

K-FLEX DUCT® LINER GRAY MECHANICAL ATTACHMENT

K-Flex USA requires that K-Flex Duct® Liner Gray be 100% adhered to ductwork and air handling units using one of the approved adhesives listed in Technical Bulletin TA14 or liner with factory-applied pressure sensitive adhesive (PSA). Additionally, K-Flex USA recommends mechanical attachment in accordance with SMACNA HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE for duct lining applications. There are two acceptable types of duct liner fasteners: weld pins and impact applied fasteners. Most sheet metal shops use weld pins. The two largest manufacturers of weld and impact pins and pin installation equipment are DuroDyne and Gripnail. There are pros and cons for both types of fastening systems.

Impact Type Pins – Impact pins are not accepted by all mechanical engineering firms. They typically have lower (but acceptable) tensile strength. Impact pins can be installed by automated equipment on coil lines and semi-automated equipment or manually for piecework. They install faster than weld pins in an automated process, are safer to use when flammable solvent-based adhesives are used to install liner and do not generate any smoke during installation. Manual installation requires a solid backing, which can create difficulties when lining air handling units or large sections or re-lining duct or AHUs on site.

Weld Pins – Weld pins provide a higher tensile strength and can be installed by automated equipment on coil lines and semi-automated equipment or with hand held and operated equipment for piecework. Weld pins should only be used with hot melt, water based or non-flammable solvent based adhesives. The welding process generates smoke from the galvanized coating and possibly from the liner if the amperage setting is not adjusted properly.

The installed quality of weld pins and the amount of smoke generated is dependent upon many variables which are discussed below.

Welding Tool – There are four variables related to both automated and manual pin spotting equipment. Typical equipment *voltage* is 220v. However, a 220 line can have an actual voltage ranging from 180 – 240v. Most hand held and single head line welders operate at an *amperage* of 30 amps. Multi-head in-line welders operate at 100 amps. The *dwelt time* is the amount of time that current is applied to the pin. The amount of *pressure* applied to the pin can also be controlled in automated equipment. Most modern resistance welding equipment allows the operator to adjust amperage, dwell time and pressure to optimize weld quality and minimize the amount of smoke generated.

Newer capacitor discharge welding tools operate on 110v, and direct the heat to the point of contact to the substrate, reducing smoke and possible liner damage. The weld setting is adjustable. The equipment is lighter and easier to handle. Capacitor discharge welders have a longer cycle time than resistance welders; 16 – 20 pins per minute.

Weld Pin – The *metallurgy* of weld pins varies by manufacturer and can affect the quality of the weld and the amount of smoke generated as the pin burns down during the welding process. Pin *length* affects the amount of smoke generated, with a *longer pin* generating less smoke. Weld pins come in various lengths for a nominal thickness of (fiberglass) insulation. The recommended pins become longer as the fiberglass density increases. When selecting a pin for use with K-Flex Duct® Liner Gray, choose the pin designed for the *highest density* of fiberglass with the same nominal thickness or a pin specifically designed for elastomeric insulation.

Substrate – The sheet metal *thickness* and *galvanizing type* affect weld quality, with lighter gauges and heavier galvanizing generating more smoke.

Backing – The backing (what is beneath the sheet metal when the pins are installed) can have a major affect on weld quality and smoke generation. A *solid* backing provides a better weld and generates less smoke than an *open* backing.

Operator – The equipment operator controls several critical variables. On semi-automated equipment, the *levelness* of the sheet metal relative to the welder head is important. The pin should be perpendicular to the sheet metal. In manual installation, the operator controls the amount of *pressure* applied to the pin, as well as the *timing* of when current is applied. Too much pressure can significantly increase the amount of smoke generated. If the operator pulls the welder trigger too soon (“in hot”) or is still pulling the trigger when he withdraws the weld gun (“out hot”), the result will be a poor quality weld and smoke generation. The ideal installation is “in cold”, pull the trigger when the pin contacts the sheet metal, and “out cold” releasing the trigger before withdrawing the gun. The operator should only apply current long enough to melt the *tip* of the pin so that little or no taper is showing. Note that these issues are eliminated with capacitor discharge equipment.

Liner – Liner *formulation* and liner *thickness* both play a role in installation quality. Thinner liner thickness requires additional care to minimize smoke generation and assure good quality welds and liner installation. K-Flex Duct® Liner Gray has been formulated specifically for use in HVAC applications. It is more flexible and has less memory than competitive closed cell elastomeric products, making it easier to apply to round and oval ducts, as well as curved transitional sections. K-Flex Duct® Liner Gray is comparable to other nitrile butadiene rubber-based insulation materials in terms of smoke generation during the welding process. EPDM rubber-based liner materials do not offer the same degree of flexibility or sound absorption capabilities and will also generate smoke if the welding equipment is not adjusted properly.

Other Precautions – K-Flex Duct® Liner Gray is a *closed-cell* insulation material. Not all water-based contact adhesives work with closed cell liners in a production environment. K-Flex 1120 water based adhesive is the only water based product approved by K-Flex USA. The 1120 should be spray applied for the shortest tack time. Recommended solvent-based contact adhesives are listed in Technical Bulletin TA14. When using weld pins, it is recommended that either K-Flex Duct® Liner Gray with factory-applied pressure sensitive adhesive, K-Flex 1120 adhesive or one of the non-flammable solvent-based adhesives be used. Trapping flammable solvent vapors between the closed cell liner and sheet metal can result in ignition of the vapors during pin welding. As an alternative, use impact pins when using flammable solvent-based adhesives.

Summary – Using the proper combination of welder settings, pressure and pin length, K-Flex Duct® Liner Gray can be installed with little or no additional smoke generation in addition to that generated by the galvanizing that is vaporized in the welding process. Older equipment may not offer the degree of adjustability necessary to minimize smoke generation. Welding with excessively high amperage settings can cause melting of all brands of elastomeric liner. The settings normally used with fiberglass insulation are too high and need to be adjusted downward when installing K-Flex Duct® Liner Gray. Regardless of the type of liner being installed, welding should only be done in well-ventilated areas using personal protection as required by OSHA.

Please call our technical service department at 800-765-6475 if you have any questions about pin welding with K-Flex Duct® Liner Gray.