Industrial Quality Soldering Irons: Everything you'll need to know

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Industrial Quality Soldering Irons are manufactured to handle the tough jobs that your average "economical" soldering iron simply cannot begin to handle. Industrial Quality Soldering Irons are available in the Pencil Style & the Heavy-Duty varieties. Pencil-Style soldering irons are available with outputs of 20 to 60 watts, while the Heavy-Duty Soldering Irons are generally manufactured with outputs of 60 to 550 watts. Both varieties are available in several different sizes each of which will usually accommodate a variety of soldering iron tip configurations. This gives you the increased ability to match certain tips and irons together so that you are able to more accurately meet the specific requirements of several different soldering applications.

The Heavy-Duty type of (constant heat) electric soldering irons was first developed in the early 1890's and has gained steady recognition over the years as a more efficient tool for heavy-duty and industrial soldering applications. The Pencil Style of (constant heat) electric soldering irons was developed around the middle of the 1930's. During that time an increasing need arose for the development of soldering tools that could be used for smaller and more specific applications. They are commonly referred to as "Pencil Style" because of their size and the manner in which they are normally held during use. Both types of soldering iron share the same basic design characteristics. They use a heating element that is manufactured using special nickel-chromium wire material that is wound around an insulated metal spool. This heating element is used to generate the required heat that gets transferred directly through the tip and into the joints that are being soldered. This special nickel-chromium material is a highly resistive alloy and it is the amount of this resistance that will determine the elements actual out-put, which is generally expressed in wattage.

These soldering irons should not be classified specifically by their wattage, because this information when taken alone can be very misleading. Additional information such as the size, mass, style, thermal efficiency, caloric heat content and maximum tip temperature can all be included in the evaluation process, when this information is determined or known. The specific wattage of the soldering irons is not usually considered to be a major factor when determining their maximum operating temperature so much as it tells how well they will be able to maintain their operating temperature during the actual soldering applications. Soldering irons that have a higher wattage will generally have a faster thermal recovery and the ability to more efficiently support soldering applications that require a heavier thermal load.

Choosing the Iron

The specific requirements of many modern soldering applications is adequate cause for insuring the thermal characteristics of a soldering iron be carefully assessed and the iron and tip be properly matched to the application being considered. When choosing the correct soldering iron for a specific application, there are several things to consider. Some of the primary issues should include the abilities of the operator, the tips size and configuration required, the accessibility to the intended soldering area, temperature requirements, thermal recovery and ergonomic issues. Having a better understanding of how each of these issues relates not only to the application, but also to each other should assist you in making the proper selection when evaluating the wide variety of soldering irons that are currently available.

Abilities of the operator relates specifically to their individual level of knowledge and experience.

Experienced operators and those who have been properly educated can be a valuable asset when evaluating a soldering application to determine the most efficient and effective tools to use. This is especially true when the application being evaluated consists of several nonstandard solder joints. As the abilities of the operators improve they will become better able to evaluate an application and offer qualified recommendations as to which tool, or tools they feel will achieve the best results. Being able to confidently rely on the qualified recommendations of your experienced operators will usually result in fewer improper tool choices and a consistently higher level of efficiency, quality and consistency.

Tip size and configuration relates directly to the mass and surface area of the components being soldered.

The purpose of the soldering tip is to efficiently convey heat from the soldering iron's element to the work. Selecting the proper tip for any soldering application is as important as selecting the correct soldering iron. The two should be properly matched to each other and to the intended application. The amount of heat (caloric content) that a soldering iron tip can hold is dependant largely upon its total mass. It is for this reason that plug style tips, which are inserted into the heating element, are generally preferred over screw-on or press fit tips.

The efficient delivery of heat through the tip is dependant upon its length and diameter when you are comparing various tip types of the same metallic make-up and having the same protective plating. The short time lapse between the formation of heat within the element and the availability of this same heat at the working portion of the tip is vitally important. A blunt short chisel is the most efficient design and the width of the chisel should be equal to or slightly greater than the width of the material that is being soldered. A tip diameter that is too small will take to long to transfer enough heat to flow the solder. A tip diameter that is too large is likely to be very cumbersome to work with and can even create problems regarding the accessibility of the intended soldering area.

Accessibility relates to the amount of space available in and around the intended solder joint area.

The area in which the soldering is going to take place may not always be completely accessible. This happens to be one of the primary reasons why there is a variety of soldering iron tip types currently available. Longer tips, or tips that have the working area turned down (although they are less efficient and generally not preferred) are sometimes required in order to effectively reach the intended soldering area. In situations like this it is important to have the proper type of soldering iron available. This means having a soldering iron that will not only be able to accommodate the required tip type but will also be able to supply the increased amount of heat that may become necessary to compensate for the possible inefficiencies experienced when using one of these tip types.

Temperature requirements relates to the heat needed to fully activate the flux and flow the solder.

Most manufacturers usually include each soldering irons maximum tip temperature as a part of their listed specifications. This information generally refers to the maximum tip temperature that is achieved by a soldering iron when it is plugged in and idling with the tip that is normally supplied properly attached to the soldering iron. This maximum tip temperature is being maintained during the actual soldering application by replenishing the heat being used during the recovery period (see thermal recovery below) that takes place between each solder joint.

A soldering iron's maximum tip temperature must be sufficient to fully activate the flux and flow the solder into the joint in an acceptable amount of time. You may want to choose an iron with an operating temperature that is 50 to 100º higher than the liquid temperature of the solder alloy that is being used. A lower temperature means a longer dwell time required to flow solder. The basic idea behind soldering is to bring the intended solder joint area up to melt temperature as quickly as possible without introducing a damaging level of heat for a sustained period of time. It is not uncommon to choose an iron that has a higher operating temperature than what is required and then adjusting the operating temperature of the iron by using a voltage regulator to control the iron.

Thermal recovery relates to the time necessary to replace the heat that was required to perform the soldering.

The soldering irons operating temperature (or the maximum tip temperature as stated) gets replenished during the thermal recovery period that takes place after each solder joint is produced and is maintained until the iron is applied for the next intended joint. The soldering iron and tips size, mass and configuration and the soldering irons wattage and maximum tip temperature specifications are all integral parts of determining the type of thermal recovery that you can expect to achieve.

The size, mass quantity and thermal characteristics of the materials being soldered will also have an effect on the thermal recovery period. For instance when you are dealing with long soldered seems or components that have substantial mass or high heat sinking properties a higher wattage soldering iron will usually be required in order to maintain an adequate and acceptable thermal recovery period. The irons thermal capacity (caloric content) or actual mass must match the intended application and should be adequate to allow for the rapid thermal recovery required between solder joints.

Ergonomic issues, relate to the operators ability to comfortably use the soldering iron.

Many of the industrial quality soldering irons that are currently available incorporate certain design specifications that relate directly to the operators comfort, handling and ease of use. They are designed to be as light as possible, considering their larger sizes. They are usually well balanced and often incorporate as flexible a cord set as possible in order to help lower or

eliminate operator fatigue. They usually have heat-baffling plates (or some other type of shielding) to help minimize the amount of heat that gets transferred into the irons handle. The handles are often manufactured out of material that will also help to insulate the operator's hand from the heat of the soldering iron. However, it is important to realize that the same design features that create the performance that people look for in a Heavy-Duty soldering iron, result in possible ergonomic issues for the end user. Many factories incorporate special holders, harnesses, heat deflection devices and work rules that help to ensure as little undue strain on the end user as possible.

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