

Instructions 31-Ja



TACHOMETERS

IMPORTANT

This folder contains installation and reading instructions—Please leave it with the instrument until it is actually placed in service.

BIDDLE INSTRUMENTS

Electrical Testing & Speed Measuring Instruments

BLUE BELL, PA. 19422

FRAHM HAND TACHOMETERS

All standard Frahm Tachometers having carbon steel reeds are calibrated at room temperature to have an accuracy of $\pm 0.3\%$ of indicated speeds.

Frahm "Precision" Tachometers are made with reeds having a special alloyed material. They are calibrated at room temperature to have an accuracy of $\pm 0.1\%$.

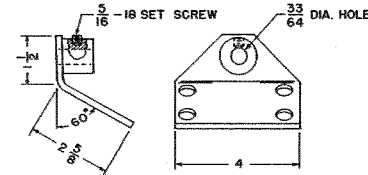
In using a Frahm Hand Tachometer, simply hold it against some stationary part of the machine under test. If the reeds vibrate with amplitudes greater than those specified under Amplitude of Vibration, hold the tachometer against some other part of the machine which is in less vibration, or cushion the instrument with the hand.

Measuring Rates of Vibration (VPM)

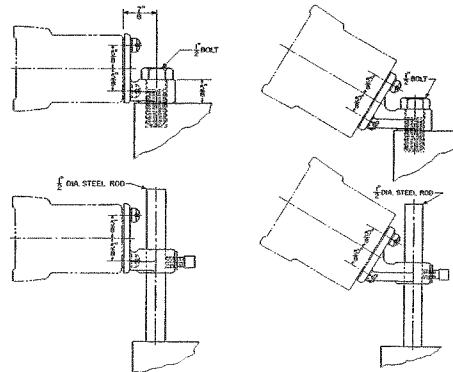
—For this purpose the instrument is applied in exactly the same way as for measuring rpm. In rotating equipment vpm is always equal to or is a simple multiple of the rpm.

Caution—When measuring vpm of pneumatic tools, concrete vibrators and other equipment where vibration is severe, DO NOT place the instrument against vibrating metal parts. Apply it to nearby material or structure, or to the air hose of pneumatic equipment. And **always**—as a first precaution—cushion the instrument.

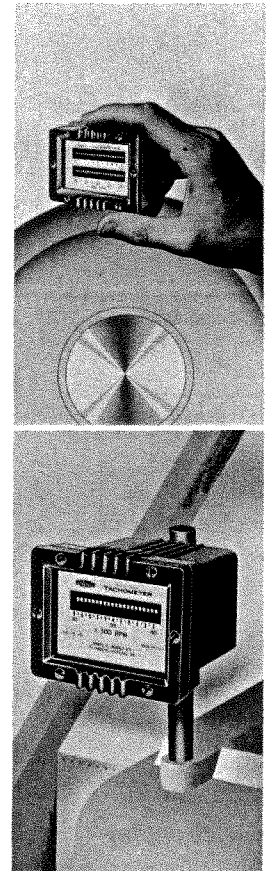
HAND TYPES—T-71 and T-72 and the miniature T-61 and T-62 may also be permanently mounted.



Catalog 31199 bracket for resonant or bolt mounting of Types T-71 and T-72



Catalog 2405, 60° bracket and Catalog 2406, 90° for use with Types T-61 and T-62



HAND TACHOMETERS

Frahm Tachometers having reeds are calibrated at room temperature to have an accuracy of $\pm 0.3\%$ at room temperature.

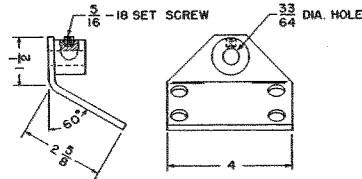
"Precision" Tachometers are made of a special alloyed material. They are calibrated at room temperature to have an accuracy of $\pm 0.1\%$.

To use a Frahm Hand Tachometer, simply hold it against some stationary part of the machine to be tested. If the reeds vibrate with an amplitude greater than those specified on the instrument, hold the tachometer against a part of the machine which is in less vibration, or cushion the instrument with the hand.

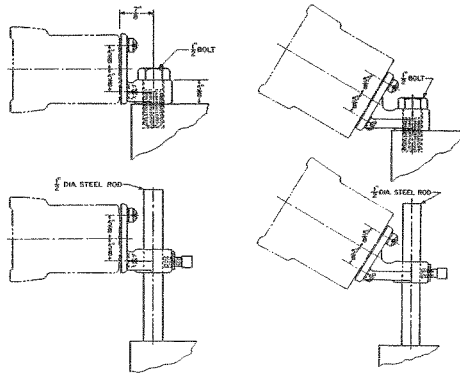
Rates of Vibration (VPM)
When the instrument is applied in the same way as for measuring vibration, the vpm is always a simple multiple of the rpm.

When measuring vpm of pneumatic concrete vibrators and other machines where vibration is severe, DO NOT apply the instrument against vibrating material or to the air hose of pneumatic equipment. **Always**—as a first precaution—hold the instrument.

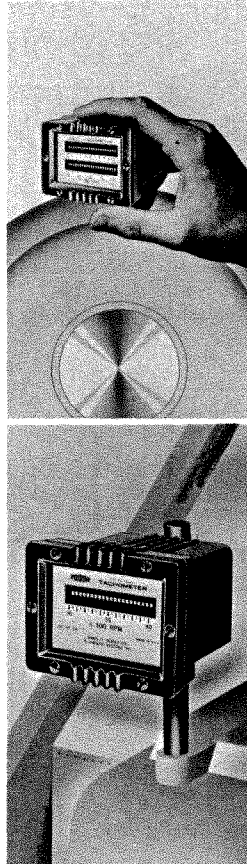
HAND TYPES—T-71 and T-72 and the miniature T-61 and T-62 may also be permanently mounted.



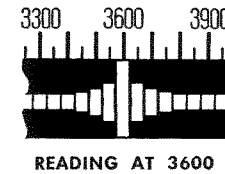
Catalog 31199 bracket for resonant or bolt mounting of Types T-71 and T-72



Catalog 2405, 60° bracket and Catalog 2406, 90° for use with Types T-61 and T-62

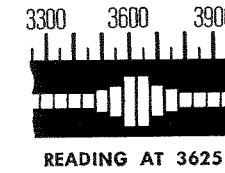


HOW TO READ THE FRAHM TACHOMETER



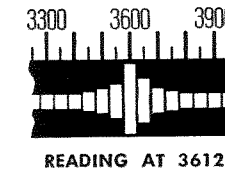
Reading 3600 RPM

When the amplitude of one reed is at its maximum and the amplitude of those on either side are smaller and equal, the speed is that of the reed vibrating at maximum amplitude, which indicates a speed of 3600 rpm.



Reading 3625 RPM

When two successive reeds vibrate with equal amplitudes, the speed is half way between the tuned frequencies of these reeds. In this illustration the 3600 and 3650 rpm reeds are vibrating with equal amplitudes; therefore, the speed is 3625 rpm.



Reading 3612 RPM

When one reed vibrates at relatively large amplitude and the amplitudes of adjacent reeds are unequal, the speed is determined by interpolation. In this illustration, the speed is nearer 3600 rpm than any other because the 3600 reed shows the greatest amplitude of vibration. It is above 3600 because the 3650 reed has the next larger amplitude. The relative amplitude of these two reeds indicates that the 3600 readings should be increased by $\frac{1}{4}$ of the interval between reeds or about 12; the speed is therefore 3612 rpm.

INSTALLING and OPERATING

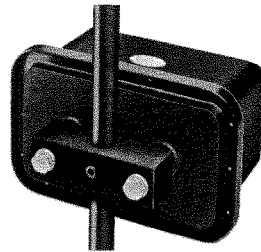
1. Mount the Tachometer on its bracket.
With the round type instrument make sure the bolts pass through the bushings under the outer rim of the case so as not to put undue stress on the instrument. The rectangular type instrument is mounted by means of bolts screwed into lugs on the back or base.

2. Try the Tachometer on its bracket, at or near the desired location for a rough check of reed indication and amplitude. The machine speed should be varied slightly in order to make sure that the reeds which are in motion are in maximum vibration.

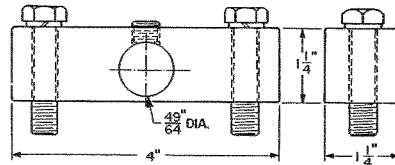
3. Select a point on the machine where the reeds appear to vibrate at normal amplitude and bolt the bracket securely in place. Vary the speed of the machine through the range of the Tachometer and observe the reed indications.

4. Amplitude of Vibration

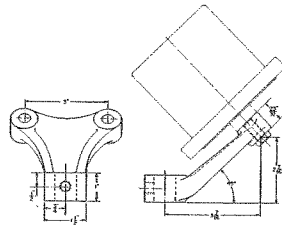
For speeds up to about 3600 rpm (or vpm) the reeds must not be allowed to vibrate continuously with an amplitude greater than the height of the scale opening—about $\frac{5}{8}$ to $\frac{3}{4}$ of an inch. As the reeds are stiffer for higher speeds, the



Catalog 7320, Type "T" bracket for Types T-8 and T-9 Tachometers (resonant mounting)



Dimensions of the "T" bracket



Dimensions of the "Y" bracket, Catalog 7308

amplitude of vibration should be made less, e.g., $\frac{1}{2}$ to $\frac{3}{8}$ of an inch at about 7200 rpm, and still less for higher speeds.

These amplitudes must not be exceeded for ordinary conditions.

5. If the amplitude is excessive, cushion the instrument with rubber or other suitable material, either between the instrument and bracket or between the bracket and the machine, or both.

Some machines will vibrate considerably more as they are brought up to speed than when running at the normal speed. In such cases, in order to secure proper amplitude of vibration of the reeds at the normal speed, it may be necessary to allow some of the reeds below the normal speed to vibrate more than might be otherwise advisable.

The same may be true of speeds above normal. The essential thing is that the reeds around normal speed, which operate for long periods of time, must not be allowed to vibrate at an excessive amplitude.

6. Where the machine vibration is slight, a little exploration may be necessary to find a point where the instrument will give satisfactory indications. Generally the vibration is greater at the bearings than on the machine frame or bed plate

and operation is usually 1 reed row is parallel to the machine.

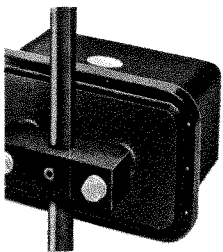
Sometimes an over-hanging give a lever effect that is tion to the lever effect providing the instrument on its b

7. Resonant Mounting

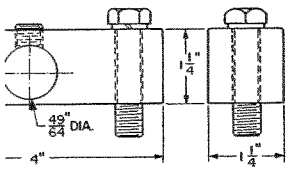
Where rotors are so well vibration is almost imperce sonant method of mounting veloped for instruments hav reeds. The principle is the adjustably mounted on a st attached to the machine. T itself is the weight, and a rod will be found where n vibration occurs. Simply ti screw and leave the instru point.

8. Internal Amplitude Stimu

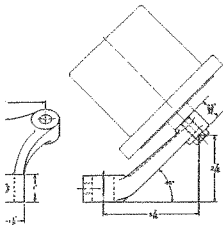
This device is attached spe individual reed combs in rounc ments having two or three 1 It can be used also, as an : resonant mounting, in rou tangular type instruments row of reeds.



e "T" bracket for Types T-8 and T-9
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- Where the machine vibration is slight, a little exploration may be necessary to find a point where the instrument will give satisfactory indications. Generally the vibration is greater at the bearings than on the machine frame or bed plate

and operation is usually best when the reed row is parallel to the axis of the machine.

Sometimes an over-hanging member will give a lever effect that is helpful, in addition to the lever effect provided by mounting the instrument on its bracket.

7. Resonant Mounting

Where rotors are so well balanced that vibration is almost imperceptible, the resonant method of mounting has been developed for instruments having one row of reeds. The principle is that of a weight adjustably mounted on a steel rod or bolt attached to the machine. The instrument itself is the weight, and a point on the rod will be found where maximum reed vibration occurs. Simply tighten the set-screw and leave the instrument at that point.

8. Internal Amplitude Stimulator

This device is attached specially to individual reed combs in round type instruments having two or three rows of reeds. It can be used also, as an alternative to resonant mounting, in round and rectangular type instruments having one row of reeds.

9. Octaves and Harmonics

Frahm Tachometers operate on the resonant principle which makes it possible for the reeds to vibrate at harmonic frequencies or rates of vibration, particularly if the vibration (of the machine under test) is considerable. The operator will have some idea of the range of speed in which he is working and will recognize when the reeds are responding to fundamental vibrations.

For example, if an instrument has a range from 1750 to 4000 rpm and the machine under test is running at 1800 rpm, the reed tuned to 1800 will respond. Also the reed tuned to 3600 rpm may respond, but at less amplitude. If the machine is running at 3600 rpm, the 1800 rpm reed is not likely to respond.

PRECAUTIONS

- Do not allow the reeds to vibrate with an amplitude greater than the values specified under Amplitude of Vibration.
- Do not open the tachometer. If anything is wrong, return the instrument to us.

We cannot be responsible for the calibration of tachometers in which these precautions are disregarded.

- See our Bulletin 31 on Frahm Resonant-Reed Tachometers for a full description of the instruments.