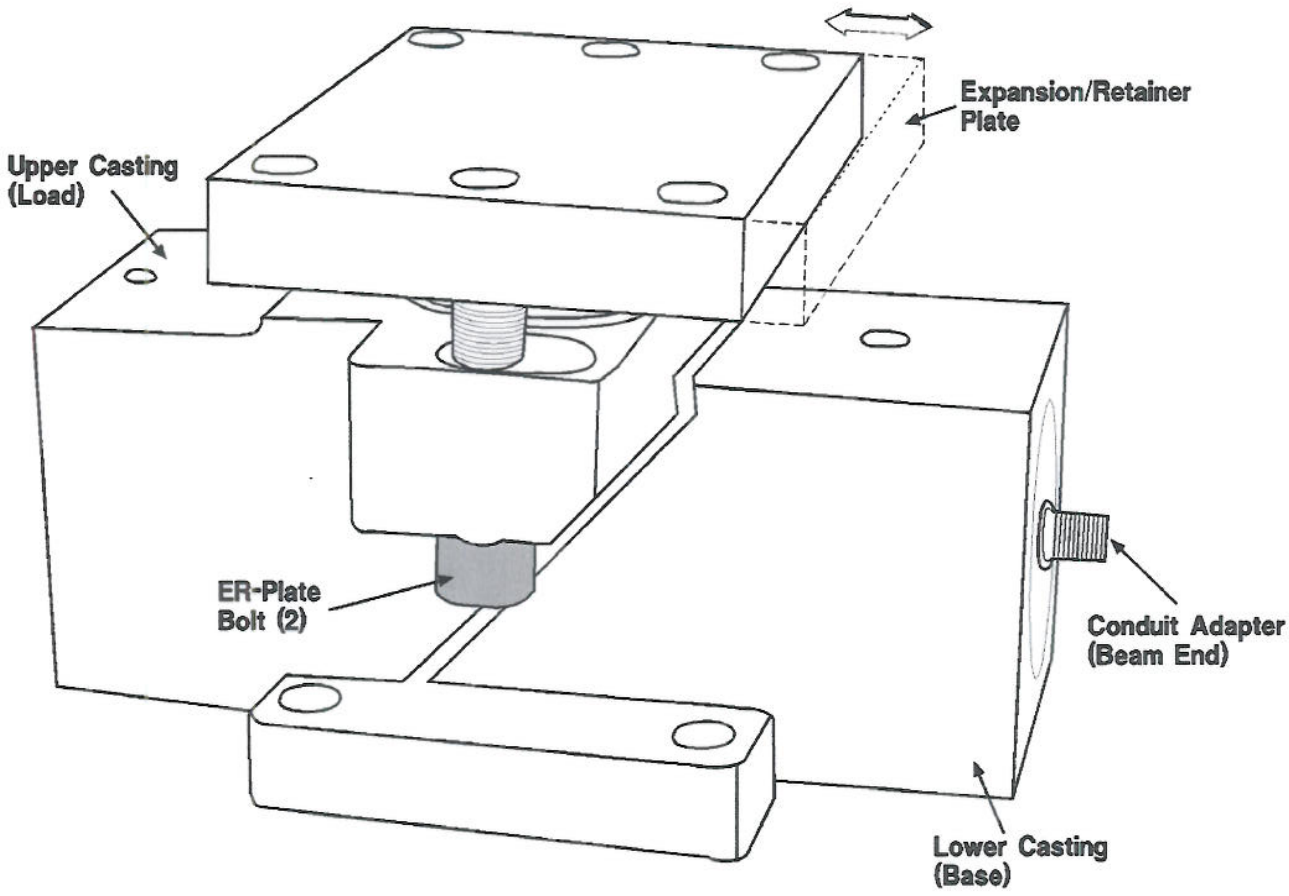


Figure 2-1. The Z-BLOK Weigh Module

2.2.1 Mechanical Installation

Z-BLOK installation instructions refer to specific parts of the Z-BLOK Weigh Module. Use the Z-BLOK module diagram (Figure 2-1) to identify parts and part locations. NOTE: Do not attempt to remove the expansion retainer plate from the upper casting during installation. The two ER-Plate bolts are factory adjusted to allow exactly the right amount of 'play' for expansion, contraction, and side force accommodation. **TAMPERING WITH THESE BOLTS VIOLATES Vishay BLH WARRANTY CONDITIONS.**

2.2.2 Step by Step Installation Instructions

(1) **Positioning**: Z-BLOK Weigh Modules should be oriented so that the main axis of the module is parallel with the diagonals of the vessel or structure. For example; on an upright cylindrical vessel, the longest dimension of the weigh module should face the center point of the vessel. On horizontal vessels, the longest axis of the module should face the opposite corner. Orienting the modules in this way provides a safe, checkless installation while allowing thermal expansion/contraction of the vessel.

(2) **Base Mounting Surface Preparation**: The base of the weigh module must be uniformly supported and level (Figure 2-2). 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.

(3) **Top Mounting Surface Preparation**: Pre-drill holes in the leg or gusset of the vessel to match the bolt pattern of the expansion/retainer plate (see 1.4 Z-BLOK Dimensions). Allow for normal bolt clearance and adjustment. To allow maximum thermal expansion/contraction, the expansion retainer bolts (Figure 2-1) should be centered in their expansion slots on the upper casting. The expansion/retainer plate is drilled and tapped to accept standard size ANSI threaded bolts. Use grade 8.8 (or stronger) bolts of sufficient length to achieve four full threads of engagement in the weigh module. Do not weld the expansion/retainer plate to the vessel leg or gusset.

(4) **Mechanical Installation** (Figure 2-3): 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 expansion/retainer 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.

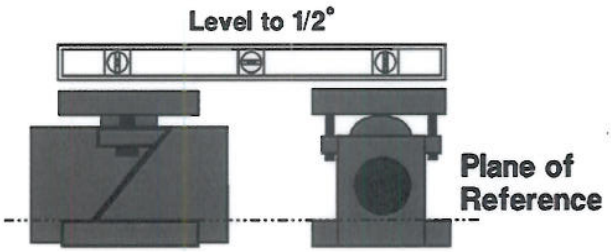


Figure 2-2. Leveling Diagram

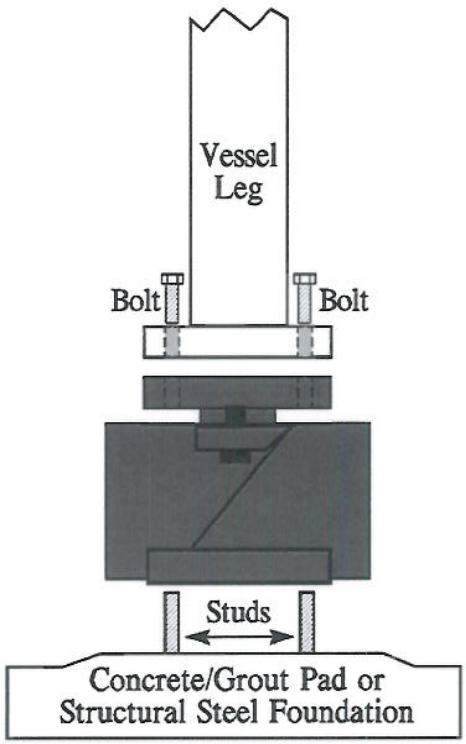


Figure 2-3. Z-BLOK Installation Assembly Diagram

(5) **Electrical Installation**: The wiring color code is presented in Section 1.4 Z-BLOK Dimensions. Z-BLOK Weigh Modules are equipped with 1/2-20 NPT threaded fittings for conduit connection, if desired. The standard ten meter Z-BLOK cable contains four conductors with integral shielding. 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.

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

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 empty vessel. Readings would normally be from 1-10mVdc. No module should indicate less than 10% of empty vessel weight; ideally a proportionate share (vessel weight/number of modules) should be carried by each.

Any module with output less than an equivalent 10% of vessel weight must be shimmed between top plate and vessel mounting point. If gap exists between Z-BLOK 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.

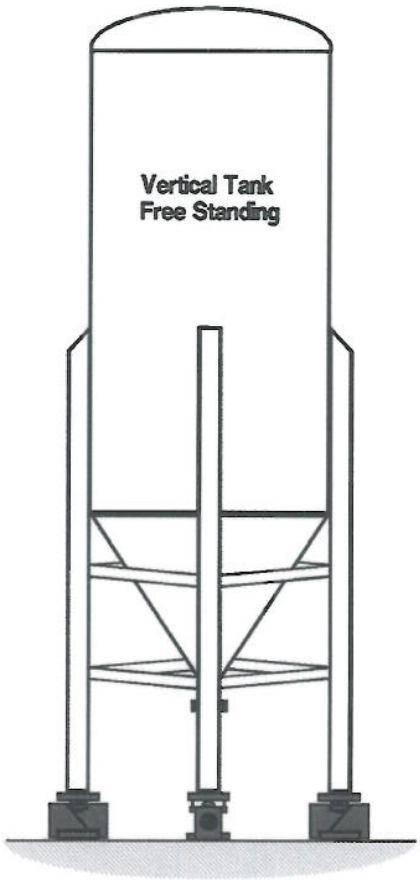
Repeat shimming process until all modules have outputs within 20-30% of each other.

2.2.4 Installation Examples

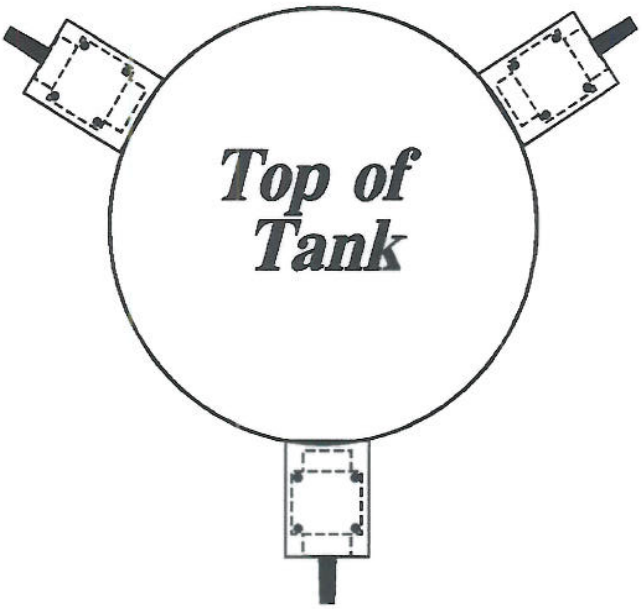
Pages 2-4 and 2-5 provide examples of horizontal and vertical tank installations.

Vertical Tank Installation

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

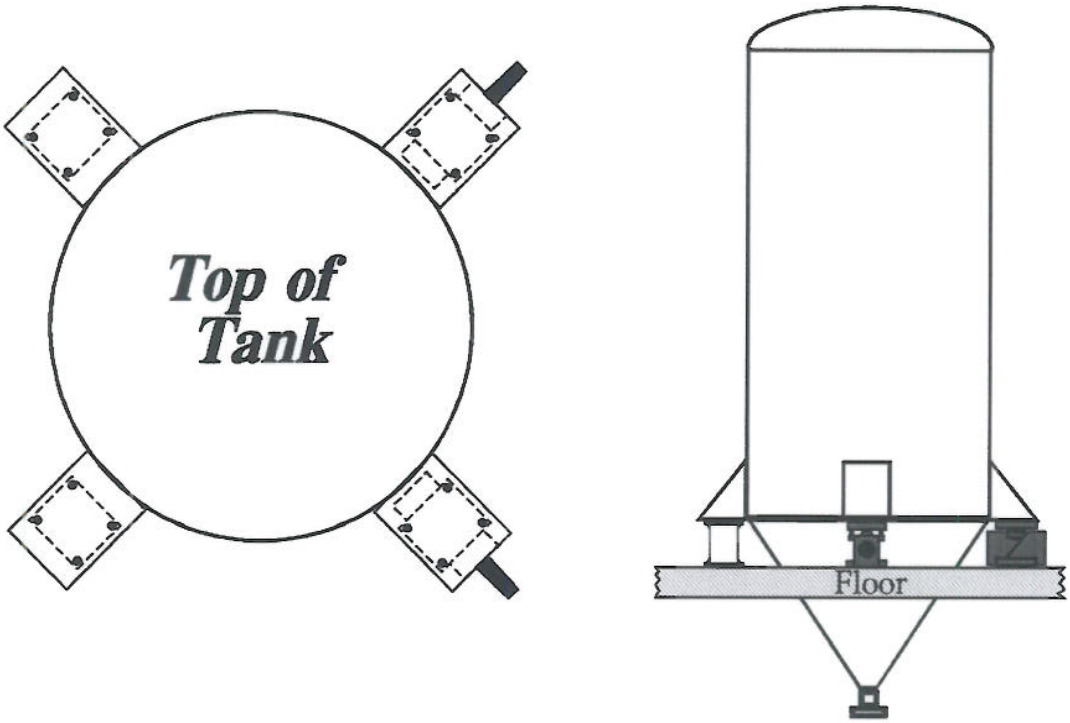


High Accuracy, Full Support Configurations

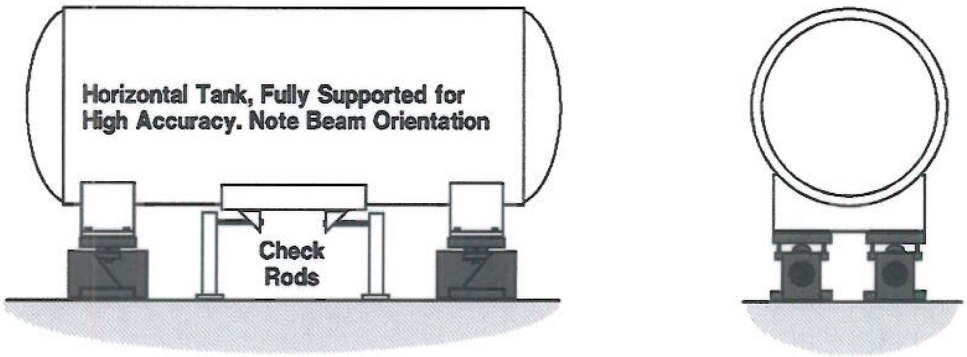


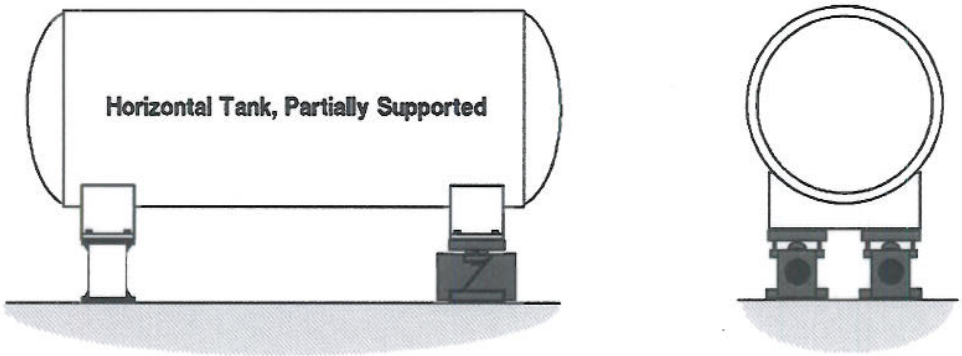
Three Point Full Support, Modules Mounted Radially Inward at 120°

Vertical Tank, Partially Supported



Horizontal Tank Installation





SECTION III
Operation

3.1 TEMPERATURE CONSIDERATIONS

Z-BLOKS 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 Z-BLOK 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

Z-BLOKS 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 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 beyond repair.

SECTION IV
Maintenance

4.1 CALIBRATION

Z-BLOKS are carefully checked and calibrated at Vishay BLH before shipment. The accuracy of the instruments and standards used for calibration are traceable to the National Bureau of Standards. A data and calibration sheet is furnished with each Z-BLOK 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 the Z-BLOK 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 Z-BLOK 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: Z-BLOK 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 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.

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