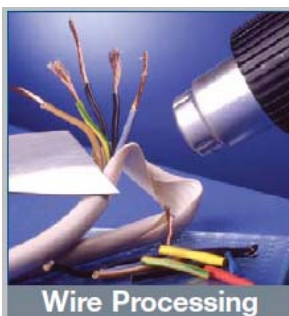




Heat Gun Handbook

Our thanks to Steinel for allowing us to reprint the following.



Wire Processing



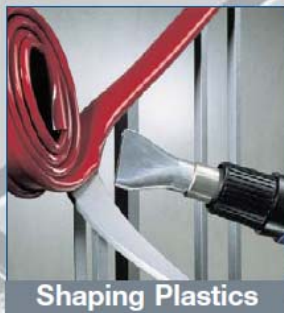
Adhesives



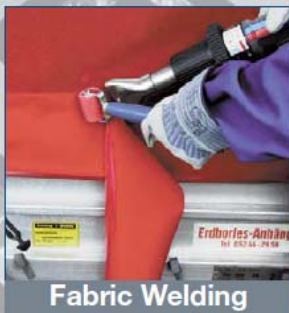
Plastic Welding



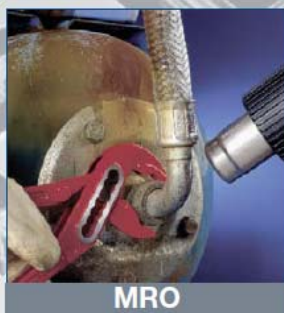
Medical



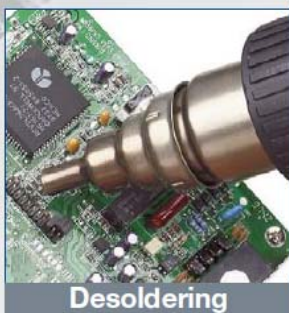
Shaping Plastics



Fabric Welding



MRO



Desoldering

Hot Air for Professionals

The Heat Gun Handbook is designed to provide a basic insight into the virtually unlimited uses of heat guns. It offers suggestions for how STEINEL heat guns can revolutionize the way you do your job and basic instructions on how to do each task.

Before attempting any job, test the heat gun on leftover material to perfect the process for yourself. Please understand that we are unable to guarantee suitability to your specific need or situation. All of the tips are based on experience from industry professionals.

We wish you the best of luck working with your heat gun.

WHAT MAKES A QUALITY HEAT GUN?

STEINEL heat guns incorporate state-of-the-art technology to produce the most precise durable tools available. User controlled temperature, airflow and the ability to reduce heat down to a pinpoint are features that combine to ensure a perfect job every time.

Programmable Output with LOC™

Select tools feature four customizable preprogrammed settings that allow a user to set the temperature and airflow. Additionally, the output of these guns can be locked-down, providing ultimate quality control.

Electronic Thermocouple Control

A temperature sensor in the output nozzle feeds information to the on board microprocessor, which adjusts automatically to achieve the desired air temperature output.

DuraTherm™ Heating Element

Coils are wound through a series of ceramic disks achieving full encapsulation. This provides even heat and added support helps to prevent coil breakage.

Interconnect Block Circuitry

Plastic is injection molded around the "wiring" to form a solid block, which will not break or disconnect like traditional wiring.

The pages that follow explain a number of basic processes. The various tips are of interest to professionals and tradesmen. Always follow basic safety procedures.

For your safety

Fresh air is important when working with hot air. Softening up paint may release solvents, soldering produces vapors from the additives used, and vapors are also generated when welding plastic. This is why you should always work outdoors or with the window open if work has to be done in small rooms.

Working in the presence of water with electrical power tools is dangerous. When using a heat gun, never work above or next to uncovered water.

Testing is the magic word when it comes to experimenting with hot air. Therefore always carry out a trial run first before attempting any new application. Check the airflow rate, temperature and compatibility of the hot air with the material you intend to work on.

Safe Operation - Be careful to avoid personal injury. Air heated to over 200°F (100°C) damages hair and injures skin. A heat gun can reach up to 1300°F (700°C). Never direct heat gun at hair, skin or other unprotected body parts.

Heat Guns in Industry

Aerospace



In the aerospace industry temperature control is critical in creating and repairing wire harness and soldering and desoldering circuit boards for satellites, radios and other communication devices. STEINEL heat guns with LOC technology and LCD display provide the precision and control these applications require.

Exterior composite work and fabricating aircraft interior panels are demanding applications where a durable tool

is necessary. STEINEL heat guns, tested to endure up to five times longer than other heat guns, provide the long life expected by discriminating professionals.

Automotive



Automotive repair shops use heat guns for a large variety of tasks including leather and vinyl repair, loosening adhesives, plastic welding bumpers and dashboards, repairing wire harness and installing electronics. STEINEL offers heat guns to accommodate a wide range of temperatures and airflows as well as accessories to help make every job easier.

Electronics



Desoldering circuit boards is a job that requires precise temperature coupled with the ability to finely control the stream of hot air. STEINEL heat guns offer the ability to specifically select temperature in 10° increments as well as the ability to control airflow. The variety of STEINEL

reduction nozzles enables the user to control the stream of hot air in the most sensitive of situations.

Construction



Construction professionals rely on heat guns to lap weld roofing materials, install flooring, sweat pipes and to make vinyl siding workable in cold temperatures. These applications require heat guns that are durable and easily repaired in the field. STEINEL offers heat gun models that have field changeable parts and are the most durably constructed tools available in the industry.

Packaging



The packaging industry uses heat guns to touch up shrink wrap on assembly lines, activate adhesives while fabricating foam packing inserts, create gift baskets, and

to loosen and remove packaging labels. STEINEL offers ergonomically engineered heat guns for long term comfort as well as the longest lasting heating elements.

Maintenance



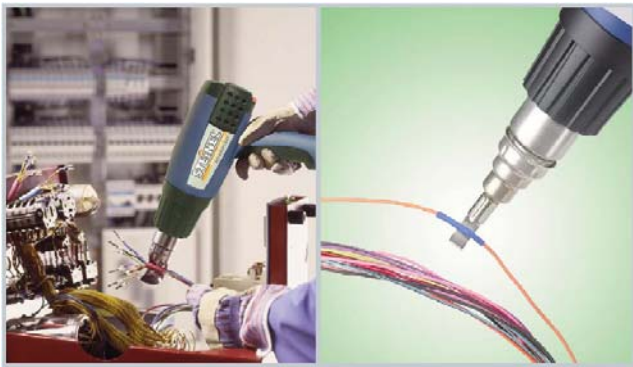
Stripping paint, applying shrink tubes and solder sleeves to repair wiring, loosening seized fasteners, bending and shaping plastics, drying putties and paints and activating and deactivating adhesives are just a few of the many uses for heat guns in MRO industries. STEINEL's heat guns and accessories simplify the job by offering the ability to accomplish all of these varied tasks with one variable output tool.

Medical



The medical field uses heat guns to shape orthotics and prosthetics, plastic weld dentures and for shaping large frames in optical labs. All of these applications require the precise even heat that STEINEL delivers with the DuraTherm™ heating element.

This is how it's done



350 – 500°F (175 – 250°C)

Wire Harnessing

The **automotive**, **electronics** and **aerospace** industries use heat guns in the manufacture of wire harnesses. This is done by placing wire bundles into the appropriate sized tubing and shrinking it down to hold the wires in place. Applying hot air at 350 – 500°F (175 – 250°C) will shrink the tube to the correct size. Precise and consistent temperature is crucial in this process to prevent damage to the wires and to prevent scorching or blistering the shrink tubing.



The 75mm and 39mm reflector nozzles are a popular choice for this application because they direct hot air around a larger diameter bundle of wires. Heat guns are also used in wire harness shops to cauterize the ends of wire harness braids.



350 – 500°F (175 – 250°C)

Heat Shrink, Connectors and Solder Sleeves

In the **electronics** and **MRO** industries heat guns are often used to make and protect wire connections. This is done by sliding a heat shrink tube of the appropriate diameter over the connection and then shrinking it on using hot air at 350 – 500°F (175 – 250°C) and a reflector nozzle. STEINEL heat guns offer precise, even heat allowing the user to effectively control temperature output and prevent scorching or blistering the tubes and sleeves. The 9mm reducer is recommended for repairs where a smaller diameter shrink tube is being used.

Solder sleeves with an integrated solder ring or crimp connection are available to ensure that a reliable electrical connection is made. They are also available with an adhesive coating on the inside for watertight connections. The 14mm reflector fit solders sleeves well, making it a great choice for this application.

Similarly the **automotive** and **aerospace** industries use heat shrink and solder sleeves for repairing wire harness.



250 – 325°F (120 – 165°C)

Activating and Deactivating Adhesives

Almost any type of adhesive can be loosened using a heat gun. In the **auto body repair** industry aluminum vehicle frames cannot be exposed to flame; therefore, they must be dismantled and repaired with a heat gun. A heat gun is used to loosen the adhesive at the joints allowing them to be separated. Simply direct the hot air where the joint is glued. The adhesive will soften and

can then be pulled apart without causing further frame damage.

Decals, stone guards, window tinting and stickers can easily be removed from surfaces without the risk of damage. Hot air will leave nothing sticking to the original surface. Direct the stream of hot air at the area you would like to remove and when the adhesive softens simply pull the material back.



In the **aviation** industry heat guns are used for exterior composite work. Seams are sealed by layering carbon fiber mesh over seams and heating them with hot air to fuse them together until the seam is filled. Heat guns are also used to fabricate aircraft interiors. Fiber glass composite is layered over jigs to create the desired shape for each part of the aircraft's interior. Heat guns are used to adhere each individual layer together until they reach the desired thickness for the specific part.



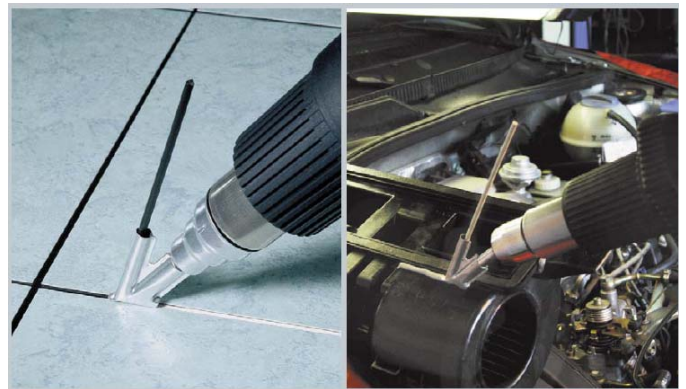
250 – 325°F (120 – 165°C)

The **renovation** and **remodeling** industries use heat guns for removing glued-on coverings, building materials, wallpaper and flooring. This is accomplished by heating up the adhesive and simply scraping off the material. Attach a spreader nozzle and direct the hot air between covering and the substrate layer. Joint sealing materials are also easy to remove with the help of hot air.

In the **flooring** industry tile adhesive is stubborn and difficult to get off. Heat softens the adhesive which can then be removed with a scraper and cloth.



Working adhesives with hot air is always an advantage when you want to bond or release large areas. The recommended temperature for this is 250 – 325°F (120 – 165°C).



450 – 725°F (230 – 385°C)

Plastic Welding

The **flooring** industry uses heat guns to weld plasticized PVC in flooring joints and seams. Plastic welding is also used in the **automotive repair**, **MRO** and **orthotics and prosthetics** industries to repair plastics.

The materials being welded must always be the same composition, the type of plastic must be identified before welding the two parts together (see table for distinguishing characteristics). Select welding rod of the appropriate material. Clamp work pieces in position. Clean, degrease and, if necessary, bevel the seam. Now heat the seam with hot air to 450 – 725°F (230 – 385°C) and offer up the welding rod via a welding nozzle. For a strong weld, the work piece and welding rod must turn to a "doughy" consistency. The seam can be validated using a pull test which, if acceptable, produces stress whitening.

Plastic types:

Material	Application types	Distinguishing characteristics
Rigid PVC	Piping, fittings, boards, building profiles, technical moulded components, etc. Welding temperature 550 – 650°F (290 – 345°C)	Incineration test: carbonizes in the flame and extinguishes on its own Smoke odor: pungent, of hydrochloric acid Drop test: crashing
Plasticized PVC	Floor coverings, wallpaper, hoses, sheets, tools, etc. Welding temperature 550 – 650°F (290 – 345°C)	Incineration test: smoking, yellowish-green flame Smoke odor: pungent, of hydrochloric acid Drop test: silent
Plasticized PE (LDPE) Polyethylene	Domestic and electronic items, toys, bottles etc. Welding temperature 450 – 550°F (230 – 290°C)	Incineration test: light, yellow flame, drops continue to burn Smoke odor: resembles an extinguished candle Drop test: dull
Hard PE (HDPE) Polyethylene	Baths, baskets, canisters, insulating materials, piping, cellar shafts, transport containers, waste bins, etc. Welding temperature 550 – 650°F (290 – 345°C)	Incineration test: light, yellow flame, drops continue to burn Smoke odor: resembles an extinguished candle Drop test: crashing
PP Polypropylene	HT drainpipes, plastic chairs, packaging, car components, equipment housings, technical mouldings, battery boxes, etc. Welding temperature 450 – 550°F (230 – 290°C)	Incineration test: light flame with a blue core, drops continue to burn Smoke odor: pungent odor of paraffin Drop test: crashing
ABS	Car components, equipment housings, suitcases Welding temperature 625 – 725°F (330 – 385°C)	Incineration test: black, fluffy smoke Smoke odor: sweetish Drop test: crashing



250 – 350°F (120 – 175°C)

Medical

Medical plastics used in **orthotics and prosthetics** can be shaped and welded using a heat gun. Unlike open flame there is more control over temperature output and less chance of scorching these expensive devices. To achieve a custom fit the materials can be heated with hot air ranging from 250 – 350°F (120 – 175°C) then shaped and smoothed. In the case of foam materials temperatures can be as low as 160°F (70°C).

Dental labs use heat guns to reshape, weld and repair dentures. It is best to consult with the material manufacturer for the workable heat ranges of these materials. In **optical labs** eye glasses often need to be adjusted to fit. Frame heaters are too small for large eye glass frames, preventing uniform heating. A heat gun set up as a bunsen burner and with a reflector nozzle will heat them evenly.

In **optical labs** eye glasses often need to be adjusted to fit. Frame heaters are too small for large eye glass frames, preventing uniform heating. A heat gun set up as a bunsen burner and with a reflector nozzle will heat them evenly.



325 – 425°F (165 – 275°C)

Shaping Plastics

The **flooring** and **MRO** industries use heat guns to make plastic sheets, pipes and rods flexible without

leaving burn marks. Plastic sheets for making containers are worked at 325 – 425°F (165 – 275°C) depending on material type. Folded edges are created by heating the work piece with a surface nozzle. The heated material then can be bent with ease.



Pipe and rod are evenly heated all the way around using a reflector nozzle. Once it has been heated it is easily shaped or bent. Holding the piece in the chosen position until cool ensures it keeps the desired shape. A coil or sand filling helps prevent pipe kinking.



775 - 1250°F (415 - 675°C)

Roofing

Heat guns are used in the roofing industry to lap weld difficult areas such as near vents and edges. To lap weld PVC a temperature of approximately 775 - 875°F (415 - 470°C) is delivered with a angled slit nozzle placed between overlapping sheets of PVC material until the surface becomes soft and begins to stick together.

Pressure is applied with a silicone seam roller on the top of the PVC to ensure the two pieces of material adhere securely.



Hypalon, modified bitumen and TPO are worked at higher temperature ranges. Temperature requirements for roofing materials vary. Consult the material manufacturer for specific temperature ranges.



625 – 725°F (330 – 385°C)

Tarps, Liners and Industrial Fabric Welding

Plastic tarpaulins in the **trucking & transport** and **tent & awning** industries as well as coated textiles in the **marine** industry can be reliably welded using heat guns. This is done by overlapping two layers of tarp or sheeting by approximately 3/4 – 1 1/2 in. (2 – 4 cm) and holding the tarps taut. Then using a slit nozzle, hot air ranging from 625 – 725°F (330 – 385°C) is blown between the overlap. The material turns soft within a matter of seconds and is firmly pressed together with a feed roller. To test your work tear the welded seam apart with force at one end or on a sample piece. If stress whitening occurs in the material, the seam is satisfactory. Otherwise, temperature needs to be increased or speed decreased.

Common uses for these types of processes are to weld plastic sheeting together to create pond liners or to create and repair tarps for marine and transport coverings, tents and awnings.



325 – 425°F (165 – 275°C)

Construction

There are numerous ways heat guns are useful in the **construction** industry. For example, in cold temperatures vinyl siding will crack when you try to cut it or work with it. To prevent wasting materials and allow **siding contractors** to work through the winter in colder areas, a heat gun and spreader nozzle are used to quickly warm each piece of vinyl siding before it is cut. This effectively prevents the material from cracking. A temperature range of 325 – 425°F (165 – 275°C) works best for this type of application.



Hot air is also useful in **plumbing** for fitting pipes. Simply heat the hose or pipe end with hot air and push it on. As it cools it contracts to create a tighter connection than could otherwise be achieved.



450 - 750°F (230 - 400°C)

Vinyl and Leather Repair

Vinyl and leather repair is common in the **automotive** industry. Heat guns are used in the process of mending tears and removing wrinkles in both of these materials. Tears are first cleaned of any stray threads and covered in a compound that matches in color to the original surface. Next it is covered with a textured cloth matching the original texture of the material. Finally, heat is applied ranging from 450 - 750°F (230 - 400°C) to set and dry the compound.



The 14mm and 20mm reducer nozzles allow the user to aim the hot air directly at the area that is being repaired, speeding up the curing process.

Wrinkles in leather and vinyl upholstery are also easily removed by applying heat.

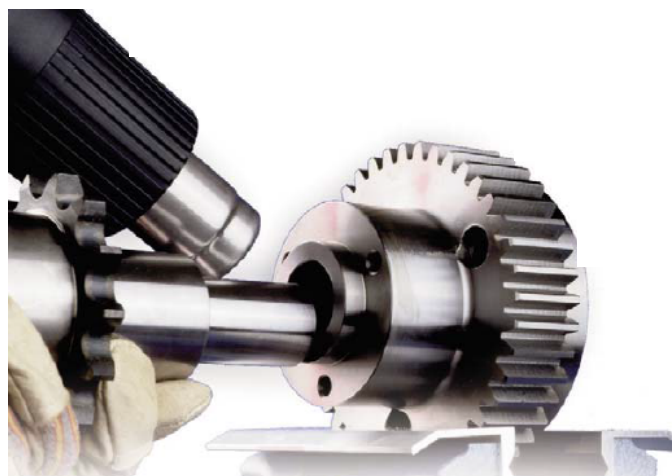


350 – 1200°F (175 – 650°C)

Maintenance, Repair and Overhaul

Heat gun use in the **MRO** industry is abundant. Stripping paint, loosening seized bolts and fitting metal components done at temperatures ranging from 900 - 1200°F (485 - 650°C), are examples of applications where heat guns come in handy. Thawing frozen pipes is effectively accomplished by using a 39mm or 75mm reflector nozzle directing heat at a temperature range of 750 - 1200°F (400 - 650°C) around the frozen pipe.

Working with plastics is another popular application for heat guns in this industry. Plastic welding can be accomplished with a 9mm reducer, plastic welding tip and a temperature ranging from 450 - 750°F (230 - 400°C) depending on the material type. (See chart on pg. 13) Plastic shaping is also done at 450 - 750°F (230 - 400°C).





350 – 1200°F (175 – 650°C)

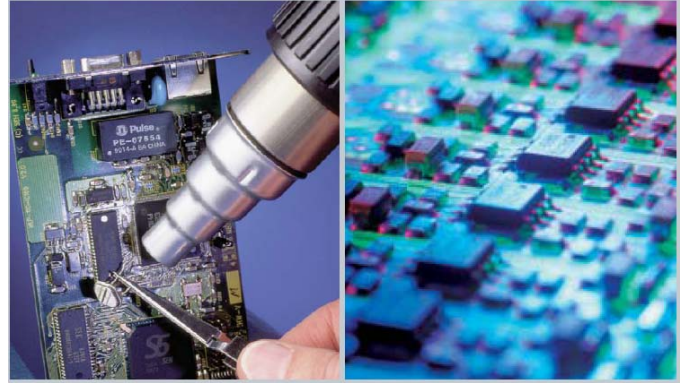
Working adhesives, like removing decals, is yet another way heat guns are utilized in the **MRO** industry. This is done at temperatures ranging from 450 - 750°F (230 - 400°C).

Drying and melting compounds is done at a temperature of 450 - 750°F (230 - 400°C). At these temperatures wax can easily be melted or softened. Industry professionals can also use the same temperature and a 50mm or 75mm spreader nozzle to quickly dry putties, paints and other compounds.

Applying shrink tubing is another practical application for heat guns in the **MRO** industry. Using the 9mm, 14mm, 39mm or the 75mm reflector nozzle and a temperature range of 350 – 500°F (175 – 250°C) shrink tubes and solder connectors can easily be applied.



STEINEL's Industrial and Multi-Purpose heat gun kits offer a wide variety of accessories that are ideal for the **MRO** industry.



750 – 1075°F and 400 – 850°C)

Soldering and Desoldering

Heat guns can be used in the **electronics** industry to desolder electronic components from damaged circuit boards. Hot air, 750 – 850°F (400 – 455°C) will loosen the solder joints allowing the components to be removed. Concentrate the hot air on the solder joint and remove the component with a special pair of pliers once the solder melts.



The 9mm reducer delivers a precise concentrated stream of hot air that is easy for a user to control on the surface of a circuit board. This makes it the ideal accessory for the delicate task of desoldering circuit boards.





300 – 925°F (150 – 495°C)

Packaging

The **packaging** industry uses heat guns to touch-up shrink wrapping after it has been through a heat shrink tunnel. This is done by applying hot air, about 825 – 925°F (440 – 495°C), through a surface nozzle to any area of a package that is not taut.



Foam inserts for packing electronics are customized to fit each product using adhesives activated by heat guns. The temperatures to activate these adhesives range from 300 – 600°F (150 – 315°C). This temperature range allows for the adhesives to sufficiently activate without scorching the foam packing material.



The **retail** industry also uses heat guns to shrink wrap gift baskets after they have been created to seal in the contents and create a decorative wrapping for resale.

The Heat Gun Product Range

Industrial Heat Guns

STEINEL Industrial Heat Guns are designed for production, roofing, flooring, packaging and other rigorous applications where performance and durability are key.



HG 5000 E

IntelliTemp™ heat gun with LED temperature display (230V)



HG 4000 E

IntelliTemp™ heat gun with LED temperature display (120V)



HG 2300 EM

Ergonomic heat gun with electronic thermocouple control

Professional Heat Guns

These high quality durable tools are suitable for heavy-duty use in industry and the trades. They provide powerful even heat with a lightweight ergonomic design.



HL 1810 S

3 stage professional heat gun



HL 1610 S

2 stage professional heat gun

Electronic Heat Guns

This heat gun line uses state of the art technology to maximize precision and durability. It incorporates new features responding directly to ever increasing requirements for rigorous, formalized quality control.



HG 2510 ESD

ESD safe programmable IntelliTemp™ heat gun



HG 2310 LCD

Programmable IntelliTemp™ heat gun with LCD display



HL 2010 E

IntelliTemp™ heat gun with LCD temperature display



HL 1910 E

Variable temperature electronic heat gun

UltraHEAT™ Heat Guns

Designed to combine high performance with exceptional value these general purpose heat guns feature a reinforced heating element tested at over twice the useful life of comparably priced tools.



UltraHEAT™ II

SV 803 variable temperature heat gun



UltraHEAT™

SV 800 dual temperature heat gun

Heat Gun Accessories...



...for both professional and electronically controlled heat guns



50mm Spreader Nozzle

Spreads air over smaller areas, such as for waxing skis. Part # 07011



75mm Spreader Nozzle

Distributes the air over a wide area for drying, paint stripping, etc. Part # 07021



50mm Deflector Nozzle

Deflects to protect overheating in narrow spots. Part # 07031



75mm Deflector Nozzle

Deflects to protect overheating in narrow spots. Part # 07041



39mm Reflector Nozzle

For soldering pipes and fitting heat shrink sleeves. Part # 07051



75mm Reflector Nozzle

For directing hot air evenly around materials such as large diameter shrink tubes. Part # 07301



20mm Reduction Nozzle

For a focused jet of heat. Popular nozzle for leather and vinyl repair. Part # 07081



Wire Protection Tube

Prevents accidental contact with hot nozzles. Part # 07403



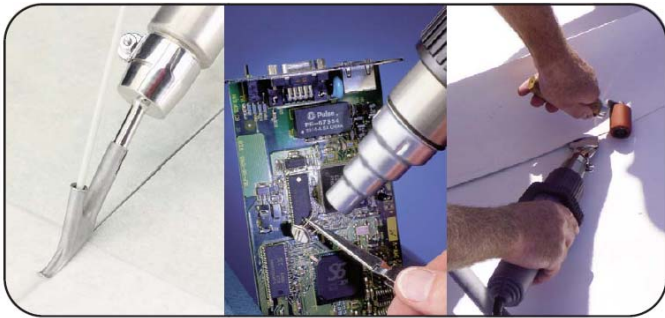
Seam Roller

This roller is designed for lap welding, edging tape and roofing applications. Part # 01250



Metal Heat Gun Stand

Offers the flexibility of hands free operation. Part # 01410



...exclusively for electronically controlled heat guns



9mm Reduction Nozzle

Pinpoint source of hot air for desoldering and welding.
Part # 07062



14mm Reduction Nozzle

Concentrated source of hot air for desoldering and PVC
welding. Part # 07071



9mm Reflector Nozzle

For directing hot air evenly around small diameter shrink
tubes. Part # 07061



14mm Reflector Nozzle

For directing hot air evenly around small diameter solder
sleeves. Part # 07461



20mm Angled Slit Nozzle

For seam sealing, roofing and lap welding in small
areas. Part # 09211*



40mm Angled Slit Nozzle

For seam sealing, roofing and lap welding. Part # 09201*



5mm Reduction Nozzle

Pinpoint source of hot air for welding and soldering
applications. Part # 09221*



10mm Reduction Nozzle

Concentrated source of hot air for welding and soldering
applications. Part # 09231*



90° Nozzle

For directing hot air into corners and hard to reach
areas. Part # 09241*



High Speed Welding Tip

For working with plastic welding rod up to 6mm dia. Fits
on a 5mm reducer. Part # 09183*

STEINEL®