



⤵ A tech uses a specially designed cleaning kit for mini-splits.

PREVENTING LEAKS IN DUCTLESS MINI-SPLIT SYSTEMS

Installation, service contractor errors on linesets avoidable with right tools, techniques.

BY BOB MARTINELLI AND ROB MOORE

Images courtesy of RectorSeal.

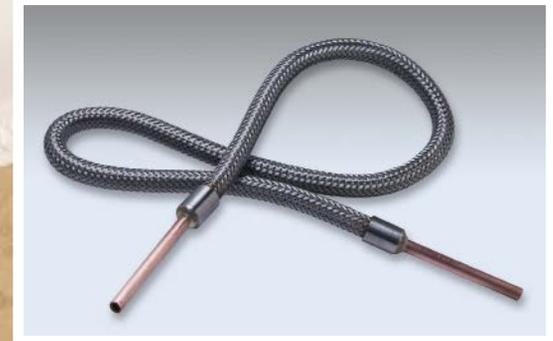
Leaks in ductless mini-split systems are many times due to installation or service contractor errors. While the blame is often pointed toward mini-split manufacturers, most of today's mini-split leaks are due to what the installer or service tech does or does not do.

Probably one of the greatest difficulties associated with installing mini-splits is maneuvering linesets into place, circumventing obstacles, flaring the copper ends and connecting them to their respective liquid and suction line ports. If the lineset is flared poorly, kinked, or not connected tightly, leaks can occur. However, accessory and tool manufacturers have come to the rescue with a myriad of recently-developed innovations to help prevent mini-split leaks.

Flare leaks

For example, field flaring by hand with flaring blocks and other conventional flaring tools is inconsistent by nature and subject to human errors from over-flaring, under-flaring, residual burrs and uneven flare surfaces. One or more of these inconsistencies almost always leads to a leak between the lineset flare and its fitting connection.

The HVACR industry has recently developed a flaring method that outperforms conventional flaring



« Using a flexible lineset connector can help make installations easier and prevent leaks.

blocks—the mainstay of flaring for decades. The improvement is flaring bits that fit into a drill chuck and complete a flare in less than five seconds using a 12V drill or impact wrench. The bits typically come in kits consisting of five bell-shaped, color-coded, size-inscribed flaring bits designed for 1/4, 3/8, 1/2, 5/8 and 3/4-in. tubing. The spinning bit forms the tube opening into a perfect 45-degree flare, without splits, burrs, blemishes or uneven edges that typically cause flare fitting connection leaks. The spinning also burnishes the flare surface for a tight-sealing connection.

Using a drill bit-style flare is nearly foolproof. An entry-level service tech can perform a flare equal to an experienced journeyman after only one flare. Conversely, mastering a flaring block requires experience that many apprentices and entry level technicians are slow to attain. The flaring drill bits are also the most efficient option for flaring short stubs or existing tubing in cramped spaces with limited accessibility. Trying to operate traditional flaring tools/blocks in the same situation would challenge the most experienced of technicians.

Another cause of flare leaks is the connection nut fitting. It might seem inconceivable to the experienced HVACR technician, but mini-split manufacturers report multiple instances from the field where service technicians somehow mistakenly use a plumbing industry flare nut instead of a refrigeration flare nut. This almost always results in leaking, because refrigeration flares are 45-degrees, whereas a waterside flare nut is 37.5-degrees, an angle degree that would crack or split a 45-degree flare upon tightening.

Preventing leaks

Lineset connectors are flexible and help installers maneuver linesets inside walls or inside the evaporator coil enclosure, and then make connections to liquid and suction line ports without kinking the lineset. These 36-in.-long, braided steel copper lines come in 1/4, 3/8, 1/2 or 5/8-in.-diameters. A flexible connector eliminates inadvertent lineset kinking, even with sharp 90-degree bends that potentially lead to leaks on more rigid cumbersome linesets in the typically tight quarters of wall-mounted and ceiling-cassette mini-split evaporator installations. Flexible connectors are especially helpful when servicing a unit, as they make pulling the evaporator coil away from the wall for repair easier because there are no movement restrictions from stiff linesets.

A flexible lineset connector can help make a smooth transition, especially in situations where the lineset enters the evaporator coil enclosure from the wrong side and must make an immediate turn toward the liquid and suction line ports. The flexible lineset connector's ends are preferably flared for connecting to a lineset via a union. Therefore, the aforementioned flaring drill bit will not only speed installation, but also help prevent leaks related to the flare. Service techs should first check manufacturer's recommendations before using flexible lineset connectors.

Insulated linesets

Lineset insulation should meet both International Mechanical Code (IMC) and the International Residential Code (IRC) in



⤴ **Tear and UV-resistant linesets for mini-splits are now code in many locations.**

terms of tearing and ultraviolet (UV) light deterioration. This is not as much an indoor leak issue as it is outdoors where animals can tear away the insulation or sunlight UV can deteriorate the insulation where it no longer covers the lineset. Uninsulated linesets exposed to outdoor elements will degrade and eventually develop formicary or pitting leaks. Another solution for outdoor lineset degradation is lineset protection duct, which should also be installed for corrosion prevention, insulation preservation and aesthetic reasons.

Sealants

Not every technician is an advocate of refrigeration leak sealants. However, it cannot be denied that they are a major part of refrigeration repair today. Literally millions of systems have been sealed in the last 15 years with products from a growing number of sealant manufacturers. Sealants are ideal for leaks in mini-split linesets and coils. In linesets, a difficult-to-find phantom leak could occur in the connection to the liquid or suction line ports when the flare connection was not flared or created well enough. Furthermore, coil leaks can occur from formicary and pitting corrosion.

Service technicians using sealants must first consider the manufacturer's warranty. Applying a sealant to warranted equipment could void the warranty. Instead of sealing, the warranty equipment should be replaced. If the warranty has expired and conventional leak finding/fixing attempts are unsuccessful, then leak sealants could be the most economical solution for the homeowner. Replacement, conventional repair and leak sealing should all be offered to the homeowner in terms of what solution is the most economical, long-lasting and poses the shortest down-time.

Customer relation consultants do not recommend telling a homeowner that something cannot be done. For example, a service contractor should not say a leaking system cannot be fixed, because the refrigerant will leak out again; or the coil cannot be fixed because it is more economical to just replace it; or that the replacement coil will not arrive for two weeks. Instead, homeowners need to hear what is going to get them air conditioning as soon as possible. Therefore, instead of the bad news first, homeowners should first hear the good news—that their mini-split can be fixed either permanently right away with a sealant; or fixed temporarily right away with a sealant while replacement equipment is on order. Leak sealants fall into two categories: polymer-based and oil-based. The number one concern for service technicians should be the selection of a leak sealant for personal and system safety.

Polymer-based sealants typically use chemicals, such as toluene, which are very harmful when exposed to skin or have dangerous flash points under 100°F. Polymer-based sealants react to atmospheric moisture to initiate a leak-sealing chemical bond as it exits the hole. However when microscopic amounts of moisture inadvertently enter the system, a premature bonding can form particulates that can potentially block capillary tubes, metering devices, tools/equipment and lock up moving components such compressor discharge valves. Because of their reaction to moisture, polymer-based sealants typically must be used with drying agents.

Conversely, oil-based sealants are safer to use and do not harm system components. Some oil-based brands support the "safe for system" claims with OEM unitary and compressor equipment approvals, plus successful third-party test results revealing no blockage of capillary tubes or components. Oil-based leak sealants are not all the same, so it is important for service techs to perform their own due diligence with the product's Safety Data Sheet (SDS) for toxic or dangerous ingredients and emergency guidelines if accidentally exposed.

Oil-based sealants travel with a system's oil, not the refrigerant. They do not react to moisture or air, but instead coagulate in layers across a leak hole, similar to the way blood reacts to a cut in the human body. Oil-based sealant brands



⤴ **This flare was created using a drill flaring bit.**

have also made installation easier with new injection-type applicators. Also new are nano sealants. The sophisticated nano mixture of various shapes and sizes allows the particles to self-organize and actively seek out and seal nano-sized leaks permanently.

Coil cleaners

Using the wrong coil cleaner can not only deteriorate the coil tubing and fins, but also distribute toxic gases throughout a household. The thinner metals used for mini-split evaporator coils make them more sensitive to chemicals than other coils. A coil cleaner with acids, for example, will deteriorate the metals and cause unnecessary corrosion and premature failure fairly quickly. For this reason, there are coil cleaners made specifically for mini-split evaporator coils, and there are cleaning kits available to keep overspray from marring interior household walls and floors.

Conclusion

Using the best tools, installation techniques and products for a mini-split can help eliminate leaks and call-backs after

installation. Furthermore, taking all the aforementioned precautions on preventing mini-split leaks is just a good practice for business, the customer and the environment. ☁

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