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FREE STANDING SPRING MOUNTS and HEIGHT SAVING BRACKETS

TYPE

SLF

SLF-200-6 BULLETIN

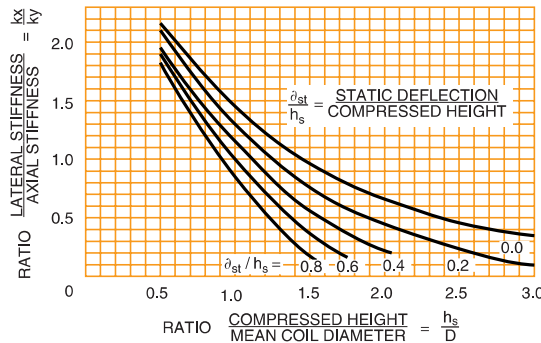
The Type **SLF** spring design evolved after many years of experience using springs within guided housing as the primary isolator. Since the old housing acted telescopically, the internal springs were designed for vertical stiffness and deflection only. Early attempts to use these tall slender springs out of their housing failed as the springs showed immediate instability or they fell over when subjected to minor horizontal forces.

It was important to eliminate the housing as they had a tendency to bind whenever they were cocked and to transmit vibration in the horizontal directions. We knew that if the springs were unhampered they would not only do better vertically, but do an equally fine job in isolating the horizontal disturbances.

Our research showed that springs could be designed with horizontal stiffnesses as high, or even higher than the vertical by carefully adhering to the ratios of the spring's compressed height to the mean coil diameter, and the static deflection to the compressed height as shown in the graph.



**SINGLE SPRING
1" (25mm) Deflection
SLF MOUNT**



Starting with the 1" (25mm) deflection series, we paid great attention to these design factors and our springs became short stable columns. When we had tested and were completely satisfied with the 1" (25mm) designs, we moved on the 2" (51mm), 3" (76mm), 4" (102mm) and 5" (127mm) deflection series. Every spring table now includes data on the ratio of the spring diameter to the compressed height, and the ratio of the horizontal to the vertical spring constants. Our specifications suggest a minimum ratio of 0.75 between the spring diameter and the compressed height as a good working rule, although some of our designs exceed this number.

All of these springs are designed so as not to exceed the elastic limit when the coils are closed up and the springs are compressed solid. This prevents damage when the springs are overloaded and assures a return to the spring's free height. The rated loads and deflections allow for 50% additional travel to solid to accommodate weight distribution errors and to keep the springs operating in a low stress range. In our Nominal 1" (25mm) Deflection A, B, and C Spring series the smallest rated deflection is 1" (25mm) although some of the lighter springs can deflect as much as 2" (51mm). The springs are used individually or in clusters to develop greater capacity. Some of our B2 and C2 springs only meet competitive criteria and do not have 50% additional travel. This is clearly noted in our catalog Data Sheet DS-208.



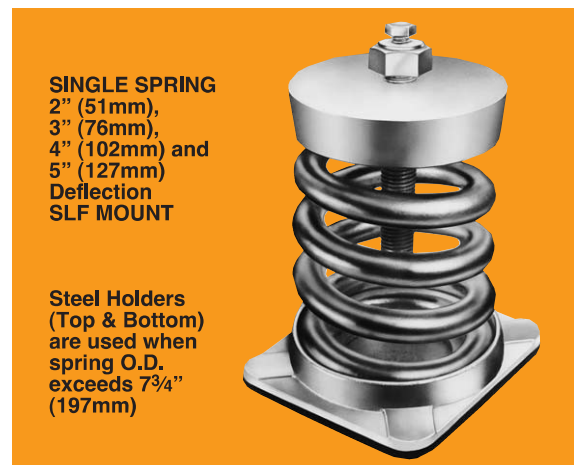
**SINGLE SPRING
1" (25mm) Deflection
SLFH MOUNT**



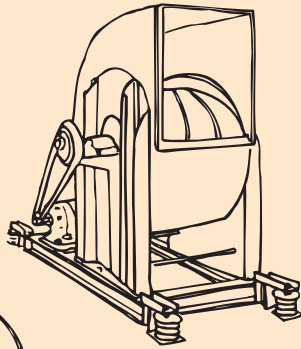
**MULTIPLE SPRING
1" (25mm) Deflection
SLF MOUNT**

In an effort to develop a foolproof simple isolator using these sophisticated springs, we have merely added a neoprene friction pad on the bottom to help prevent the passage of noise and a spring loading and adjustment bolt at the top with a locking cap screw. You will find that these adjustment bolts are very substantial because they must be made rigid enough to maintain the alignment of the top of the spring with the base plate, and the head of the bolt is actually the equipment supporting surface. The bolts are tapped to receive the locking cap screw as this methods makes it easy to remove the isolator for servicing. The 5" (127mm) deflection springs are sometimes furnished with three adjustment bolts in a tripod arrangement to maintain the top plate stability. Other stabilizing methods use single oversized bolts or pull-down brackets. In some cases **SLF** mountings with smaller deflections are similarly designed when there are large horizontal forces such as in the isolation of a horizontal compressor. There is no need to bolt this mounting down in most cases because of the friction pad and the spring's reduction of the horizontal forces before they get down to the base plate.

SLF mountings of the proper deflection are recommended for all vibration control applications where it is not necessary to cope with weight removal or seismic and wind load problems. Excessive discharge pressures can be dealt with by adding mass through the use of floating inertia bases or where mass is not a practical solution, by the addition of horizontal thrust restraints.

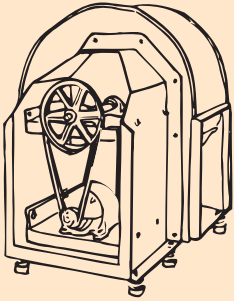


The **SLFH** series of mounts are identical to the style **SLF** except for having two or four holes in the base to allow for bolting to the structure. Since it is expensive to bolt mountings down, and any bolting procedure tends to bypass the acoustical action of the neoprene pad on the bottom of the mounting, it is strongly recommended that you use the Type **SLF** unless the **SLFH** must be used because of elevated installations on steel beams, etc.



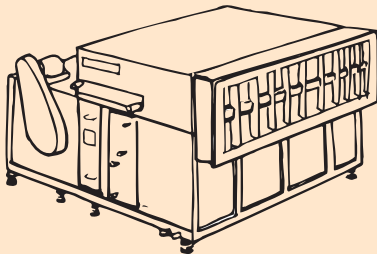
BELT DRIVEN CENTRIFUGAL FAN and MOTOR

SLF springs are used to isolate all kinds of fan equipment. Deflections are determined by fan speed, size, motor horsepower and equipment location as discussed in the VCS-100 Engineering Specification and Selection Guide. Bases may be made of structural steel or concrete. The sketch shows a centrifugal fan on a type WFSL base with 3" (76mm) deflection springs.



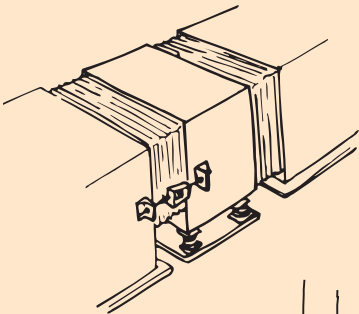
UTILITY SET

Utility sets are normally direct mounted on 1" (25mm) deflection SLF springs as illustrated. ICS rails are used in conjunction with the springs when higher deflections are required or there is an unsupported fan scroll that causes over balancing. KSL concrete filled bases are recommended for outdoor locations because of the need for wind resistance.



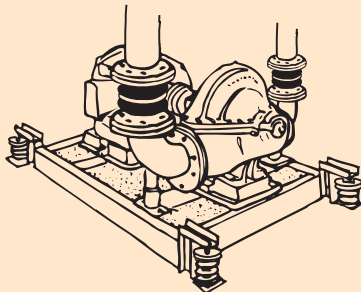
FACTORY ASSEMBLED AIR HANDLING EQUIPMENT

Factory assembled air handling equipment may be direct mounted as shown or placed on ICS rails when higher deflections are called for. It is important to study the equipment base or legs to determine whether rails are needed for structural reinforcement.



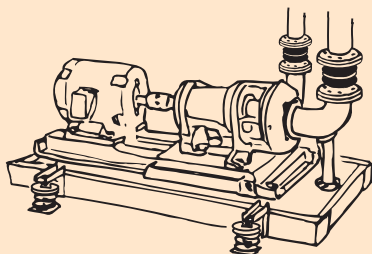
FAN HEAD

A fan head develops high horizontal thrust because of the negative pressure on the very large inlet area. The SLF springs cannot handle this thrust without Horizontal Thrust Restraints as sketched or massive concrete filled bases to increase the resistive weight and spring constants.



END SUCTION PUMP or DOUBLE SUCTION PUMP

SLF spring mountings of the proper deflection are recommended for all pump isolation problems. While steel bases may be used, concrete is preferred for greater rigidity and the possibility of grouting in the pump base. Bases should be made large enough to support the suction and discharge elbows whenever possible. Thus, Double Suction bases become wide and End Suction bases long.



SLF applications are by no means limited to these sketches. We have merely tried to illustrate the many modes of application and some of the design considerations.

VERTICAL PUMPS

Vertical pump bases using SLF mountings should be made large enough for stability and extended as required to support the piping before attachment to the pump flanges. This piping support reduces the strain on the pump casing.

CLOSE COUPLED PUMP

Close coupled pumps are generally unstable when mounted directly on SLF mountings because they are small in configuration and have a severe overhang on the pump end. A concrete base makes them less sensitive to external forces so the installation becomes much more workmanlike and practical. SLF deflections depend on location and pump size.

DIRECTLY DRIVEN REFRIGERATION COMPRESSOR UNIT

1" (25mm) deflection SLF mountings can be directly attached to the isolated equipment. Mountings of different capacities would be used at the two ends to compensate for the uneven weight distribution and provide reasonably uniform deflection. This use of springs of different capacity but the same potential deflection applies to all isolator selections.

BELT DRIVEN AIR COMPRESSOR

When 2" (51mm) or higher deflection SLF mountings are used we normally recommend ICS rails to minimize elevations. In this particular case the rails project beyond the flywheel to compensate for the overhang. The higher deflections are used to increase efficiency at the low operating speed.

VERTICAL TANK TYPE AIR COMPRESSOR

It is important to exercise caution when applying spring mountings to tall machines with small base dimensions. The use of a concrete filled type K base with SLF mountings lowers the center of gravity in addition to enlarging the base dimensions. Thus, the installation becomes much more stable.

SLOW SPEED VERTICAL or HORIZONTAL COMPRESSOR or VACUUM PUMP

Slow speed, large bore and stroke reciprocating compressors or vacuum pumps have large residual unbalanced forces that make direct mounting impossible because of excessive motion. The concrete inertia block mass is calculated from unbalanced force data supplied by the manufacturer. It is often as much as seven times the equipment weight. Vertical compressors are located over the combined vertical center of gravity. The springs under horizontal compressors are elevated to the horizontal CG. Three adjustment bolts are most important to maintain horizontal SLF stiffness.

