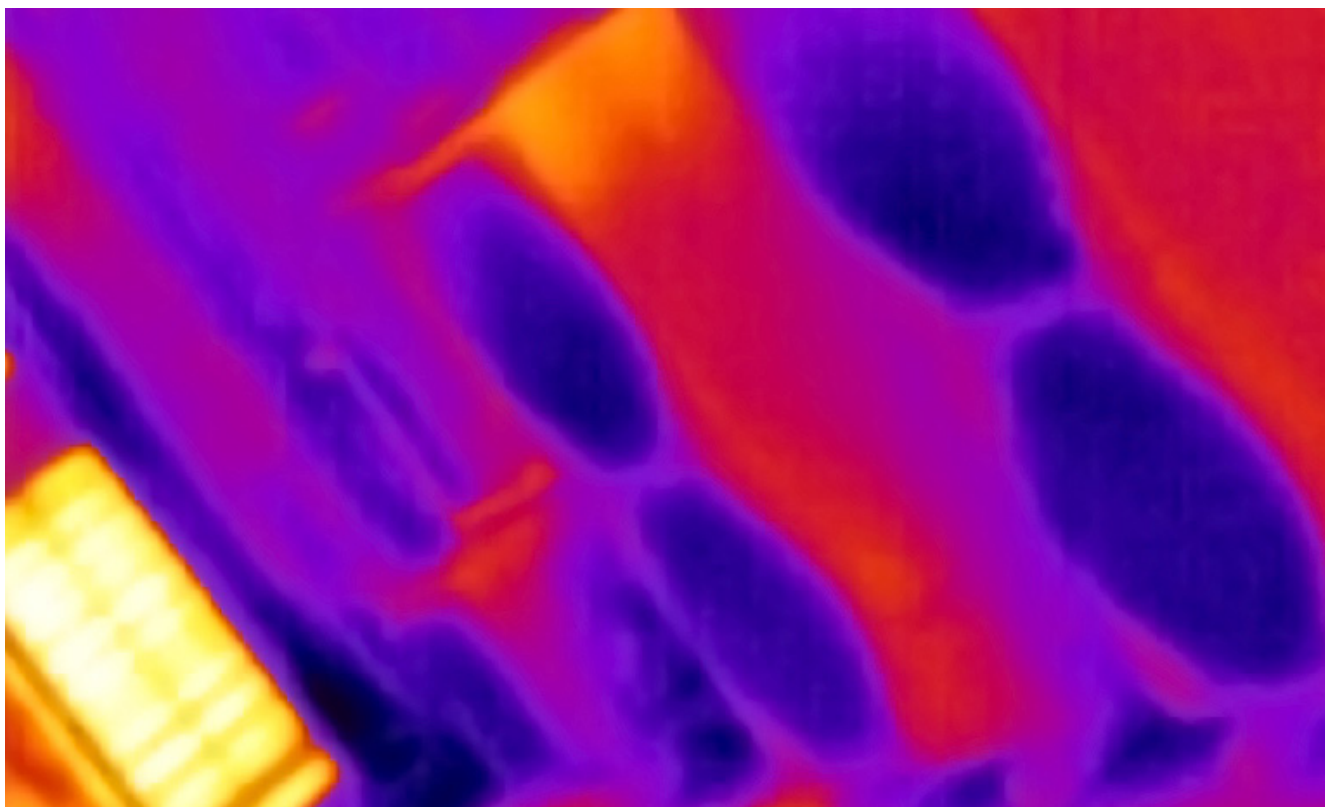




# The Secrets of Temperature Ranges

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Temperature is a hot topic in the electronics industry (pun intended). In extreme temperature environments, you might get melting or cracking in your plastic housings. But even before that point is reached, heat can impact the performance of your products. In this article, we'll take you through 3 different temperature ratings:

- Storage Temperature
- Processing Temperature
- Operating Temperature

An extreme in any of these three can cause various issues. These may show up immediately or over time, impacting the longevity of the product.

## Storage Temperature

Before the product is assembled, often components are sitting on a shelf somewhere waiting to be used. That might be at the manufacturer, the distributor or on your shelf ready for the production slot.

Even on the shelf it's important that the parts are not subject to extremes – it can cause a variety of issues that lead to the solderability of the product being affected. And poor soldering can lead to short-term failures or long-term reliability issues.



Storage temperatures are almost always a narrower band than operating temperatures – once the product is soldered to the final assembly, then other factors come into play that are less sensitive to temperature. Check with manufacturers for any specifics, but a general search for electronics storage conditions indicates that a range of 10 to 30°C (50 to 86°F) is most favorable.

For some regions of the world, this will require an air-conditioned warehouse, and minimizing the time spent on a production line.

We're only concentrating on temperature in this article, but you'll also need to consider humidity and contamination for a complete storage setup. Product should also be kept in its original, unopened packaging. Check with the manufacturer for the duration of the shelf life for the product.



## Processing Temperature

This is the temperatures that the component experiences during soldering. These will usually be higher than the maximum operating temperature. However, the exposure time is also much shorter.

Typical examples will look like “260°C (500°F) for 10 seconds max”. This would be the maximum soldering temperature that your soldering profile should reach.

For connectors, the maximum temperature will factor in the melting point of the plastics used, so exceeding this will cause permanent damage.



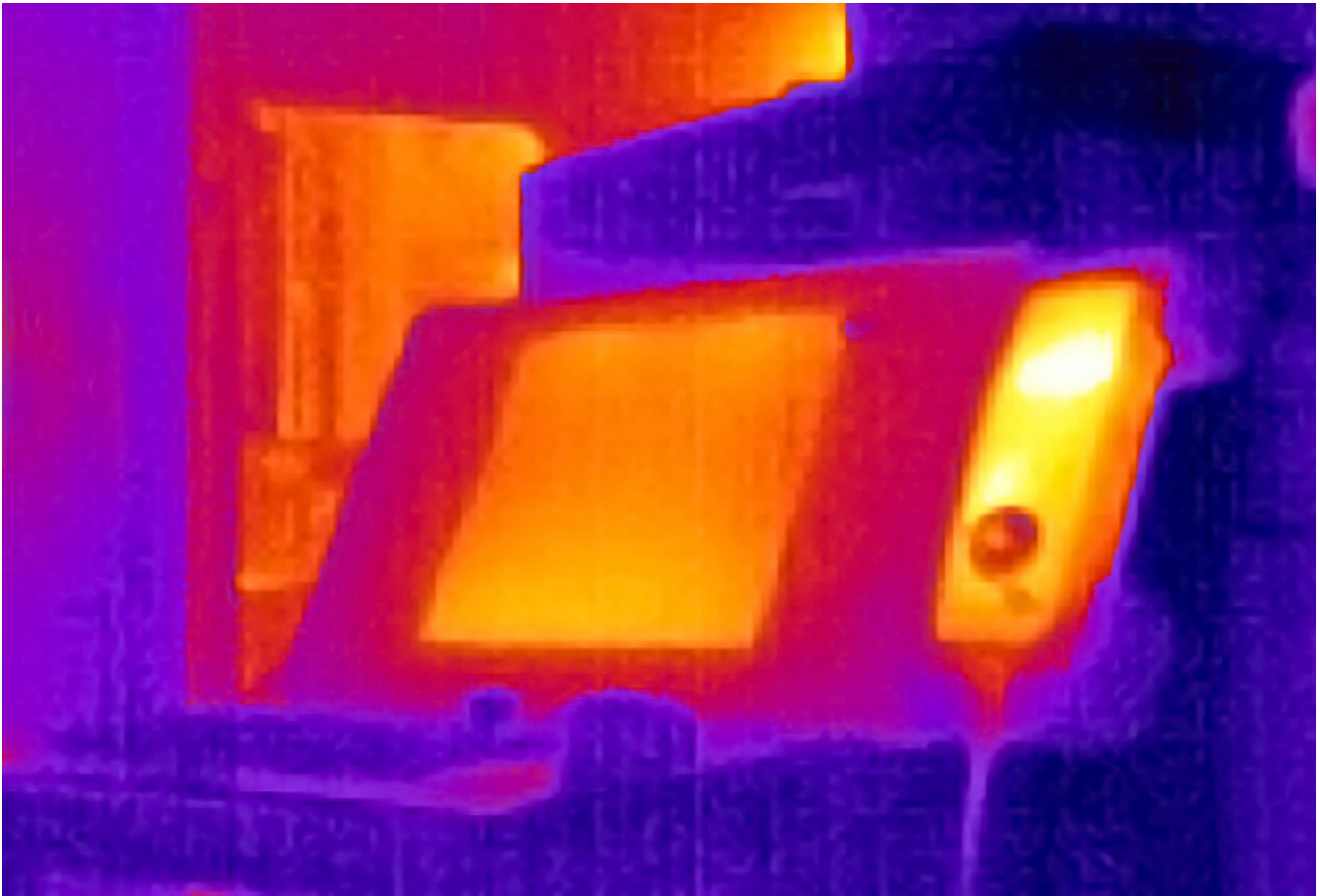
Some parts also quote an additional slightly lower Solderability rating – this is the optimum soldering temperature. Some products may have a full recommended soldering profile for the complete process – however, this will need balancing with other products on your PCB (and the PCB itself). You may be able to decide on a final solder profile from manufacturer’s data. For confirmation, a test run of the solder process is often advised.



## Operating Temperature

Now we get to the post-processing temperature range – this will apply for both in-use and sitting in storage, once your components are assembled. It's generally called operating temperature as it relates to the temperatures encountered during their operating life. This can vary from frigid outdoor exposure to next to a red-hot engine.

Standard connector examples can be as narrow as -20 to +85°C, or as wide as -65 to +175°C (-4 to +185°F and -85 to +347°F). For connectors, these ranges will relate to the female contact materials. The increasing temperature causes the metal connection (which is under force in use) to start relaxing, and spring force is lowered and eventually lost. This affects various performance aspects.



To extend temperature ranges in either direction, specialist materials will be required and costs will escalate, so be sure that you really do need increased performance requirements. Both external environments and localized heat sources will affect the actual temperature experienced by each element.



## Why is there only one “Temperature” rating?

**BE WARNED!** If a connector manufacturer claims a non-specific “Temperature” up to 260°C (without any special materials used), it’s likely they are quoting a combined range of Processing and Operating temperatures.

Make sure you check their detailed technical specifications, or ask them questions for clarification. You may find out that the upper operating temperature is much lower.

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## So what is Temperature Range?

In summary, the short answer is “Check if you’re not sure”. Check what you actually need for operational temperature resistance. Check with the manufacturer which temperatures they are quoting if the language is not clear. And if you are operating at the edge of the specification, you may even need to check performance with environmental testing.

**Need some more assistance? [Our Experts](#) are ready and waiting to answer your questions on temperatures or any other specifications on Harwin products**