| | | | | |
|---|---|---|---|---|
| **Test report no.:**<br>*Prüfbericht-Nr.:* | **CN25HB0M 001** | **Order No.:**<br>*Auftragsnr.:* | **326110045** | **Page 1 of 16**<br>*Seite 1 von* 16 |
| **Client reference no.:**<br>*Kunden-Referenz-Nr.:* | 2003090 | **Order date:**<br>*Auftragsdatum:* | 2025-05-20 | |
| **Client:**<br>*Auftraggeber:* | Samsung Electronics Co., Ltd.<br>129, Samsung-ro, Yeoungtong-gu, Suwon-si, Gyeonggi-do 16677,<br>Republic of KOREA | | | |
| **Test item:**<br>*Prüfgegenstand:* | DQHD Monitor | | | |
| **Identification / Type no.:**<br>*Bezeichnung / Typ-Nr.:* | Viewfinity S95UF 49 inch | | | |
| **Order content:**<br>*Auftrags-Inhalt*: | Verification of Product Carbon Footprint<br>TÜV Rheinland Q Mark approval | | | |
| **Test specification**<br>*Prüfgrundlage:* | 2PfG Q 2895/06.24<br>ISO 14067:2018<br>(ISO 14064-3:2019 as reference verification standrad) | | | |

| | |
|---|---|
| **Date of sample receipt:**<br>*Wareneingangsdatum:* | N/A |
| **Test sample no:**<br>*Prüfmuster-Nr.:* | N/A |
| **Testing period:**<br>*Prüfzeitraum:* | 2025-05-20–2025-06-03 |
| **Place of testing:**<br>*Ort der Prüfung:* | Remote Audits |
| **Testing laboratory:**<br>*Prüflaboratorium:* | TUV Rheinland (Shanghai) Co.,Ltd. |
| **Test result*:**<br>*Prüfergebnis*:* | see other / siehe Sonstiges |


S95UF 49 inch

**Audited by:** Ryan Duan
*Auditiert von:*

**Date:** 2025.06.04
*Datum:*

**Position** / *Stellung*: Expert/Sachverständige(r)

**Reviewed by:** Chloe Chen
*Bewertet von:*

**Issue date:**
*Ausstellungsdatum:*

**Position** / *Stellung*: Expert/Sachverständige(r)

**Other:** Unmodified opinion
*Sonstiges:*

-Main report including this cover page (16 pages)
-Product check and PCF vertification records by TÜV Rheinland Korea Ltd.

**Condition of the test item at delivery:** Test item complete and undamaged
*Zustand des Prüfgegenstandes bei Anlieferung:* Prüfmuster vollständig und unbeschädigt

| | | | | |
|---|---|---|---|---|
| * Legend: | P(ass) = passed a.m. test specification(s) | F(ail) = failed a.m. test specification(s) | N/A = not applicable | N/T = not tested |
| * Legende: | P(ass) = entspricht o.g. Prüfgrundlage(n) | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |

| **Absatz** *Clause* | **Anforderungen - Prüfungen** *Requirements – Test* | **Messergebnisse – Bemerkungen** *Measuring results – Remarks* | ***Ergebnis*** *Result* |
|---|---|---|---|

| | |
|---|---|
| **1** | Alle eingesetn Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetn Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.<br>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.<br><br>*The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.*<br>*Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.* |
| **2** | Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature<br><br>*As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature* |
| **3** | Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.<br>Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.<br><br>*Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.*<br>*Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.* |

| **Absatz** *Clause* | **Anforderungen - Prüfungen** *Requirements – Test* | **Messergebnisse – Bemerkungen** *Measuring results – Remarks* | ***Ergebnis*** *Result* |
|---|---|---|---|

**Summary**

| | |
|---|---|
| **License Holder** | **Samsung Electronics Co., Ltd.**<br>129, Samsung-ro, Yeoungtong-gu, Suwon-si, Gyeonggi-do 16677, Republic of KOREA |
| **Product** | DQHD Monitor<br>Viewfinity S95UF 49 inch |
| **TÜV Rheinland Program/Criteria** | 2PfG Q 2895/06.24 |
| **Standard** | ISO 14067:2018<br>ISO 14064-3:2019 |
| **Scope** | System Boundary: Cradle to Grave<br>Data period: 01.10. 2023 ~ 30.09.2024 for manufacturing<br>2025 for product use stage<br>LCA software: N/A (calculated by Samsung's PCF program)<br>LCIA method: IPCC2021, GWP100<br>Database: Ecoinvent 3.10, Korea National LCI DB<br>Level of assurance: Reasonable<br>Materiality: 5% of the total PCF |
| **Product Carbon Footprint** | Total Product carbon footprint per Functional Unit: See CLS 5. |
| **Functional Unit** | 1 set of DQHD monitor with reference service life 4 years<br>(Off-mode 55%, Sleep-mode 5%, On-mode 40% a day) |

# Contents

# 1 Introduction

## 1.1 Manufacturer information

This report demonstrates the verification of product carbon footprint of DQHD Monitor Viewfinity S95UF 49 inch manufactured by Samsung Electronics CO., Ltd. Refer to Table 2. Product information list. The manufacturer site of product models is listed below Table1:

Table 1. manufacturer site

| No. | Name / Address |
|---|---|
| 1 | **Samsung Mexicana S.A. de C.V.**<br>BLVD. LOS OLIVOS #11110, PARQUE INDUSTRIAL EL FLORIDO, 2DA. SECCION, 22244 TIJUANA, Baja California, Mexico |
| 2 | **Samsung Electronics HCMC CE Complex Co., Ltd.**<br>Lot I-11, D2 Road, Saigon Hi-tech Park, Tang Nhon Phu B Ward, Thu Duc City, Ho Chi Minh City 70000 Vietnam |
| 3 | **Samsung Electronics Egypt S.A.E (SEEG)**<br>Piece No.98, Engineering Sector, Kom Abu Radi Industrial Zone, 62815 Al Wasta, Beni Suef Egypt |

## 1.2 Standards

The assessment on Product Carbon Footprint has been performed in accordance with 2 PfG Q2895/06.24 and the requirements as below:

- ISO 14067:2018 Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification
- ISO 14040:2006/ AMD 1:2020 Environmental management - Life cycle assessment - Principles and framework
- ISO 14044:2006/ AMD 2:2020 Environmental management - Life cycle assessment - Requirements and guidelines
- ISO 14064-3:2019 Greenhouse gases - Part 3: Specification with guidance for the verification and validation of greenhouse gas statements

## 1.3 Product information

Table 2. Production information

| **Absatz** *Clause* | **Anforderungen - Prüfungen** *Requirements – Test* | **Messergebnisse – Bemerkungen** *Measuring results – Remarks* | ***Ergebnis*** *Result* |
|---|---|---|---|

| | | |
|---|---|---|
| 1 | **Produktdetails / Gewicht**<br>*Product details / Weight* | DQHD Monitor Viewfinity S95UF 49 inch<br>-Set size: 1147.6 x 568.4 x 420.5 mm<br>-Weight<br>**Total** **20.154 kg**<br>Product 15.824 kg<br>Minimum Packaging 3.707 kg<br>Shipping Packaging 0.623 kg |
| 2 | **Trademark** | SAMSUNG |
| 3 | **Ausstattung / Zubehör**<br>*Equipment / Accessories* | HDMI cable, USB type-C Cable |
| 4 | **Sonstiges**<br>*Other* | N/A |
| 5 | **Prüfmusterbereitstellung**<br>*Test sample obtaining* | ☒ Sampling by TÜV Rheinland Group<br>☐ Sending by customer ☐ others: |

**Photos**

Viewfinity S95UF 49 inch


# 2 Scope and Objectives

## 2.1 Scope and specifications

**Level of assurance - Reasonable**

At a reasonable- level of assurance, Greenhouse gases (GHG) statement is verified substantially correct.

**Materiality**

5% for the total sum of the Product Carbon Footprint.

**System Boundary**

The production system and life cycle boundary are Cradle to Grave. Descriptions and specifications of system categories are as follows:

a. Raw Material Supply: This life cycle phase captures emissions generated during the extraction, production, and transport of raw materials.
b. Manufacture: This life cycle phase captures emissions generated during the manufacture of subassemblies (including the product packaging) and product assembly.
c. Distribution: Emissions included in the distribution phase include all those generated during the ocean or land distribute of finished products from facilities to warehouses
d. Use: In use energy consumption is calculated based on measurement result. Average emissions factors for the continental group are applied. The product use scenario and the test method follow Samsung internal standard.
e. End-of-life: The EOT scenario is based on 'The National Status of Waste Production and Disposal' of KR. It is important to note that these figures cannot be taken as a global average. However, since it is not possible to reflect all the statistics of each country, and also because the PCF contribution rate is quiet low in the EOL stage, it does not have a significant impact.

Table 3. System boundaries in this report

| Life cycle stages | Selected | Phase |
|---|---|---|
| Raw material supply | ☒ Y/ ☐ N/A | Raw material acquisition |
| | ☒ Y/ ☐ N/A | Raw materials processing |
| | ☐ Y/ ☒ N/A | Raw materials transport |
| Manufacturing | ☒ Y/ ☐ N/A | Manufacturing of product |
| Distribution | ☒ Y/ ☐ N/A | Distribution |
| Product Operation | ☐ Y/ ☒ N/A | Installation |
| | ☒ Y/ ☐ N/A | Use stage |
| | ☐ Y/ ☒ N/A | Maintenance |
| | ☐ Y/ ☒ N/A | De-installation |
| Product End-of-life | ☐ Y/ ☒ N/A | Transport |
| | ☒ Y/ ☐ N/A | EoLT |

**Cut-off Criteria**

All materials input and output to the product system are fully included. The transportation of materials/parts input into the manufacturing process of the product is cut off, but this is supplemented by secondary data using the market activity data set.

Items that have little effect on the total PCF value are the target of cut-off. This includes the process data for the supplier to manufacture components from materials. Since most of the supplier's processes are also assembly processes, this can also be ignored.

Defective products that occur during the manufacturing process are also cut off. The number of defective products is very small, and the supplier collects all defective parts and parts used in defective products. Therefore, PCF due to defective products is completely transferred to the supplier.

**End-of-Life Treatment**

The product disposal scenario applied the EOL T statistics of electrical and electronic waste and general waste in Korea. (2024 statistics) First, it was assumed that all materials were recycled as much as the recycling rate of display-related products among electrical and electronic products. After that, the statistics for the treatment method of general waste by material were reflected for materials that were not recycled.

This method cannot represent the disposal scenario of the region where the product will be sold, but it is realistically impossible to apply the disposal scenario of all regions where the product is sold, and since the PCF contribution rate of the EOL T stage is less than 1%, the impact on the total PCF value will not be significant.

**Allocation**

The allocation of power usage used in the manufacturing stage was performed. The manufacturing process is an assembly process, and the energy usage of the assembly process is proportional to the assembly time. During the data collection period, the ratio corresponding to the assembly time of the target product among the total assembly time in the factory was reflected in the total power and allocated.

## 2.2 Functional unit

The functional unit of products is 1 set of DQHD monitor with reference service life 4 years (Off-mode 55%, Sleep-mode 5%, On-mode 40% a day). Operation power refers to section 4.4

# 3 Measures

**Evidence gathering plan and procedures**

Validation and verification plan was developed, and applicant was notified in advanced to confirm verification meeting schedule, procedures, checklist, information including level of assurance and materiality.

**Data collection and verification**

A remote audit was conducted on behalf of the on-site audit for Samsung E-paper's PCF reports evaluation. This is because data collection was sufficiently proven to be accurate and reliable in the process of Samsung Electronics receiving PCF certificate through TUV Rheinland in 2024. In addition, sufficient evidence was collected, reviewed, and verified through document review and remote audit.

Samsung Electronics submitted a letter of commitment as a concept of self-declaration on the confidence level of the data.

**Documentation review and independent review**

Product life cycle inventory data was reviewed and verified. Evidence materials of activity data, GHG statement, GHG inventory regarding product bill of materials, manufacturing, transport and distribution, usage profile and end-of-life were reviewed. For detailed verification findings, refer to separate project finding list.

# 4 Activity Data through Product Life Cycle

## 4.1 Raw material supply

The raw material inventory of the product assembly is in '3_1 data collection', 3.2 before manufacturing' sheet of the PCF report for each model. The evaluation was performed based on the BOM according to the raw material composition, electronic components and processing input.

Each report is as follows:

PCF_Report_S49F950 v2.1.xlsx

## 4.2 Manufacturing and packaging

Table 4. show the energy and resource usage required to produce one product during the product manufacturing stage. The GHG emissions assessment considered the elementary flow of manufacturing and assembly on site. Activities not related to product manufacturing, such as facility installation, office building energy and resource usage, and internal transportation, were not included.

All defective components are recalled by suppliers, and the number of defective products was excluded from the impact assessment because it was very small.

Table 4. Material and energy flow of manufacturing and packaging onsite

| | **Viewfinity Monitor S95UF 49 inch** | | | | |
|---|---|---|---|---|---|
| Input | BOM material | kg | 1.58E+01 | | |
| | Minimum packaging | kg | 3.71E+00 | | |
| | Shipping packaging | kg | 6.23E-01 | | |
| | Energy use | kWh | VN Factory | EG Factory | MX Factory |
| | | | 1.30 | 1.25 | 1.65 |
| Output | 1set of product | pcs | 1 | | |
| | | kg | 2.02E+01 | | |

## 4.3 Distribution

The distribution of this product concerns land transportation(truck) from the manufacturer's site to the departure port; the shipping from departure port to destination port; the road transport(truck) from destination port to destination location.

This product originates from 3 manufacturing plants and reaches 74 final destinations. The transport distances are calculated using the shortest distance application using Google Maps for land transport and Searates.com for sea route distances. Each transport distance is mentioned in the PCF report mentioned in Section 4.1.

## 4.4 Product operation

Product use stage operation emissions is estimated below table.

The power for each model is tested following The Transitional Methods in Annex IIIa of Regulation (EU) No 2019/2021 (as amended) and EN 50564:2011.

Table 5. Use stage total Energy (Electricity) Consumption for 4 years

| Power(W) by mode | | | Total Energy Consumption (kWh) |
|---|---|---|---|
| On (idle) / 40% | Sleep / 5% | Off / 55% | |
| 45.2 | 0.5 | 0.3 | 6.40E+02 |

## 4.5 End-of-Life treatment

All inputs are subject to disposal. This is because it is assumed that there are no product rejects and no process waste.

The impacts related to EoLT material mass and EoLT methods such as recycling, incineration, and landfill are evaluated. EoLT is currently deployed outside the product system, and a disposal scenario using mandatory recycling rates and statistical data in Korea was applied. (KEITI notification No. 2024-072[1])

First, it was assumed that the materials contained in the product/packaging material were recycled at the mandatory recycling rate for (1)electrical and electronic products and (2)plastic packaging materials. The figures are (1)38.5% and (2)85.9%, respectively.

Second, it was assumed that the remaining materials and packaging materials that were not recycled were recycled/incinerated/landfilled at the rate of general waste treatment statistics. The figures are 17.2%, 62.0%, and 20.8% based on LDPE.

There is a clear limit to applying the same rate to all 74 countries where products are sold. However, it is acceptable in terms of materiality when considering the PCF contribution rate.

1 https://ecosq.or.kr/websquare.do#w2xPath=/ui/eve/ev/oz/EVOZ130M02.xml&tmpltNo=BBS0024&bbsSn=13653&menuSn=80010101&lgcyTabId=tabs20&lgcyPageIdx=0&lgcyTwdcvlnBbsLclsfCd=&lgcySrchCondt=00&lgcySrchCondtCn=%25ED%2586%25B5%25EA%25B3%2584

# 5 Result of Product Carbon Footprint

PCF values by 74 sales regions are shown Table 8.

Table 8. PCF result

| Country | | Emissions per f.u (kg $CO_2$e/f.u) | | | | | |
|---|---|---|---|---|---|---|---|
| Production | Use | Before_manufac | Manufacturing | Distribution | Use | Disposal | Total |
| Vietnam | Greece | 3.806E+02 | 8.521E-01 | 1.419E+01 | 2.107E+02 | 7.128E+00 | 6.14E+02 |
| Vietnam | Netherlands | 3.806E+02 | 8.521E-01 | 3.305E+00 | 2.107E+02 | 7.128E+00 | 6.03E+02 |
| Vietnam | Norway | 3.806E+02 | 8.521E-01 | 8.021E+00 | 2.107E+02 | 7.128E+00 | 6.07E+02 |
| Vietnam | Germany | 3.806E+02 | 8.521E-01 | 5.655E+00 | 2.107E+02 | 7.128E+00 | 6.05E+02 |
| Vietnam | Latvia | 3.806E+02 | 8.521E-01 | 1.034E+01 | 2.107E+02 | 7.128E+00 | 6.10E+02 |
| Vietnam | Romania | 3.806E+02 | 8.521E-01 | 1.172E+01 | 2.107E+02 | 7.128E+00 | 6.11E+02 |
| Vietnam | Lithuania | 3.806E+02 | 8.521E-01 | 9.723E+00 | 2.107E+02 | 7.128E+00 | 6.09E+02 |
| Vietnam | Belgium | 3.806E+02 | 8.521E-01 | 3.926E+00 | 2.107E+02 | 7.128E+00 | 6.03E+02 |
| Vietnam | Sweden | 3.806E+02 | 8.521E-01 | 8.660E+00 | 2.107E+02 | 7.128E+00 | 6.08E+02 |
| Vietnam | Switzerland | 3.806E+02 | 8.521E-01 | 6.322E+00 | 2.107E+02 | 7.128E+00 | 6.06E+02 |
| Vietnam | Spain | 3.806E+02 | 8.521E-01 | 1.003E+01 | 2.107E+02 | 7.128E+00 | 6.09E+02 |
| Vietnam | Slovakia | 3.806E+02 | 8.521E-01 | 7.780E+00 | 2.107E+02 | 7.128E+00 | 6.07E+02 |
| Vietnam | Poland | 3.806E+02 | 8.521E-01 | 7.737E+00 | 2.107E+02 | 7.128E+00 | 6.07E+02 |
| Vietnam | UK | 3.806E+02 | 8.521E-01 | 4.736E+00 | 2.107E+02 | 7.128E+00 | 6.04E+02 |
| Vietnam | Portugal | 3.806E+02 | 8.521E-01 | 1.181E+01 | 2.107E+02 | 7.128E+00 | 6.11E+02 |
| Vietnam | Italy | 3.806E+02 | 8.521E-01 | 9.486E+00 | 2.107E+02 | 7.128E+00 | 6.09E+02 |
| Vietnam | Turkiye | 3.806E+02 | 8.521E-01 | 1.545E+01 | 2.107E+02 | 7.128E+00 | 6.15E+02 |
| Vietnam | Hungary | 3.806E+02 | 8.521E-01 | 8.517E+00 | 2.107E+02 | 7.128E+00 | 6.08E+02 |
| Vietnam | France | 3.806E+02 | 8.521E-01 | 5.085E+00 | 2.107E+02 | 7.128E+00 | 6.04E+02 |
| Vietnam | Austria | 3.806E+02 | 8.521E-01 | 7.551E+00 | 2.107E+02 | 7.128E+00 | 6.07E+02 |
| Vietnam | Croatia | 3.806E+02 | 8.521E-01 | 8.245E+00 | 2.107E+02 | 7.128E+00 | 6.08E+02 |
| Vietnam | Czech Republic | 3.806E+02 | 8.521E-01 | 6.516E+00 | 2.107E+02 | 7.128E+00 | 6.06E+02 |
| Vietnam | Denmark | 3.806E+02 | 8.521E-01 | 6.175E+00 | 2.107E+02 | 7.128E+00 | 6.06E+02 |
| Vietnam | Estonia | 3.806E+02 | 8.521E-01 | 1.153E+01 | 2.107E+02 | 7.128E+00 | 6.11E+02 |
| Vietnam | Finland | 3.806E+02 | 8.521E-01 | 1.068E+01 | 2.107E+02 | 7.128E+00 | 6.10E+02 |
| Vietnam | Slovenia | 3.806E+02 | 8.521E-01 | 7.889E+00 | 2.107E+02 | 7.128E+00 | 6.07E+02 |
| Vietnam | Russia | 3.806E+02 | 8.521E-01 | 1.256E+01 | 4.744E+02 | 7.128E+00 | 8.76E+02 |
| Vietnam | Moldova | 3.806E+02 | 8.521E-01 | 1.139E+01 | 4.744E+02 | 7.128E+00 | 8.74E+02 |
| Vietnam | Kazakhstan | 3.806E+02 | 8.521E-01 | 2.360E+01 | 4.744E+02 | 7.128E+00 | 8.87E+02 |
| Vietnam | Belarus | 3.806E+02 | 8.521E-01 | 9.812E+00 | 4.744E+02 | 7.128E+00 | 8.73E+02 |
| Vietnam | Ukraine | 3.806E+02 | 8.521E-01 | 1.088E+01 | 4.744E+02 | 7.128E+00 | 8.74E+02 |
| Vietnam | Uzbekistan | 3.806E+02 | 8.521E-01 | 2.559E+01 | 4.744E+02 | 7.128E+00 | 8.89E+02 |
| Mexico | USA | 3.806E+02 | 9.907E-01 | 1.559E+01 | 2.865E+02 | 7.128E+00 | 6.91E+02 |
| Mexico | Canada | 3.806E+02 | 9.907E-01 | 1.596E+01 | 2.865E+02 | 7.128E+00 | 6.91E+02 |
| Mexico | Mexico | 3.806E+02 | 9.907E-01 | 1.071E+01 | 2.865E+02 | 7.128E+00 | 6.86E+02 |
| Mexico | Panama | 3.806E+02 | 9.907E-01 | 1.199E+00 | 2.865E+02 | 7.128E+00 | 6.76E+02 |
| Mexico | Argentina | 3.806E+02 | 9.907E-01 | 2.714E+00 | 3.155E+02 | 7.128E+00 | 7.07E+02 |
| Mexico | Chile | 3.806E+02 | 9.907E-01 | 1.913E+00 | 3.155E+02 | 7.128E+00 | 7.06E+02 |
| Mexico | Brazil | 3.806E+02 | 9.907E-01 | 2.323E+00 | 3.155E+02 | 7.128E+00 | 7.07E+02 |
| Mexico | Colombia | 3.806E+02 | 9.907E-01 | 1.340E+00 | 3.155E+02 | 7.128E+00 | 7.06E+02 |
| Mexico | Uruguay | 3.806E+02 | 9.907E-01 | 2.696E+00 | 3.155E+02 | 7.128E+00 | 7.07E+02 |
| Vietnam | Vietnam | 3.806E+02 | 8.521E-01 | 5.739E+00 | 6.051E+02 | 7.128E+00 | 9.99E+02 |
| Vietnam | Australia | 3.806E+02 | 8.521E-01 | 1.721E+00 | 4.744E+02 | 7.128E+00 | 8.65E+02 |
| Vietnam | New zealand | 3.806E+02 | 8.521E-01 | 1.984E+00 | 4.744E+02 | 7.128E+00 | 8.65E+02 |
| Vietnam | Malaysia | 3.806E+02 | 8.521E-01 | 6.021E-01 | 6.051E+02 | 7.128E+00 | 9.94E+02 |
| Vietnam | Singapore | 3.806E+02 | 8.521E-01 | 5.341E-01 | 6.051E+02 | 7.128E+00 | 9.94E+02 |
| Vietnam | India | 3.806E+02 | 8.521E-01 | 1.066E+00 | 6.051E+02 | 7.128E+00 | 9.95E+02 |
| Vietnam | South Korea | 3.806E+02 | 8.521E-01 | 9.897E-01 | 6.051E+02 | 7.128E+00 | 9.95E+02 |
| Vietnam | Hong Kong | 3.806E+02 | 8.521E-01 | 6.269E-01 | 6.051E+02 | 7.128E+00 | 9.94E+02 |
| Vietnam | Thailand | 3.806E+02 | 8.521E-01 | 5.134E-01 | 6.051E+02 | 7.128E+00 | 9.94E+02 |
| Vietnam | Bangladesh | 3.806E+02 | 8.521E-01 | 1.036E+00 | 6.051E+02 | 7.128E+00 | 9.95E+02 |
| Vietnam | Indonesia | 3.806E+02 | 8.521E-01 | 6.707E-01 | 6.051E+02 | 7.128E+00 | 9.94E+02 |
| Vietnam | Myanmar | 3.806E+02 | 8.521E-01 | 8.995E-01 | 6.051E+02 | 7.128E+00 | 9.95E+02 |
| Vietnam | Philippines | 3.806E+02 | 8.521E-01 | 6.283E-01 | 6.051E+02 | 7.128E+00 | 9.94E+02 |
| Vietnam | Sri Lanka | 3.806E+02 | 8.521E-01 | 1.055E+00 | 6.051E+02 | 7.128E+00 | 9.95E+02 |
| Vietnam | Taiwan | 3.806E+02 | 8.521E-01 | 7.414E-01 | 6.051E+02 | 7.128E+00 | 9.94E+02 |
| Vietnam | China | 3.806E+02 | 8.521E-01 | 8.693E-01 | 6.051E+02 | 7.128E+00 | 9.95E+02 |
| Egypt | Egypt | 3.806E+02 | 7.815E-01 | 3.800E-01 | 5.934E+02 | 7.128E+00 | 9.82E+02 |
| Egypt | Pakistan | 3.806E+02 | 7.815E-01 | 1.947E+00 | 5.934E+02 | 7.128E+00 | 9.84E+02 |
| Egypt | Algeria | 3.806E+02 | 7.815E-01 | 1.490E+00 | 5.321E+02 | 7.128E+00 | 9.22E+02 |
| Egypt | Cameroon | 3.806E+02 | 7.815E-01 | 2.771E+00 | 5.321E+02 | 7.128E+00 | 9.23E+02 |
| Egypt | Ghana | 3.806E+02 | 7.815E-01 | 2.575E+00 | 5.321E+02 | 7.128E+00 | 9.23E+02 |
| Egypt | Iran | 3.806E+02 | 7.815E-01 | 1.933E+00 | 5.934E+02 | 7.128E+00 | 9.84E+02 |
| Egypt | Iraq | 3.806E+02 | 7.815E-01 | 2.091E+00 | 5.934E+02 | 7.128E+00 | 9.84E+02 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Egypt | Israel | 3.806E+02 | 7.815E-01 | 1.045E+00 | 5.934E+02 | 7.128E+00 | 9.83E+02 |
| Egypt | Jordan | 3.806E+02 | 7.815E-01 | 1.035E+00 | 5.321E+02 | 7.128E+00 | 9.22E+02 |
| Egypt | Kenya | 3.806E+02 | 7.815E-01 | 1.917E+00 | 5.321E+02 | 7.128E+00 | 9.23E+02 |
| Egypt | Morocco | 3.806E+02 | 7.815E-01 | 1.690E+00 | 5.321E+02 | 7.128E+00 | 9.22E+02 |
| Egypt | Nigeria | 3.806E+02 | 7.815E-01 | 2.649E+00 | 5.321E+02 | 7.128E+00 | 9.23E+02 |
| Egypt | Saudi Arabia | 3.806E+02 | 7.815E-01 | 1.158E+00 | 5.934E+02 | 7.128E+00 | 9.83E+02 |
| Egypt | South Africa | 3.806E+02 | 7.815E-01 | 2.445E+00 | 5.321E+02 | 7.128E+00 | 9.23E+02 |
| Egypt | Sudan | 3.806E+02 | 7.815E-01 | 1.179E+00 | 5.934E+02 | 7.128E+00 | 9.83E+02 |
| Egypt | Tanzania | 3.806E+02 | 7.815E-01 | 1.963E+00 | 5.321E+02 | 7.128E+00 | 9.23E+02 |
| Egypt | UAE | 3.806E+02 | 7.815E-01 | 1.955E+00 | 5.934E+02 | 7.128E+00 | 9.84E+02 |

Table 9. PCF contribution rate by sales regions

| Country | | Emissions per f.u (kg $CO_2$e/f.u) | | | | | |
|---|---|---|---|---|---|---|---|
| Production | Use | Before manufac | Manufacturing | Distribution | Use | Disposal | Total |
| Vietnam | Greece | 62.038% | 0.139% | 2.312% | 34.350% | 1.162% | 100% |
| Vietnam | Netherlands | 63.158% | 0.141% | 0.548% | 34.970% | 1.183% | 100% |
| Vietnam | Norway | 62.667% | 0.140% | 1.321% | 34.698% | 1.174% | 100% |
| Vietnam | Germany | 62.912% | 0.141% | 0.935% | 34.834% | 1.178% | 100% |
| Vietnam | Latvia | 62.429% | 0.140% | 1.695% | 34.567% | 1.169% | 100% |
| Vietnam | Romania | 62.288% | 0.139% | 1.919% | 34.488% | 1.166% | 100% |
| Vietnam | Lithuania | 62.492% | 0.140% | 1.596% | 34.601% | 1.170% | 100% |
| Vietnam | Belgium | 63.093% | 0.141% | 0.651% | 34.934% | 1.182% | 100% |
| Vietnam | Sweden | 62.601% | 0.140% | 1.424% | 34.662% | 1.172% | 100% |
| Vietnam | Switzerland | 62.843% | 0.141% | 1.044% | 34.796% | 1.177% | 100% |
| Vietnam | Spain | 62.461% | 0.140% | 1.646% | 34.584% | 1.170% | 100% |
| Vietnam | Slovakia | 62.692% | 0.140% | 1.281% | 34.712% | 1.174% | 100% |
| Vietnam | Poland | 62.697% | 0.140% | 1.275% | 34.714% | 1.174% | 100% |
| Vietnam | UK | 63.008% | 0.141% | 0.784% | 34.887% | 1.180% | 100% |
| Vietnam | Portugal | 62.278% | 0.139% | 1.933% | 34.483% | 1.166% | 100% |
| Vietnam | Italy | 62.516% | 0.140% | 1.558% | 34.615% | 1.171% | 100% |
| Vietnam | Turkiye | 61.910% | 0.139% | 2.512% | 34.279% | 1.159% | 100% |
| Vietnam | Hungary | 62.616% | 0.140% | 1.401% | 34.670% | 1.173% | 100% |
| Vietnam | France | 62.972% | 0.141% | 0.841% | 34.867% | 1.179% | 100% |
| Vietnam | Austria | 62.716% | 0.140% | 1.244% | 34.725% | 1.174% | 100% |
| Vietnam | Croatia | 62.644% | 0.140% | 1.357% | 34.685% | 1.173% | 100% |
| Vietnam | Czech Republic | 62.823% | 0.141% | 1.075% | 34.784% | 1.176% | 100% |
| Vietnam | Denmark | 62.858% | 0.141% | 1.020% | 34.804% | 1.177% | 100% |
| Vietnam | Estonia | 62.308% | 0.139% | 1.887% | 34.499% | 1.167% | 100% |
| Vietnam | Finland | 62.394% | 0.140% | 1.750% | 34.547% | 1.168% | 100% |
| Vietnam | Slovenia | 62.681% | 0.140% | 1.299% | 34.706% | 1.174% | 100% |
| Vietnam | Russia | 43.473% | 0.097% | 1.434% | 54.181% | 0.814% | 100% |
| Vietnam | Moldova | 43.531% | 0.097% | 1.303% | 54.253% | 0.815% | 100% |
| Vietnam | Kazakhstan | 42.932% | 0.096% | 2.662% | 53.506% | 0.804% | 100% |
| Vietnam | Belarus | 43.610% | 0.098% | 1.124% | 54.351% | 0.817% | 100% |
| Vietnam | Ukraine | 43.557% | 0.098% | 1.245% | 54.285% | 0.816% | 100% |
| Vietnam | Uzbekistan | 42.835% | 0.096% | 2.880% | 53.386% | 0.802% | 100% |
| Mexico | USA | 55.098% | 0.143% | 2.256% | 41.470% | 1.032% | 100% |
| Mexico | Canada | 55.069% | 0.143% | 2.309% | 41.448% | 1.031% | 100% |
| Mexico | Mexico | 55.490% | 0.144% | 1.561% | 41.765% | 1.039% | 100% |
| Mexico | Panama | 56.270% | 0.146% | 0.177% | 42.352% | 1.054% | 100% |
| Mexico | Argentina | 53.836% | 0.140% | 0.384% | 44.632% | 1.008% | 100% |
| Mexico | Chile | 53.897% | 0.140% | 0.271% | 44.682% | 1.009% | 100% |
| Mexico | Brazil | 53.866% | 0.140% | 0.329% | 44.656% | 1.009% | 100% |
| Mexico | Colombia | 53.941% | 0.140% | 0.190% | 44.718% | 1.010% | 100% |
| Mexico | Uruguay | 53.838% | 0.140% | 0.381% | 44.633% | 1.008% | 100% |
| Vietnam | Vietnam | 38.084% | 0.085% | 0.574% | 60.544% | 0.713% | 100% |
| Vietnam | Australia | 44.018% | 0.099% | 0.199% | 54.860% | 0.824% | 100% |
| Vietnam | New zealand | 44.005% | 0.099% | 0.229% | 54.843% | 0.824% | 100% |
| Vietnam | Malaysia | 38.280% | 0.086% | 0.061% | 60.857% | 0.717% | 100% |
| Vietnam | Singapore | 38.283% | 0.086% | 0.054% | 60.861% | 0.717% | 100% |
| Vietnam | India | 38.263% | 0.086% | 0.107% | 60.828% | 0.717% | 100% |
| Vietnam | South Korea | 38.265% | 0.086% | 0.099% | 60.833% | 0.717% | 100% |
| Vietnam | Hong Kong | 38.279% | 0.086% | 0.063% | 60.855% | 0.717% | 100% |
| Vietnam | Thailand | 38.284% | 0.086% | 0.052% | 60.862% | 0.717% | 100% |
| Vietnam | Bangladesh | 38.264% | 0.086% | 0.104% | 60.830% | 0.717% | 100% |
| Vietnam | Indonesia | 38.278% | 0.086% | 0.067% | 60.852% | 0.717% | 100% |
| Vietnam | Myanmar | 38.269% | 0.086% | 0.090% | 60.838% | 0.717% | 100% |
| Vietnam | Philippines | 38.279% | 0.086% | 0.063% | 60.855% | 0.717% | 100% |
| Vietnam | Sri Lanka | 38.263% | 0.086% | 0.106% | 60.829% | 0.717% | 100% |
| Vietnam | Taiwan | 38.275% | 0.086% | 0.075% | 60.848% | 0.717% | 100% |
| Vietnam | China | 38.270% | 0.086% | 0.087% | 60.840% | 0.717% | 100% |
| Egypt | Egypt | 38.748% | 0.080% | 0.039% | 60.408% | 0.726% | 100% |
| Egypt | Pakistan | 38.687% | 0.079% | 0.198% | 60.312% | 0.724% | 100% |
| Egypt | Algeria | 41.279% | 0.085% | 0.162% | 57.702% | 0.773% | 100% |
| Egypt | Cameroon | 41.222% | 0.085% | 0.300% | 57.622% | 0.772% | 100% |
| Egypt | Ghana | 41.230% | 0.085% | 0.279% | 57.634% | 0.772% | 100% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Egypt | Iran | 38.687% | 0.079% | 0.196% | 60.312% | 0.724% | 100% |
| Egypt | Iraq | 38.681% | 0.079% | 0.212% | 60.303% | 0.724% | 100% |
| Egypt | Israel | 38.722% | 0.080% | 0.106% | 60.367% | 0.725% | 100% |
| Egypt | Jordan | 41.299% | 0.085% | 0.112% | 57.730% | 0.773% | 100% |
| Egypt | Kenya | 41.260% | 0.085% | 0.208% | 57.675% | 0.773% | 100% |
| Egypt | Morocco | 41.270% | 0.085% | 0.183% | 57.689% | 0.773% | 100% |
| Egypt | Nigeria | 41.227% | 0.085% | 0.287% | 57.629% | 0.772% | 100% |
| Egypt | Saudi Arabia | 38.718% | 0.079% | 0.118% | 60.360% | 0.725% | 100% |
| Egypt | South Africa | 41.236% | 0.085% | 0.265% | 57.642% | 0.772% | 100% |
| Egypt | Sudan | 38.717% | 0.079% | 0.120% | 60.359% | 0.725% | 100% |
| Egypt | Tanzania | 41.258% | 0.085% | 0.213% | 57.672% | 0.773% | 100% |
| Egypt | UAE | 38.686% | 0.079% | 0.199% | 60.311% | 0.724% | 100% |

Table 10. PCF contribution rate by each component. (Production: VN / Use: VN)

| | Life cycle stage | source | Process/material | kgCO2e/Fu | Contribution rate |
|---|---|---|---|---|---|
| 1 | Use | Use | Energy consumption for use (reg.: VN) | 605.099 | 60.544% |
| 2 | Before manufacturing | Product & Acc. | ASSY PCB MAIN | 93.990 | 9.404% |
| 3 | Before manufacturing | Product & Acc. | DC VSS-POWER BOARD | 92.360 | 9.241% |
| 4 | Before manufacturing | Product & Acc. | ASSY OPEN CELL | 76.760 | 7.680% |
| 5 | Before manufacturing | Product & Acc. | ASSY BACK LIGHT UNIT | 63.810 | 6.385% |
| 6 | Before manufacturing | Product & Acc. | ASSY T CON P | 11.090 | 1.110% |
| 7 | Before manufacturing | Product & Acc. | ASSY COVER P-REAR | 9.638 | 0.964% |
| 8 | Before manufacturing | Product & Acc. | ASSY STAND P-COVER TOP | 7.022 | 0.703% |
| 9 | Before manufacturing | Product & Acc. | ASSY CHASSIS FRONT P | 6.528 | 0.653% |
| 10 | Disposal | Disposal | product_others | 6.000 | 0.600% |
| 11 | Distribution | Distribution | VN factory to VN warehouse | 5.739 | 0.574% |
| 12 | Before manufacturing | Minimum Packaging | CUSHION-SET | 4.374 | 0.438% |
| 13 | Before manufacturing | Product & Acc. | ASSY ACCESSORY MANUAL CABLE | 3.142 | 0.314% |
| 14 | Before manufacturing | Minimum Packaging | BOX UNIT | 2.596 | 0.260% |
| 15 | Before manufacturing | Product & Acc. | ASSY STAND P-COVER NECK | 1.903 | 0.190% |
| 16 | Before manufacturing | Product & Acc. | ASSY STAND P-BRACKET LINK | 1.796 | 0.180% |
| 17 | Before manufacturing | Product & Acc. | COVER-REAR BOTTOM | 1.105 | 0.111% |
| 18 | Before manufacturing | Shipping Packaging | WRAP VINYL | 0.995 | 0.100% |
| 19 | Before manufacturing | Product & Acc. | ASSY SPEAKER P-FRONT | 0.973 | 0.097% |
| 20 | Before manufacturing | Product & Acc. | ASSY COVER P-DECORATION | 0.893 | 0.089% |
| 21 | Manufacturing | Ass'y process | Manufacturing (Electricity _ VN factory) | 0.852 | 0.085% |
| 22 | Disposal | Disposal | minimum packaging_others | 0.645 | 0.065% |
| 23 | Before manufacturing | Product & Acc. | ASSY COVER P-REAR TOP | 0.541 | 0.054% |
| 24 | Disposal | Disposal | minimum packaging_recycled | 0.265 | 0.027% |
| 25 | Before manufacturing | Shipping Packaging | PACKING ANGLE | 0.230 | 0.023% |
| 26 | Before manufacturing | Product & Acc. | COVER-TERMINAL SIDE | 0.189 | 0.019% |
| 27 | Disposal | Disposal | shipping packaging_others | 0.118 | 0.012% |
| 28 | Before manufacturing | Product & Acc. | LEAD CONNECTOR-POWER | 0.112 | 0.011% |
| 29 | Before manufacturing | Shipping Packaging | PAD-SHEET | 0.111 | 0.011% |
| 30 | Before manufacturing | Shipping Packaging | BAG ROLL | 0.102 | 0.010% |
| 31 | Disposal | Disposal | product_recycled | 0.071 | 0.007% |
| 32 | Before manufacturing | Shipping Packaging | BAG AIR | 0.048 | 0.005% |
| 33 | Before manufacturing | Shipping Packaging | BAG AIR | 0.048 | 0.005% |
| 34 | Before manufacturing | Product & Acc. | LEAD CONNECTOR-SUB ASSY | 0.042 | 0.004% |
| 35 | Before manufacturing | Product & Acc. | FFC | 0.035 | 0.003% |
| 36 | Before manufacturing | Product & Acc. | GASKET-EMI | 0.030 | 0.003% |
| 37 | Before manufacturing | Minimum Packaging | PAD-EPE | 0.029 | 0.003% |
| 38 | Disposal | Disposal | shipping packaging_recycled | 0.028 | 0.003% |
| 39 | Before manufacturing | Product & Acc. | COVER-DECORATION POWER | 0.027 | 0.003% |
| 40 | Before manufacturing | Product & Acc. | FFC | 0.020 | 0.002% |
| 41 | Before manufacturing | Shipping Packaging | PACKING ROLL | 0.019 | 0.002% |
| 42 | Before manufacturing | Product & Acc. | ASSY BOARD P-FUNCTION | 0.018 | 0.002% |
| 43 | Before manufacturing | Minimum Packaging | TAPE-SINGLE FACE | 0.009 | 0.0009% |
| 44 | Before manufacturing | Product & Acc. | LABEL-E PASS | 0.009 | 0.0009% |
| 45 | Before manufacturing | Product & Acc. | LABEL-RATING | 0.007 | 0.0007% |
| 46 | Before manufacturing | Product & Acc. | LEAFLET-INSTALL GUIDE | 0.007 | 0.0007% |
| 47 | Before manufacturing | Product & Acc. | LABEL-ENERGY | 0.006 | 0.0006% |
| 48 | Before manufacturing | Minimum Packaging | LABEL BOX | 0.004 | 0.0004% |
| 49 | Before manufacturing | Product & Acc. | SCREW-TAPTYPE | 0.003 | 0.0003% |
| 50 | Before manufacturing | Product & Acc. | LABEL-ENERGY | 0.001 | 0.0001% |

# 6 Conclusions

Samsung Electronics Co., Ltd. has voluntarily entrusted TÜV Rheinland to carry out an independent (the 3rd party) verification of DQHD Monitor Viewfinity S95UF 49 inch's Product Carbon Footprint (PCF).

Samsung Electronics Co., Ltd. is responsible for the preparation and fair presentation of the PCF reports in accordance with the ISO 14067 standard. And TÜV Rheinland is responsible for expressing an opinion on the PCF report based on ISO 14064-3 standard.

The review of the data was carried out based on the verification principles of relevance, completeness, accuracy, transparency of information, and consistency. Although not absolute, the verification was conducted within a reasonable level of assurance. The materiality threshold was set at 5% of the total carbon footprint value (based on environmental impact), as agreed upon with the client. Any identified gaps, omissions, or inaccuracies were rectified to ensure the final conclusions were sound. After verifying the Product carbon footprint of Viewfinity S95UF 49 inch from Samsung Electronics Co., Ltd. as of Jun. 2025, we determined that in all material respects, the greenhouse gas emissions and removals are fairly and factually represented. This verification report has been issued in accordance with the agreement with our client and within the framework of TÜV Rheinland's regulations.

# Appendix 1. Information of Secondary data

| DB Version | LCI Database Name | Emission factor |
|---|---|---|
| Ecoinvent v3.10 | Market for Acrylonitrile-Butadiene-Styrene Copolymer - RER | 4.65E+00 |
| Ecoinvent v3.10 | Market For Acrylonitrile - Glo | 4.67E+00 |
| Ecoinvent v3.10 | Market for Aluminum, Wrought Alloy - GLO | 1.39E+01 |
| Ecoinvent v3.10 | Market for Polyethylene, Low Density, Granulate - GLO | 3.26E+00 |
| Ecoinvent v3.10 | Market for Polyethylene, High Density, Granulate - GLO | 3.10E+00 |
| Ecoinvent v3.10 | Market for Polypropylene, Granulate - GLO | 3.52E+00 |
| National LCI DB | Battery-Mn | 5.18E-02 |
| Ecoinvent v3.10 | Market for Corrugated Board Box - RER | 1.04E+00 |
| Ecoinvent v3.10 | Market for Reinforcing Steel - GLO | 2.32E+00 |
| Ecoinvent v3.10 | Market for copper, cathode - GLO | 7.00E+00 |
| Ecoinvent v3.10 | Market for Polystyrene, Expandable - RoW | 3.62E+00 |
| Ecoinvent v3.10 | Market for Epoxy Resin, Liquid - RER | 6.00E+00 |
| Ecoinvent v3.10 | Market for Ethylene Vinyl Acetate Copolymer - RER | 2.90E+00 |
| Ecoinvent v3.10 | Market for fibre, polyester - GLO | 5.01E+00 |
| Ecoinvent v3.10 | Market for Magnetite - GLO | 9.82E-01 |
| Ecoinvent v3.10 | Market for Flat Glass, Coated - RER | 1.11E+00 |
| Ecoinvent v3.10 | Market for Graphite - GLO | 7.28E-02 |
| Ecoinvent v3.10 | market for polystyrene, high impact, GLO | 3.73E+00 |
| Ecoinvent v3.10 | Market For Polyethylene Terephthalate, Granulate, Amorphous - GLO | 3.89E+00 |
| Ecoinvent v3.10 | Market for Liquid Crystal Display, Unmounted - GLO | 6.67E+01 |
| Ecoinvent v3.10 | Market for wood chips and particles, willow - Row | 6.43E-02 |
| Ecoinvent v3.10 | Market for nylon 6 - RoW | 9.38E+00 |
| Ecoinvent v3.10 | Market for kraft paper - RER | 6.92E-01 |
| National LCI DB | Poly Butylene Terephthalate | 2.82E+00 |
| Ecoinvent v3.10 | Market for Polycarbonate - RER | 6.20E+00 |
| Ecoinvent v3.10 | Market for printed wiring board, surface mounted, unspecified, Pb free - GLO | 3.16E+02 |
| Ecoinvent v3.10 | Market for Polymethyl Methacrylate, Beads - GLO | 7.45E+00 |
| Ecoinvent v3.10 | Market for Polyurethane, Rigid Foam - RER | 4.64E+00 |
| Ecoinvent v3.10 | Market for Synthetic Rubber - GLO | 3.33E+00 |
| Ecoinvent v3.10 | Market for Steel, Chromium Steel 18/8, Hot Rolled - GLO | 5.39E+00 |
| Ecoinvent v3.10 | Market for Cable, Unspecified - GLO | 6.35E+00 |