LOSS-OF-WEIGHT- Systems
Installation and Operating Instructions

Metalfab, Inc. *Vernon, NJ 07462 Phone (973)764-2000 Fax (973)764-0272 www.metalfab@metalfabinc.com*

Contents:

GENERAL DESCRIPTION

When a process requires accuracies greater than 1 to 1 1/2% or it is necessary to record actual feed rates, feeding by weight loss is the only method. Required rates are actually monitored by a scaling system in conjunction with either a batch or continuous controller. Weight of product being delivered is continuously monitored against weight required.

INSTALLATION

Even though we have designed our LOSS-OF-WEIGHT® weigh assembly with stops, you can permanently damage the load cell if you drop, overload or allow anything to impact the scale. Care should be taken to eliminate these occurrences.

The bin activator should be located in an area with minimal traffic or disturbances and mounted on a stable and level support. After placing the bin into position, remove the shipping clips from the upper and lower weighing deck. The weigh deck's corner and load cell stops were adjusted during assembly and ***should not*** be field adjusted.

Use the wiring schematic supplied with the LOSS-OF-WEIGHT® system's NEMA 4 enclosure and make your connections to the load cell terminals.

If you did not purchase our optional inlet and outlet sleeves, connect the upstream and downstream equipment with flexible connections. We recommend a thin natural rubber or similar type material be used with enough slack to prevent mechanical sticktion. The more flexible the connections are, the better the accuracy you can achieve.

Note: There should be no rigid connections between earth and the LOSS-OF-WEIGHT® feeder scale platform.

INSTALLATION AND OPERATING INSTRUCTIONS METALFAB BIN ACTIVATOR

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Contents:

GENERAL DESCRIPTION

1. Upper hanger (suspension arm) brackets are pre-assembled, at the factory, to a flanged cylindrical section. It insures proper alignment of the suspension arms and sleeve clamping surfaces.

2. Flanged mounting ring may be provided with bolt holes for bolting to a mating flange on the bin.

   Note: Nuts, bolts and gasketing for the mating flanges are not supplied by Metalfab. Use high strength, grade 5 bolts and locknuts.

3. When being installed on a conical section of a bin, it can also be welded directly to the bin cone. The cone may be butted against the horizontal or inside diameter of the flange and seal welded.

4. Before doing any welding, remove the vibrator from the Bin Activator.

5. In all cases, regardless of installation procedures, the mounting flange must not be distorted or bent during installation.

6. Even though the locating of suspension brackets is done with special equipment, it is recommended that mating parts be maintained, i.e., do not interchange mounting flanges from one serial numbered unit with another serial numbered unit.

7. To insure proper fit and alignment, plan view orientation of the hopper mounting flange with relation to the Bin Activator must not be changed.

8. In most cases, generally 3 foot through 8 foot diameter units, the mounting flange is shipped pre-assembled to the Bin Activator. For 10 foot diameter and larger, the mounting flange is split in half and shipped on the same skid as the Bin Activator or separately. A metal brace may be welded to each half section to prevent distortion during shipment. If so, remove after installation.

INSTALLATION – ASSEMBLY

1. Specific sequence of installing a **Metalfab Bin Activator** can be changed to suite individual requirements. Most important is the end result, i.e., proper alignment and tightness of nuts, bolts and sleeve clamps.

2. Plan view orientation of the vibrator location with respect to the storage bin is not critical. It can be located to suit.

3. For units provided with bolt holes, the bolt holes can be pre-drilled in the mating bin flange. Care must be taken to make certain that the flange is not warped or not distorted. If the bin flange is warped, distorted or not level, transfer bolt holes from the mounting flange at the time of installation. Shim, with metal, as required before bolting mating flanges.

4. The mating flanges can also be welded, continuous internal and intermittent or continuous external.

5. When bolting the mating flange, it is good practice to user a sealant such as Permatex, Silastic or similar material between the flanges to prevent leakage of fine particle size products. A thin, approximately 1/8” gasket of resilient material may be used in place of a sealant. Sealant by others.

6. After installing the completely assembled Bin Activator and tightening all bolts, run the unit empty for approximately ten minutes. Then recheck the suspension arm bolts, vibrating mounting bolts and

sleeve clamps for tightness. Suspension arm bolts are Grade 5 and must be torqued to 466 foot pounds; vibrator mounting bolts as follows:

3 / 8" BOLT	GRADE 5	25 FOOT POUNDS
1 / 2" BOLT	GRADE 5	60 FOOT POUNDS
5 / 8" BOLT	GRADE 5	120 FOOT POUNDS
3 / 4" BOLT	GRADE 8	296 FOOT POUNDS
7 / 8" BOLT	GRADE 8	473 FOOT POUNDS
1" BOLT	GRADE 8	714 FOOT POUNDS

7. **Metalfab** 10 foot and 12 foot diameter Bin Activators and special units are shipped unassembled, in some cases the mounting flange is split in half for shipping purposes.

8. When installing units not completely assembled, the correct procedure is to completely assemble the unit at grade with the following procedure:

   A. Stand or support the Bin Activator in a level position (discharge outlet facing down).

   B. If applicable, join the two (2) halves of the upper mounting flange and tighten securely or weld.

   C. If not already in position, place the flexible sleeve and two (2) complete sleeve clamps on the Bin Activator ***** leave clamps loose.

   D. Position the assembled mounting flange on the Bin Activator.

   E. Install all suspension arms, insert high strength bolts in upper and lower holes and snug up each elastic stop nut and bolt. After all nut bolts are installed snug, tighten to the correct torque specifications.

   F. Check placement of the flexible sleeve to mounting flange and Bin Activator. A sealant material such as Silastic or Permatex may be used between the sleeve and metal surfaces.

   G. Position the upper and lower sleeve clamps close to the beaded edge of the flexible sleeve. After seating and adjusting clamps, tighten both securely.

   Note: When tightening the clamps, be sure to support the far side tube with vise grip pliers when turning nut. Failure to do so may cause a twisting action on strapping, which may lead to damage of clamp.

9. Run the unit as noted previously and tighten bolts as required, including sleeve clamps.

VIBRATOR INSTALLATION

1. This unit imparts vibration to the Bin Activator. It must be securely bolted to the unit (torque mounting bolts according to previous instructions), and all bolts must be retightened after the first ten minutes of operation and again during the second day of operation. All nuts and bolts, especially vibrator mounting bolts, should be retightened every three (3) months or more frequently depending on the amount of usage.

2. Because the Bin Activator and the motor vibrate, the electrical connections must be made with flexible lead. Braided neoprene covered cable is recommended.

3. Refer to wiring diagram in motor conduit box for wiring instructions.

VIBRATOR FORCE ADJUSTMENT

1. The centrifugal force setting of the vibrator is set at the factory for the minimum force level that will produce flow of product. If flow is not instantaneous or continuous, it may be necessary to increase the centrifugal force. To do so, the following procedure should be followed:

1) Remove the bolts of both the upper and lower end covers.
2) Remove end covers exposing the four (4) eccentric weights.

Note: The (2) OUTER weights on the *INVICTA* Explosion Proof and the *METALFAB* Vibrators are the weights to be adjusted. The (2) INNER weights on the *INVICTA* TENV Vibrators are the weights to be adjusted.

2. To increase the force setting, loosen the clamping bolt on the two (2) weights that will be adjusted. (See note above).

3. Refer to the applicable vibrator operation and maintenance instructions for force settings and technical information.

4. As the centerline of the adjusted weights approach the centerline of the fixed weights, the centrifugal force is increased. When the weights centerline are opposed, the centrifugal force decreases. If the centerline of all four (4) weights are completely aligned, you will develop the maximum force available for that size vibrator.

5. Regardless of which vibrator you have, when you have completed your force adjustment, the OUTER weights should be in line with each other and the INNER weights should be in line with each other. ANY OTHER ARRANGEMENT WILL RESULT IN A MOTION THAT CAN DAMAGE THE VIBRATOR AND BE VERY DETRIMENTAL TO THE APPLICATION, WELDS OF THE BIN ACTIVATOR AND SUPPORT STRUCTURES.

6. Assemble the unit by reversing the procedure outline as above.

Note: Bin Activator vibrator should be electrically interlocked with down stream feed devices, i.e., when screw, belt, rotary, etc., feeder stops – vibrator should also stop.

FULL LOAD AND STARTING CURRENT

See Vibrator Instruction Manual and Motor Nameplate Data.

SECONDARY BAFFLE

1. The secondary baffle has been positioned by **Metalfab** engineering for your application requirements. Its position will allow for the proper flow of product through the Bin Activator outlet.

2. The position of the secondary baffle is maintained by an Esna type lock nut. The secondary baffle can be repositioned vertically by using a deep socket type wrench to loosen the lock nut, thereby, allowing the secondary baffle to be turned, possibly by hand, on the threaded section of the extended rod, to a higher or lower position. Since the secondary baffle is located near the outlet, it is easily accessible from the outlet.

3. If flow problems occur, the secondary baffle could be repositioned to help eliminate the problem. Before making any adjustment, it is advisable to check with **Metalfab** engineering for advice as to what new position might be helpful.

MAINTENANCE INSTRUCTIONS

1. **Vibrator Lubrication**

The vibrators are lubricated as supplied. The lubrication is good for 2,000 to 5,000 hours. See vibrator instructions.

2. **Flexible Sleeve**

Aside from checking the clamp tightness, there is no maintenance required on the sleeve. Periodic visual checks should be made to see if there is damage caused by chemical attack or mechanical damage to the elastomer.

Note: Standard sleeve is Neoprene with a maximum temperature rating of 210°F. Optional sleeves are NORDEL with a maximum temperature rating of 325°F and VITON with a maximum temperature rating of 400°F.

WARNING:* Because of the elastomeric seals required on vibrated equipment, the Bin Activator WILL NOT CONTAIN A FIRE OR EXPLOSION. If a fire is in the bin. *THE AREA SHOULD BE EVACUATED AND AVOIDED!

3. **Isolators**

The isolators should give years of use baring chemical attack or severe overloading.

WHEN INQUIRING ABOUT ANY BIN ACTIVATOR, ALWAYS REFER TO THE SERIAL NUMBER STAMPED ON THE METALFAB NAMEPLATE.

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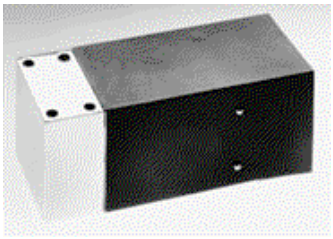
ENGINEERING DATA

Load Cells:



A load cell is a strain gage mounted on a machined and calibrated piece of metal. The metal can be carbon steel, stainless steel or aluminum.

The capacity of a Load Cell is = to Dead Load + Live Load

The Dead Load is equal to the machine's weight.
The Live Load is equal to the material's weight.

Weigh Instruments:

The system accuracy is dependent on how well the weigh instrument can convert the load cell signal to digital information and how it averages, filters and tabulates those same digits.

The weigh instrument begins the process by supplying an excitation voltage (usually 10 volts DC) which excites the cell. The returning voltage to the instrument is DC, measured in miliVolts. The value of the signal is dependent on the strain on the cell (in our case, weight).

The weigh instrument must convert the returned load cell signal into digital data. During the machine calibration, we place known weights on the scale and tell the instrument what the weights values are. Then the instrument uses those values to calculate a linear line for signal verses weight values.

Resolution is the number of pieces that the whole load cell signal is divided by. If we divide the signal by 10, we then have ten counts of resolution or ten grads or ten graduations. One thousand divisions would be one thousand counts of resolution.

The number of resolution is set by the capacity of the load cell divided by divisions we want to see on the weigh instrument's display.

Load Cell Capacity / Display Div. = Resolution
500 pound cell / .01 (Display Div.) = 50,000 counts of resolution

The majority of the weigh instrument manufacturers advertise up to one million counts of resolution.

All weigh systems are only as good as their load cells. 1:10,000 is used for legal for trade applications, in most cases 1:30,000 counts of resolution will provide a good stable reading.

When you divide the signal by the resolution number, each graduation will have a voltage value. The value of each graduation can be found by:

Excitation Voltage x miliVolt / Volt x 1000 Resolution
= Micro Volt / Count (grad)

It is important to keep the microVolt / Grad as large as possible. Or another way of saying it would be:
Use the smallest resolution for the largest graduation value. All our instruments have digital averaging, filtering and vibration elimination. When talking about digital averaging, we need to understand Running Averaging.
Usually the first step during calibration is to input a digital average value or use the default settings. After calibration, the instrument waits until it has counted its first averages.

If we have the averaging set at 12, the instrument waits until it has 12 digits and then it calculates its first average. That digital average is dropped to a register and waits for digit number 13. Another average is done and that value is added to the register. The weigh instrument's display reflects the digits that were dropped to the averaging register. An important thing to remember is that after the instrument waits for the first 12 digits, the register is updated every time another digit is added.
Both of our instruments use Filtering (vibration elimination). Think of vibration elimination as "Magic Numbers".

In most cases “Magic Numbers” are an asset. But as with everything else, there is a limit.
We like the fact that the “Magic Numbers” eliminates repetitive noise, but too much filtering dampens your readings. When changing the filtering settings, you sacrifice time. The higher the setting, the longer it takes to make that filtering calculation.

MEASURING ACCURACY:

When testing one of our LOSS-OF-WEIGHT® Systems, we catch 30 consecutive one minute samples.

The plus & minus deviation of these samples are analyzed using 2 Sigma deviation formulas.

When sampling, 65% of the samples will fall within one standard deviation or (1) Sigma and 95% will fall within two standard deviations or (2) Sigma. The loss-in-weight industry has standardized on the 2 Sigma as an accuracy statement.

CONTROL FEATURES - "LOSS-OF-WEIGHT"® BATCH LOSS-OF-WEIGHT SYSTEM

The METALFAB batch controller is used to control the fast (bulk) and slow (dribble) speeds of our "LOSS-OF-WEIGHT" Systems.

1. The bulk dribble targets are entered through the front panel or down loaded to the indicator using RS-232 or optional RS-485 and Allen Bradley Blue Hose communications. The Systems fast and slow speeds are set manually and are initiated by the weigh indicator's twenty (20) programmable steps.

2. In addition to the fast and slow speed outputs, the indicator has two (2) additional outputs which can be configured for a refill, batch complete or general alarm conditions. These outputs can be wired to motor starters to control ancillary equipment such as vibrator motors, control valves, conveyors, etc.

3. Formatting printing can be done and is activated by one of the programmable steps or by pushing the print button located on the front panel.

4. The indicator is also supplied with four accumulators and their values printed through the print functions.

5. Vibration elimination is used to remove motor and machine noise from the raw digital data used for weigh indication. It is also an added benefit when using vibration to assist with feeding.

6. Both the SCR DC drive and weigh indicator are mounted in the same NEMA 4 enclosure having a power on/off switch with light, Jog/Batch and Abort/Start selector switches.

7. Normally the control is supplied 230/1/60 VAC As an option, 115/1/60 VAC can be supplied.

For a detailed description of the Batch Control and installation, calibration and operating instructions, refer to the schematics and instructions enclosed in our control enclosure.

CONTROL FEATURES - "LOSS-OF-WEIGHT" CONTINUOUS LOSS-OF-WEIGHT SYSTEM

Unlike the batch LOSS-OF-WEIGHT Systems, the continuous weighers deliver an ongoing flow of material. The LOSS-OF-WEIGHT of material per time is constantly monitored in order to maintain a continuous LOSS-OF-WEIGHT with an accuracy of ± 0.25% to 0.5% with (1) minute samples.

The METALFAB continuous controller is used to control the speed of our "LOSS-OF-WEIGHT" Systems based on the amount of material weight loss within a time period.

1. The rate targets are entered through the front panel or can be down loaded to the indicator using RS-232, optional RS-485 or Allen Bradley Blue Hose communications.

2. After our "LOSS-OF-WEIGHT" continuous controller has been installed, load cell and automatic rate calibrations are performed. The Proportion, Integral and Derivative factors are automatically calculated and stored in the indicator. This eliminates the trial and error methods used by other manufacturers.

3. Operation of the control can be manual, continuous or continuous batching. In all modes of operation, the indicator monitors material gross weight and initiates automatic refills with high and low level alarms.

4. The feed rate can be set for lbs./sec., lbs./min. or lbs./hr. A rate tolerance input is used to **provide a band for monitoring** the indicator's performance. If the rate is operating out of tolerance for a set time, the indicator will output an alarm and can be programmed to automatically shut down the feeder.

5. The indicator uses vibration elimination to remove noise from the raw digital data used for weigh indication. The sensitivity can be preset to eliminate noise from machines, motors or vibrators.

6. As with our batch feeder control, both the SCR DC drive and weigh indicator are mounted in the same NEMA 4 enclosure having a power on/off switch with **light and** indicator keypad and display.

7. The control is supplied as 230/1/60 VAC. As an option, 115/1/60 VAC can be supplied.

For a detailed description of the Continuous Control and installation, calibration and operating instructions, refer to the schematics and instructions enclosed in our control enclosure.

Metalfab has designed our
LOSS-OF-WEIGHT® machines to have:
The minimal "Dead Load"
The maximum "Live Load"
To use the smallest load cell capacity
With the biggest Resolution

Metalfab Service

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