



# ASUS NUC Essential, NUC Pro and NUC Compute Element Sustained Operation

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## Revision History

| <b>Revision</b> | <b>Description</b>  | <b>Date</b>     |
|-----------------|---|-----------------|
| 1.0             | First Release   | 17 May 2018     |
| 1.1             | Added NUC Compute Element   | 11 Mar 2020     |
| 1.2             | Update dates and logo   | 7 Jul 2021      |
| 1.3             | Update dates, hyperlinks and added information about MTBF                               | 19 October 2021 |
| 1.4             | Updated logo, dates, hyperlinks and formatting. Removed Compute Card and Compute Stick. | 30 January 2025 |
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# 1 Introduction

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This document will cover ASUS NUC Essential Family, NUC Pro Family and NUC Element Family sustained operation usage. 24x7 support will be defined along with what is and is not included in the definition.

For more information about the ASUS NUC Essential or ASUS NUC Pro, visit the [ASUS NUC website](#).

For more information about the ASUS NUC Compute Element visit the [ASUS NUC Compute Element website](#).

## 1.1 Sustained Operation Definition

Sustained operation or 24x7 usage for these products is defined below.

***“24x7 operation for 5 years with 50% system utilization on average with an expected service rate of 1% per year during this period”***

Table 1 and Table 2 provide details for this definition.

**Table 1. What is Included**

| Item                                  | Details   |
|---------------------------------------|---|
| ASUS NUC Essential L10 Kits           | All the hardware components that are included in the L10 NUC Essential Mini-PC  |
| ASUS NUC Essential L6 Kits            | All the hardware components that are included in the L6 NUC Essential Kit   |
| ASUS NUC Pro L10 Kits                 | All the hardware components that are included in the L10 NUC Pro Mini-PC  |
| ASUS NUC Pro L6 Kits                  | All the hardware components that are included in the L6 NUC Pro Kit   |
| ASUS NUC Compute Element              | All versions of the NUC Compute Element   |
| ASUS NUC Board Element                | All versions of the NUC Board Element   |
| ASUS NUC Chassis and Assembly Element | All versions of the NUC Rugged Chassis Element, NUC Chassis Element and NUC Assembly Element  |
| Hardware                              | Only hardware that came with the L10 NUC Essential Mini-PC, L6 NUC Essential Kit, L10 NUC Pro Mini-PC, L6 NUC Pro Kit, Compute Element, Board Element, Rugged Chassis Element, Chassis Element, and Assembly Element. |
| The stock thermal solution            | Changing or modifying the stock thermal solution invalidates the above 24x7 statement.  |
| The stock fan                         | Changing or modifying the stock fan invalidates the above 24x7 statement.   |
| The stock enclosure                   | Changing or modifying the stock enclosure invalidates the above 24x7 statement.   |

**Table 2. What is not Included**

| Item                                       | Details  |
|--|--|
| Board only products                        | Integration and handling of board only products may induce failures. Enclosure selection may also influence 24x7 operation.  |
| Operating System                           | Operating System issues cannot be covered by the above 24x7 statement.   |
| Any installed software                     | Unknown software installation and use may also influence 24x7 operation.   |
| Environmental conditions                   | Use of the product outside of published specifications will influence 24x7 operation.  |
| Electrostatic Discharge (ESD)              | Integration in a non-protected ESD environment will influence 24x7 operation.  |
| Electric utility power source              | Inconsistent, irregular or improperly grounded power sources will influence 24x7 operation.  |
| 3 <sup>rd</sup> party integration process  | The integration process may influence 24x7 operation.  |
| Any added 3 <sup>rd</sup> party components | The selection of components added to the system may influence 24x7 operation. See the tested components list on the <a href="#">ASUS Support Site</a> for suggestions. |

## 2 Testing

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Product testing is a part of the development process. Below is a list of the testing done during validation for all the products listed in this document.

### 2.1 Temperature and Humidity

**Table 3. Temperature and Humidity**

| Test                              | Purpose   |
|-----------------------------------|---|
| Temperature Cycling               | Assess ability of board, components and solder joints to withstand thermo-mechanical fatigue  |
| Thermal Baseline                  | Assess ability of heat sink and thermal interface material (thermal solution) to maintain acceptable component operating temperatures before application of any stress conditions |
| Bake                              | Assess impact of long-term temperature exposure on the thermal solution performance   |
| Thermal Temperature Humidity      | Assess impact of long-term temperature and humidity exposure on the thermal solution performance  |
| Temperature Humidity              | Ensure that system function/cosmetics are not impacted following exposure to high temperature/humidity  |
| Operating Temperature Humidity    | Assess ability of system to function at temperature and humidity extremes   |
| Temperature and Voltage Margining | Assess ability of system to boot at extremes of temperature and voltage on board power rails  |
| Boot Cycle                        | Assess ability of system to boot repeatedly with AC power cycles and Ctrl-Alt-Del cycles under temperature extremes   |

## 2.2 Shock and Vibration

**Table 4. Shock and Vibration**

| Test                          | Purpose   |
|-------------------------------|---|
| Drop                          | Assess ability of system to retain functionality after multiple drops onto concrete surface                 |
| Mechanical Vibration          | Check ability of system to withstand mechanical vibration stress caused during shipping and use             |
| Packaged Mechanical Shock     | Confirm that product shipping package adequately protects product against mechanical shock                  |
| Packaged Mechanical Vibration | Confirm that product shipping package adequately protects product against mechanical vibration              |
| Thermal Shock                 | Assess impact of mechanical shock stress caused during shipping and use on thermal solution performance     |
| Thermal Vibration             | Assess impact of mechanical vibration stress caused during shipping and use on thermal solution performance |

## 2.3 Mean Time Between Failure (MTBF)

Each ASUS NUC Essential, NUC Pro and NUC Element family undergoes demonstrated MTBF testing, where 40 units are functionally tested continuously for 90 days (~86,000 accumulated hours), conforming to 50,000 hours of MTBF.