Entropy Workstation

Environmental Product Declaration

ISO 14020:2000, IS0 14025:2006, ISO 14040:2006,
ISO 14044:2006, EN 15804:2019 A2

EPD registration number:	S-P-02109
Publication date:	2021-03-23
Validity date:	2026-03-22
Geographical scope:	India

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1. Introduction

Talin Modular Office Furniture Systems Pvt. Ltd is a pioneer and leader in the manufacture of modular furniture in India. Established in 1995, Talin has serviced a high-profile clientele that includes some of the biggest international brands and brings on board an unmatched reputation for innovation and excellence. Talin is led by wealth creators and fresh leaders with experience in design engineering, fabrication and have a deep sense of commitment towards customer satisfaction.

Talin is engaged in the manufacture, supply, and installation of customized modular office furniture such as ergonomic workstations, height-adjustable workstations, executive furniture, storage units, lab tables, woodworks, etc. The company has a diversified product mix to offer to its clients.

Talin workstations create perfect work environments and enhance employee engagement and productivity. The continuous effort of Talin to blend quality and visual appeal results into workstations that are elegant, versatile and durable. The sleek desking system range by Talin, namely Entropy is characterised by contemporary design, assured quality, versatility and value for money. These features have made it the workstation of choice for leading organisations across the country. Entropy allows unmatched flexibility in terms of material, and thus can be used to create floor to ceiling configurations in a workspace which are simple and effective. The wide range of options to craft a rich office ambience at minimum cost makes Entropy desking system affordable and future proof.

This Environmental Product Declaration covers one of the workstation products named Entropy. Entropy workstation has 8 choices of partitioning systems with varying pax configuration.

The LCA model was created using the GaBi ts Software system for life cycle engineering, developed by Sphera Solutions Inc.

2. General Information

2.1 EPD, PCR, LCA Information

Table 1: EPD Information	
Programme	The International EPD® System, www.environdec.com
Program operator	EPD International AB Box 210 60, SE-100 31 Stockholm, Sweden.
Declaration holder	Talin Modular Office Furniture Systems Pvt Ltd Sy No 189&190, Kacharakanahalli, 15th Cross, 3rd Block, 1st Stage, HBR Layout, Kalyananagar Post, Bengaluru, Karnataka 560043, India
Product	Entropy Workstation
CPC Code	UN CPC 3511
EPD registration number	S-P-02109
Publication date	2021-03-23
Validity date	2026-03-22
Geographical scope	India
Reference standards	IS0 14020:2001, ISO 14025:2006, ISO 14040/44, EN 15804:2019,

Table 2: PCR Information	
Reference PCR	**'FURNITURE, EXCEPT SEATS AND MATTRESSES' Version** 2.01, 2012:19
Date of Issue	2019-08-18 (Version 2.01)

Table 3: Verification Information	
Demonstration of verification	External, independent verification
Third party verifier	Dr Hüdai Kara, Metsims Sustainability Consulting, 4 Clear Water Place, Oxford OX2 7NL, UK Email: hudai.kara@metsims.com

Table 4: LCA Information	
Title	Environmental Product Declaration of Entropy Workstation
Preparer	Dr. Rajesh Kumar Singh thinkstep Sustainability Solutions- a Sphera Company 707, Meadows, Sahar Plaza, Andheri Kurla Road, Andheri East, Mumbai - 400059, India Email: rsingh@sphera.com

2.2 Reference Period of EPD Data

The reference period for the data used within this EPD is the 2019-20 (April 2019 to March 2020)

2.3 Geographical Scope of EPD Application

The geographical scope of this EPD is India.

2.4 Additional Information about EPD

This EPD provides information for Entropy Workstation product with 8 choices of partitioning system with varying pax configuration. The EPD is in accordance with ISO 14025. The Life Cycle Assessment (LCA) study carried out for developing this EPD for Entropy workstation as per ISO 14040 and ISO 14044 requirements

Product Category Rules (PCR) for the assessment of the environmental performance of modular furniture (Entropy Workstation) products is 'FURNITURE, EXCEPT SEATS AND MATTRESSES' Version 2.01, 2012:19.

3. Product Description and System Boundaries

3.1 Product Identification and Usage

Experience the sleek desking system range by Talin, characterised by contemporary design, robust quality, versatility, and value. Enabling collaborative workspaces and optimising space, the modular design of Entropy facilitates dynamic changes based on user needs. Entropy is the workstation of choice for all leading organisations across the country with its features and ergonomic design.

From open plan and monolithic applications to the creation of colourful and energetic workspaces, the Entropy desking system can be configured to meet your changing needs, simply and easily.

It has Pre-fabricated panels that enable quick installation at the site; frames are finished with aluminium extruded trims 2mm thick. All metal parts are pre-treated using 7 tank treatment and powder coated. Thus making this workstation a completely reconfigurable one

Entropy workstation has 8 choices of partitioning system out of which first 6 models have 4 pax configuration, seventh model has 3 pax (non-sharing), and the eighth one has 6 pax configuration. The 6 configurations (4 pax) choices are Tabulated below in Table 1 while the rest 2 configuration choices are tabulated in Table 2.

Table 1 Entropy Workstation (Model 1- Model 6) Configuration

Entropy Workstation Configuration	Partition Material	Type of Leg	Dimension (1 seating)
Model 1	Fabric Panel	Tapered Tube	1200W X 750D X 1075mm H
Model 2	Glass Panel	Tapered Tube	1200W X 750D X 1075mm H

Model 3	Fabric Panel	Tapered Tube	1500W X 750D X 1075mm H
Model 4	Glass Panel	Tapered Tube	1500W X 750D X 1075mm H
Model 5	Fabric Panel	Triangle Leg	1200W X 750D X 1075mm H
Model 6	Glass Panel	Triangle Leg	1200W X 750D X 1075mm H

Table 2 Entropy Workstation (Model 7 and Model 8) Configuration

Entropy Workstation Configuration	Partition Material	Type of Leg	Dimension (1 seating)
Model 7 (3 pax non-sharing)	Fabric Panel	Tapered Tube	1200W X 750D X 1050mm H
Model 8 (6 pax)	Fabric Panel	Tapered Tube	1200W X 750D X 1075mm H

A breakdown of materials for Entropy Workstation - Model 1 is tabulated below in Table 3

Table 3 Materials by % mass for Entropy Workstation (Model 1)

Material	Weight(kg)	% distribution
Steel	60.37	43.57
Aluminium	0.84	0.6
Polyester	0.5	0.36
PVC	1.56	1.13
Laminated wooden board	75.02	54.15
Tin	0.26	0.19
Total	138.55	100

4. LCA

4.1 Information Sources and Data Quality

Talin Modular Office Furniture Systems Pvt. Ltd. provided primary data with a very high data quality for Entropy product. The quality of the LCI data for modelling the life cycle stages, assessed according to ISO 14044 (2006) is judged by its precision (measured, calculated or estimated), completeness (e.g. are there unreported emissions), consistency (degree of uniformity of the methodology applied on an LCA serving as a data source) and representativeness (geographical, time period, technology). To achieve this, industry data collected directly from the producers were used wherever possible. All upstream LCA data from the GaBi 9 Professional database from Sphera Solutions Inc.

4.2 Methodological Details

4.2.1 Declared unit

The declared unit is 1 piece of Entropy workstation with varying pax configuration.

4.2.2 Selection of application of LCIA categories

A list of relevant impact categories and category indicators is defined and associated with the inventory data. The methods that have been selected for evaluation of environmental impacts are mentioned in (Table 4). These indicators are scientifically and technically valid.

The environmental impact per declared unit for the following environmental impact categories were reported in the EPD according to PCR 'FURNITURE, EXCEPT SEATS AND MATTRESSES' 2012:19 Version 2.01 and divided into core, upstream (and downstream, if included) module.

Table 4 Environmental impacts indicators

Impact Indicator	LCIA Method	Unit
Global Warming Potential (GWP-total)	IPCC 2013	kg CO_2 equivalent
Global Warming Potential (GWP-fossil)	IPCC 2013	kg CO_2 equivalent
Global Warming Potential (GWP-biogenic)	IPCC 2013	kg CO_2 equivalent
Global Warming Potential land use and land use change (GWP-luluc)	IPCC 2013	kg CO_2 equivalent
Acidification Potential	CML	mol SO_2 equivalent
Eutrophication Potential (EP-freshwater)	CML	kg PO_4^{3-} equivalent
Photochemical Ozone Creation Potential	CML	kg ethene equivalent
Abiotic depletion potential – Elements	CML	kg Sb equivalent
Abiotic depletion potential – Fossil fuels	CML	MJ, net calorific value
Water scarcity potential	AWARE 2016	m^3 world equivalent deprived

Table 5 Resources use parameters

Parameter	Unit
Primary energy resources – Renewable	MJ, net calorific value
Primary energy resources – Non-Renewable	MJ, net calorific value
Secondary Material	kg
Renewable secondary fuels	MJ, net calorific value
Non-renewable secondary fuels	MJ, net calorific value
Net use of fresh water	m^3

The consumption of resources declared per function unit is reported in the EPD. Input parameters, describing resource use are shown in Table 5.

Table 6 Optional Environmental Indicators

Parameter	Unit
Human toxicity, cancer (recommended and interim)	cases
Human toxicity, non-canc. (recommended and interim)	cases
Fresh water ecotoxicity (recommended and interim)	PAF.m^3.day
Land Use	species. yr

Table 7 Waste Categories

Waste categories	Unit
Hazardous waste disposed	kg
Non-hazardous waste disposed	kg
Radioactive waste disposed/stored	kg

Table 8 Indicators describing the output flows

Parameter	Unit
Components for reuse	kg
Material for recycling	kg
Materials for energy recovery	kg
Exported energy, electricity	MJ
Exported energy, thermal	MJ

4.3 Cut-off Criteria

Life Cycle Inventory data for a minimum of 99 % of total inflows to the core module shall be included. Inflows not included in the LCA shall be documented in the EPD. Input and output data have been collected through detailed questionnaires which have been developed and refined. In practice, this means that, at least, all material flows going into the production processes (inputs) higher than 1% of the total mass flow (t) or higher than 1% of the total primary energy input (MJ) are part of the system and modelled in order to calculate elementary flows. Inputs with less than 1% of mass flow and less than 1% of the total primary energy input are also considered as all these were environmentally relevant.

4.4 Allocation

No allocation has been done. As no co-products are produced, the flow of materials and energy and the associated release of substances and energy into the environment is related exclusively to the Entropy model produced. Any allocation performed in the background processes is according to the PCR.

4.5 System Boundaries

The system boundary for Entropy Workstation represents a Cradle-to-Grave, which covers production Phase, packaging phase and End of life phase. The production phase includes the raw material extraction, production of the raw materials, auxiliary material production, upstream transportation, manufacturing process of the final product and its packaging. End of life phase includes waste processing for reuse, recovery or recycling and disposal.

4.5.1 Geographic System Boundaries

The geographical coverage of this declaration covers the production of all the 8 models of Entropy Workstation in India. Wherever possible, the country specific (India) boundaries have been adapted and other datasets were chosen from EU if no India datasets were available

4.5.2 Temporal System Boundaries

The data collection is related to one year of operation and the year of the data is indicated in the questionnaire for each data point. The majority of data was derived for the year 2019-20 (April 2019 to March 2020) and is believed to be representative of production of product ‘Entropy Workstation’ in India during this time frame.

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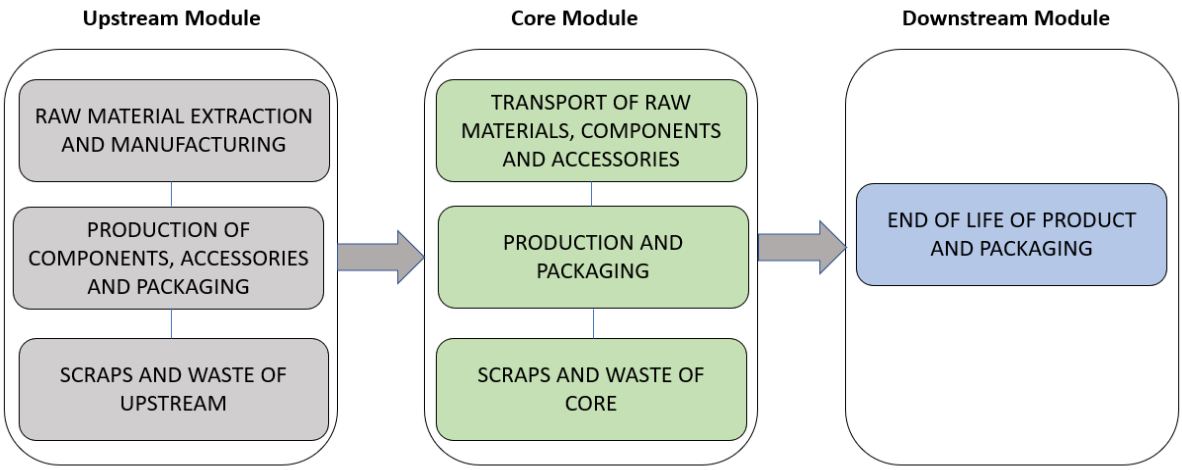

Figure 1 Details of system boundary included in the study

4.5.3 Technology coverage

The exact technological configuration was used for the various process's operation of its plant for efficient performance in production and minimizing environmental impacts. It was assumed that secondary data from databases that were used for this assessment, were temporally and technologically comparable to that of primary data and within the temporal coverage already addressed.

4.6 Software and database

The LCA model was created using the GaBi 9 Software system for life cycle engineering, developed by Sphera Solutions. The GaBi database provides the life cycle inventory data for several of the raw and process materials obtained from the upstream system. Detailed database documentation for GaBi datasets can be accessed at http://www.gabi-software.com/international/support/gabi/gabi-database-2020-lci-documentation.

4.7 Comparability

According to the standards, EPDs do not compare the environmental performance of products in the sector. Any comparison of the declared environmental performance of products lies outside the scope of these standards and is suggested to be feasible only if all compared declarations follow equal standard provisions.

4.8 Results

The tables below show the life cycle environmental impacts for 1 piece of workstation having of 8 choice of partitioning systems.

4.8.1 Entropy Workstation Model 1: The table below shows the LCIs, LCIAs Resource use, Waste categories for Entropy Workstation Model 1 configuration

Figure 2 Entropy Workstation Model 1

Table 9 LCIA and LCI Result for Entropy Workstation Model 1

Environmental Impacts	Unit	Upstream	Core	Downstream
Global Warming Potential (GWP-total)	kg CO_2 eq.	213	15	-106
Global Warming Potential (GWP-fossil)	kg CO_2 eq.	325	15	-110
Global Warming Potential (GWP-biogenic)	kg CO_2 eq.	-113	-4.69E-03	3.71
Global Warming Potential land use and land use change (GWP-luluc)	kg CO_2 eq.	0.33	3.07E-02	-2.94E-02
Acidification Potential	kg SO_2 eq.	1.63	0.17	-0.36
Eutrophication Potential (EP-freshwater)	kg PO_4^{3-} eq.	0.14	0.01	-0.02
Photochemical Ozone Creation Potential	kg C_2H_4 eq.	0.15	0.01	-0.05
Abiotic depletion potential – Elements	kg Sb- eq.	2.61E-03	8.86E-07	-1.47E-03
Abiotic depletion potential – Fossil fuels	MJ	4563.90	151.22	-992.13
Water scarcity potential	m^3	22.87	1.64	-8.46

Resource Use		Unit	Upstream	Core	Downstream
Primary energy resources – Renewable	**Used as energy career**	MJ	1803.16	24.87	36.92
	Used as materials	MJ	0	0	0
	Total	MJ	1803.16	24.87	36.92
Primary energy resources – Non-renewable	**Used as energy career**	MJ	4652.86	155.90	-966.16
	Used as materials	MJ	0	0	0
	Total	MJ	4652.86	155.90	-966.16
Secondary Material		kg	0	0	0
Renewable secondary fuels		MJ	0	0	0
Non-renewable secondary fuels		MJ	0	0	0
Net use of fresh water		m^3	0.98	0.06	-0.22

Waste categories	Unit	Upstream	Core	Downstream
Hazardous waste disposed	kg	6.05E-05	1.11E-07	-1.00E-04
Non-hazardous waste disposed	kg	26.09	0.06	94.50
Radioactive waste disposed/stored	kg	3.91E-02	1.78E-03	-1.63E-03
Parameter	**Unit**	**Upstream**	**Core**	**Downstream**
Components for reuse	kg	0	0	0
Material for recycling	kg	0	0	52.34
Materials for energy recovery	kg	0	0	0
Exported energy, electricity	MJ	0	0	0
Exported energy, thermal	MJ	0	0	0
Other Indicators	**Unit**	**Upstream**	**Core**	**Downstream**
Human toxicity, cancer (recommended and interim)	cases	1.94E-06	1.98E-08	2.24E-07
Human toxicity, non-canc. (recommended and interim)	cases	3.06E-05	1.23E-06	5.14E-06
Fresh water ecotoxicity (recommended and interim)	PAF.m^3.day	56096.61	8359.14	-8792.82
Land Use	species. yr	1.20E-07	2.77E-09	-2.22E-08

4.8.2 Entropy Workstation Model 2: The table below shows the LCIs, LCIAs Resource use, Waste categories for Entropy Workstation Model 2 configuration

Figure 3 Entropy Workstation Model 2

Table 10 LCIA and LCI Result for Entropy Workstation Model 2

Environmental Impacts	Unit	Upstream	Core	Downstream
Global Warming Potential (GWP-total)	kg CO_2 eq.	226	11.60	-104
Global Warming Potential (GWP-fossil)	kg CO_2 eq.	322	11.60	-108
Global Warming Potential (GWP-biogenic)	kg CO_2 eq.	-96	-3.63E-03	3.50
Global Warming Potential land use and land use change (GWP-luluc)	kg CO_2 eq.	0.33	2.38E-02	-2.73E-02
Acidification Potential	kg SO_2 eq.	1.64	0.13	-0.36
Eutrophication Potential (EP-freshwater)	kg PO_4^{3-} eq.	0.13	0.01	-0.02
Photochemical Ozone Creation Potential	kg C_2H_4 eq.	0.14	0.01	-0.05
Abiotic depletion potential – Elements	kg Sb- eq.	2.53E-03	6.87E-07	-1.45E-03
Abiotic depletion potential – Fossil fuels	MJ	4435.10	117.29	-980.29
Water scarcity potential	m^3	22.37	1.27	-8.32

Resource Use		Unit	Upstream	Core	Downstream
Primary energy resources – Renewable	**Used as energy career**	MJ	1570.49	19.29	35.70
	Used as materials	MJ	0	0	0
	Total	MJ	1570.49	19.29	35.70
Primary energy resources – Non-renewable	**Used as energy career**	MJ	4516.19	120.92	-955.24
	Used as materials	MJ	0	0	0
	Total	MJ	4516.19	120.92	-955.24
Secondary Material		kg	0	0	0
Renewable secondary fuels		MJ	0	0	0
Non-renewable secondary fuels		MJ	0	0	0
Net use of fresh water		m^3	0.94	0.04	-0.22

Waste categories	Unit	Upstream	Core	Downstream
Hazardous waste disposed	kg	5.65E-05	8.64E-08	-9.86E-05
Non-hazardous waste disposed	kg	25.26	0.04	86.77
Radioactive waste disposed/stored	kg	3.59E-02	1.38E-03	-1.82E-03
Parameter	**Unit**	**Upstream**	**Core**	**Downstream**
Components for reuse	kg	0	0	0
Material for recycling	kg	0	0	52.34
Materials for energy recovery	kg	0	0	0
Exported energy, electricity	MJ	0	0	0
Exported energy, thermal	MJ	0	0	0
Other Indicators	**Unit**	**Upstream**	**Core**	**Downstream**
Human toxicity, cancer (recommended and interim)	cases	1.68E-06	1.61E-08	2.20E-07
Human toxicity, non-canc. (recommended and interim)	cases	2.83E-05	9.64E-07	4.95E-06
Fresh water ecotoxicity (recommended and interim)	PAF.m^3.day	56570.99	6485.11	-8690.27
Land Use	species. yr	1.17E-07	2.15E-09	-2.19E-08

4.8.3 Entropy Workstation Model 3: The table below shows the LCIs, LCIAs Resource use, Waste categories for Entropy Workstation Model 3 configuration

Figure 4 Entropy Workstation Model 3

Table 11 LCIA and LCI Result for Entropy Workstation Model 3

Environmental Impacts	Unit	Upstream	Core	Downstream
Global Warming Potential (GWP-total)	kg CO_2 eq.	253	12.60	-128
Global Warming Potential (GWP-fossil)	kg CO_2 eq.	398	12.60	-133
Global Warming Potential (GWP-biogenic)	kg CO_2 eq.	-145	-3.94E-03	4.61
Global Warming Potential land use and land use change (GWP-luluc)	kg CO_2 eq.	0.36	2.58E-02	-2.81E-02
Acidification Potential	kg SO_2 eq.	1.85	0.14	-0.40
Eutrophication Potential (EP-freshwater)	kg PO_4^{3-} eq.	0.16	6.63E-03	-2.27E-02
Photochemical Ozone Creation Potential	kg C_2H_4 eq.	0.18	6.68E-03	-5.92E-02
Abiotic depletion potential – Elements	kg Sb- eq.	3.53E-03	7.46E-07	-1.86E-03
Abiotic depletion potential – Fossil fuels	MJ	5594.73	127.27	-1199.42
Water scarcity potential	m^3	27.68	1.38	-10.21

Resource Use		Unit	Upstream	Core	Downstream
Primary energy resources – Renewable	**Used as energy career**	MJ	2246.42	20.93	53.76
	Used as materials	MJ	0	0	0
	Total	MJ	2246.42	20.93	53.76
Primary energy resources – Non-renewable	**Used as energy career**	MJ	5694.04	131.20	-1165.26
	Used as materials	MJ	0	0	0
	Total	MJ	5694.04	131.20	-1165.26
Secondary Material		kg	0	0	0
Renewable secondary fuels		MJ	0	0	0
Non-renewable secondary fuels		MJ	0	0	0
Net use of fresh water		m^3	1.18	4.79E-02	-0.26

Waste categories	Unit	Upstream	Core	Downstream
Hazardous waste disposed	kg	8.91E-05	9.37E-08	-1.27E-04
Non-hazardous waste disposed	kg	34.11	4.75E-02	118.26
Radioactive waste disposed/stored	kg	4.59E-02	1.50E-03	-1.55E-03
Parameter	**Unit**	**Upstream**	**Core**	**Downstream**
Components for reuse	kg	0	0	0
Material for recycling	kg	0	0	66.85
Materials for energy recovery	kg	0	0	0
Exported energy, electricity	MJ	0	0	0
Exported energy, thermal	MJ	0	0	0
Other Indicators	**Unit**	**Upstream**	**Core**	**Downstream**
Human toxicity, cancer (recommended and interim)	cases	2.42E-06	1.72E-08	2.90E-07
Human toxicity, non-canc. (recommended and interim)	cases	3.56E-05	1.04E-06	6.87E-06
Fresh water ecotoxicity (recommended and interim)	PAF.m^3.day	59515.00	7035.90	-8809.89
Land Use	species. yr	1.41E-07	2.33E-09	-2.72E-08

4.8.4 Entropy Workstation Model 4: The table below shows the LCIs, LCIAs Resource use, Waste categories for Entropy Workstation Model 4 configuration

Figure 5 Entropy Workstation Model 4

Table 12 LCIA and LCI Result for Entropy Workstation Model 4

Environmental Impacts	Unit	Upstream	Core	Downstream
Global Warming Potential (GWP-total)	kg CO_2 eq.	291	12.60	-128.00
Global Warming Potential (GWP-fossil)	kg CO_2 eq.	412	12.60	-133.00
Global Warming Potential (GWP-biogenic)	kg CO_2 eq.	-121	-3.94E-03	4.41
Global Warming Potential land use and land use change (GWP-luluc)	kg CO_2 eq.	0.39	2.58E-02	-2.60E-02
Acidification Potential	mol SO_2 eq.	2.03	0.14	-0.40
Eutrophication Potential (EP-freshwater)	kg PO_4^{3-} eq.	0.17	6.63E-03	-2.29E-02
Photochemical Ozone Creation Potential	kg C_2H_4 eq.	0.18	6.68E-03	-5.96E-02
Abiotic depletion potential – Elements	kg Sb- eq.	3.53E-03	7.46E-07	-1.86E-03
Abiotic depletion potential – Fossil fuels	MJ	5628.77	127.27	-1201.97
Water scarcity potential	m^3	28.56	1.38	-10.18

Resource Use		Unit	Upstream	Core	Downstream
Primary energy resources – Renewable	**Used as energy career**	MJ	1940.10	20.93	52.90
	Used as materials	MJ	0	0	0
	Total	MJ	1940.10	20.93	52.90
Primary energy resources – Non-renewable	**Used as energy career**	MJ	5722.93	131.20	-1168.50
	Used as materials	MJ	0	0	0
	Total	MJ	5722.93	131.20	-1168.50
Secondary Material		kg	0	0	0
Renewable secondary fuels		MJ	0	0	0
Non-renewable secondary fuels		MJ	0	0	0
Net use of fresh water		m^3	1.18	4.79E-02	-0.26

Waste categories	Unit	Upstream	Core	Downstream
Hazardous waste disposed	kg	8.46E-05	9.37E-08	-1.26E-04
Non-hazardous waste disposed	kg	29.80	4.75E-02	110.42
Radioactive waste disposed/stored	kg	4.38E-02	1.50E-03	-1.83E-03
Parameter	**Unit**	**Upstream**	**Core**	**Downstream**
Components for reuse	kg	0	0	0
Material for recycling	kg	0	0	66.85
Materials for energy recovery	kg	0	0	0
Exported energy, electricity	MJ	0	0	0
Exported energy, thermal	MJ	0	0	0
Other Indicators	**Unit**	**Upstream**	**Core**	**Downstream**
Human toxicity, cancer (recommended and interim)	cases	2.06E-06	1.72E-08	2.89E-07
Human toxicity, non-canc. (recommended and interim)	cases	3.38E-05	1.04E-06	6.74E-06
Fresh water ecotoxicity (recommended and interim)	PAF.m^3.day	68705.89	7035.90	-8836.89
Land Use	species. yr	1.41E-07	2.33E-09	-2.72E-08

4.8.5 Entropy Workstation Model 5: The table below shows the LCIs, LCIAs Resource use, Waste categories for Entropy Workstation Model 5 configuration

Figure 6 Entropy Workstation Model 5

Table 13 LCIA and LCI Result for Entropy Workstation Model 5

Environmental Impacts	Unit	Upstream	Core	Downstream
Global Warming Potential (GWP-total)	kg CO_2 eq.	234	9.42	-115.00
Global Warming Potential (GWP-fossil)	kg CO_2 eq.	373	9.40	-119.00
Global Warming Potential (GWP-biogenic)	kg CO_2 eq.	-140	-2.94E-03	4.57
Global Warming Potential land use and land use change (GWP-luluc)	kg CO_2 eq.	0.37	1.93E-02	-2.84E-02
Acidification Potential	kg SO_2 eq.	1.83	0.10	-0.37
Eutrophication Potential (EP-freshwater)	kg PO_4^{3-} eq.	0.16	4.96E-03	-2.09E-02
Photochemical Ozone Creation Potential	kg C_2H_4 eq.	0.18	4.99E-03	-5.31E-02
Abiotic depletion potential – Elements	kg Sb- eq.	2.70E-03	5.57E-07	-1.64E-03
Abiotic depletion potential – Fossil fuels	MJ	5310.30	95.02	-1076.70
Water scarcity potential	m^3	26.20	1.03	-9.18

Resource Use		Unit	Upstream	Core	Downstream
Primary energy resources – Renewable	**Used as energy career**	MJ	2194.80	15.63	44.61
	Used as materials	MJ	0	0	0
	Total	MJ	2194.80	15.63	44.61
Primary energy resources – Non-renewable	**Used as energy career**	MJ	5414.98	97.96	-1047.13
	Used as materials	MJ	0	0	0
	Total	MJ	5414.98	97.96	-1047.13
Secondary Material		kg	0	0	0
Renewable secondary fuels		MJ	0	0	0
Non-renewable secondary fuels		MJ	0	0	0
Net use of fresh water		m^3	1.14	3.58E-02	-0.23

Waste categories	Unit	Upstream	Core	Downstream
Hazardous waste disposed	kg	7.19E-05	7.00E-08	-1.11E-04
Non-hazardous waste disposed	kg	30.16	0.04	115.88
Radioactive waste disposed/stored	kg	4.60E-02	1.12E-03	-1.56E-03
Parameter	**Unit**	**Upstream**	**Core**	**Downstream**
Components for reuse	kg	0	0	0
Material for recycling	kg	0	0	58.97
Materials for energy recovery	kg	0	0	0
Exported energy, electricity	MJ	0	0	0
Exported energy, thermal	MJ	0	0	0
Other Indicators	**Unit**	**Upstream**	**Core**	**Downstream**
Human toxicity, cancer (recommended and interim)	cases	2.40E-06	1.39E-08	2.55E-07
Human toxicity, non-canc. (recommended and interim)	cases	3.66E-05	7.90E-07	6.10E-06
Fresh water ecotoxicity(recommended and interim)	PAF.m^3.day	61911.88	5255.56	-8708.44
Land Use	species.yr	1.31E-07	1.74E-09	-2.43E-08

4.8.6 Entropy Workstation Model 6: The table below shows the LCIs, LCIAs Resource use, Waste categories for Entropy Workstation Model 6 configuration.

Figure 7 Entropy Workstation Model 6

Table 14 LCIA and LCI Result for Entropy Workstation Model 6

Environmental Impacts	Unit	Upstream	Core	Downstream
Global Warming Potential (GWP-total)	kg CO_2 eq.	246	9.10	-115
Global Warming Potential (GWP-fossil)	kg CO_2 eq.	367	9.08	-119
Global Warming Potential (GWP-biogenic)	kg CO_2 eq.	-121	-2.84E-03	4.37
Global Warming Potential land use and land use change (GWP-luluc)	kg CO_2 eq.	0.36	1.86E-02	-2.64E-02
Acidification Potential	kg SO_2 eq.	1.84	0.10	-0.38
Eutrophication Potential (EP-freshwater)	kg PO_4^{3-} eq.	0.16	4.79E-03	-2.11E-02
Photochemical Ozone Creation Potential	kg C_2H_4 eq.	0.17	4.82E-03	-5.35E-02
Abiotic depletion potential – Elements	kg Sb- eq.	2.61E-03	5.38E-07	-1.64E-03
Abiotic depletion potential – Fossil fuels	MJ	5118.44	91.80	-1079.65
Water scarcity potential	m^3	25.52	0.99	-9.18

Resource Use		Unit	Upstream	Core	Downstream
Primary energy resources – Renewable	**Used as energy career**	MJ	1934.04	15.10	43.72
	Used as materials	MJ	0	0	0
	Total	MJ	1934.04	15.10	43.72
Primary energy resources – Non-renewable	**Used as energy career**	MJ	5214.72	94.64	-1050.79
	Used as materials	MJ	0	0	0
	Total	MJ	5214.72	94.64	-1050.79
Secondary Material		kg	0	0	0
Renewable secondary fuels		MJ	0	0	0
Non-renewable secondary fuels		MJ	0	0	0
Net use of fresh water		m^3	1.09	0.03	-0.23

Waste categories	Unit	Upstream	Core	Downstream
Hazardous waste disposed	kg	6.62E-05	6.76E-08	-1.11E-04
Non-hazardous waste disposed	kg	29.19	3.43E-02	107.64
Radioactive waste disposed/stored	kg	4.25E-02	1.08E-03	-1.84E-03
Parameter	**Unit**	**Upstream**	**Core**	**Downstream**
Components for reuse	kg	0	0	0
Material for recycling	kg	0	0	58.97
Materials for energy recovery	kg	0	0	0
Exported energy, electricity	MJ	0	0	0
Exported energy, thermal	MJ	0	0	0
Other Indicators	**Unit**	**Upstream**	**Core**	**Downstream**
Human toxicity, cancer (recommended and interim)	cases	2.09E-06	1.33E-08	2.54E-07
Human toxicity, non-canc. (recommended and interim)	cases	3.38E-05	7.63E-07	5.95E-06
Fresh water ecotoxicity (recommended and interim)	PAF.m^3.day	62914.97	5077.53	-8737.56
Land Use	species. yr	1.26E-07	1.68E-09	-2.43E-08

4.8.7 Entropy Workstation Model 7: The table below shows the LCIs, LCIAs Resource use, Waste categories for Entropy Workstation Model 7 configuration.

Figure 8 Entropy Workstation Model 7

Table 15 LCIA and LCI Result for Entropy Workstation Model 7

Environmental Impacts	Unit	Upstream	Core	Downstream
Global Warming Potential (GWP-total)	kg CO_2 eq.	227	4.79	-110
Global Warming Potential (GWP-fossil)	kg CO_2 eq.	302	4.79	-113
Global Warming Potential (GWP-biogenic)	kg CO_2 eq.	-75.3	-1.49E-03	2.61
Global Warming Potential land use and land use change (GWP-luluc)	kg CO_2 eq.	0.29	9.80E-03	-2.13E-02
Acidification Potential	kg SO_2 eq.	1.48	0.05	-0.33
Eutrophication Potential (EP-freshwater)	kg PO_4^{3-} eq.	0.11	2.54E-03	-1.89E-02
Photochemical Ozone Creation Potential	kg C_2H_4 eq.	0.13	2.54E-03	-5.03E-02
Abiotic depletion potential – Elements	kg Sb- eq.	2.65E-03	2.84E-07	-1.60E-03
Abiotic depletion potential – Fossil fuels	MJ	4156.22	48.39	-1015.70
Water scarcity potential	m^3	21.03	0.53	-8.63

Resource Use		Unit	Upstream	Core	Downstream
Primary energy resources – Renewable	**Used as energy career**	MJ	1250.98	7.95	47.96
	Used as materials	MJ	0	0	0
	Total	MJ	1250.98	7.95	47.96
Primary energy resources – Non-renewable	**Used as energy career**	MJ	4216.91	49.88	-986.06
	Used as materials	MJ	0	0	0
	Total	MJ	4216.91	49.88	-986.06
Secondary Material		kg	0	0	0
Renewable secondary fuels		MJ	0	0	0
Non-renewable secondary fuels		MJ	0	0	0
Net use of fresh water		m^3	0.84	0.02	-0.22

Waste categories	Unit	Upstream	Core	Downstream
Hazardous waste disposed	kg	6.39E-05	3.56E-08	-1.09E-04
Non-hazardous waste disposed	kg	19.94	0.02	71.90
Radioactive waste disposed/stored	kg	2.91E-02	5.70E-04	-1.21E-03
Parameter	**Unit**	**Upstream**	**Core**	**Downstream**
Components for reuse	kg	0	0	0
Material for recycling	kg	0	0	57.28
Materials for energy recovery	kg	0	0	0
Exported energy, electricity	MJ	0	0	0
Exported energy, thermal	MJ	0	0	0
Other Indicators	**Unit**	**Upstream**	**Core**	**Downstream**
Human toxicity, cancer (recommended and interim)	cases	1.44E-06	8.65E-09	2.45E-07
Human toxicity, non-canc. (recommended and interim)	cases	2.44E-05	4.20E-07	5.52E-06
Fresh water ecotoxicity (recommended and interim)	PAF.m^3.day	50120.02	2679.76	-6740.58
Land Use	species. yr	1.14E-07	8.87E-10	-2.31E-08

4.8.8 Entropy Workstation Model 8**:** The table below shows the LCIs, LCIAs Resource use, Waste categories for Entropy Workstation Model 8 configuration

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Table 16 LCIA and LCI Result for Entropy Workstation Model 8

Environmental Impacts	Unit	Upstream	Core	Downstream
Global Warming Potential (GWP-total)	kg CO_2 eq.	374	6.02	-170
Global Warming Potential (GWP-fossil)	kg CO_2 eq.	449	6.01	-173
Global Warming Potential (GWP-biogenic)	kg CO_2 eq.	-75	-1.87E-03	2.81
Global Warming Potential land use and land use change (GWP-luluc)	kg CO_2 eq.	0.37	1.23E-02	-1.18E-02
Acidification Potential	kg SO_2 eq.	2.05	6.63E-02	-0.40
Eutrophication Potential (EP-freshwater)	kg PO_4^{3-} eq.	0.15	3.18E-03	-2.48E-02
Photochemical Ozone Creation Potential	kg C_2H_4 eq.	0.17	3.19E-03	-7.68E-02
Abiotic depletion potential – Elements	kg Sb- eq.	2.99E-03	3.56E-07	-2.65E-03
Abiotic depletion potential – Fossil fuels	MJ	6053.37	60.73	-1548.02
Water scarcity potential	m^3	29.79	0.66	-13.08

Resource Use		Unit	Upstream	Core	Downstream
Primary energy resources – Renewable	**Used as energy career**	MJ	1287.87	9.98	97.52
	Used as materials	MJ	0	0	0
	Total	MJ	1287.87	9.98	97.52
Primary energy resources – Non-renewable	**Used as energy career**	MJ	6117.55	62.60	-1495.47
	Used as materials	MJ	0	0	0
	Total	MJ	6117.55	62.60	-1495.47
Secondary Material		kg	0	0	0
Renewable secondary fuels		MJ	0	0	0
Non-renewable secondary fuels		MJ	0	0	0
Net use of fresh water		m^3	1.12	0.02	-0.32

Waste categories	Unit	Upstream	Core	Downstream
Hazardous waste disposed	kg	9.81E-05	4.47E-08	-1.80E-04
Non-hazardous waste disposed	kg	26.92	2.27E-02	86.00
Radioactive waste disposed/stored	kg	3.44E-02	7.15E-04	-7.33E-04
Parameter	**Unit**	**Upstream**	**Core**	**Downstream**
Components for reuse	kg	0	0	0
Material for recycling	kg	0	0	94.37
Materials for energy recovery	kg	0	0	0
Exported energy, electricity	MJ	0	0	0
Exported energy, thermal	MJ	0	0	0
Other Indicators	**Unit**	**Upstream**	**Core**	**Downstream**
Human toxicity, cancer (recommended and interim)	cases	1.48E-06	9.98E-09	4.18E-07
Human toxicity, non-canc. (recommended and interim)	cases	2.89E-05	5.18E-07	9.60E-06
Fresh water ecotoxicity (recommended and interim)	PAF.m^3.day	66050.84	3361.10	-5170.46
Land Use	species. yr	1.49E-07	1.11E-09	-3.62E-08

4.9 Interpretation

The interpretation of the average results for 1 piece of workstation for Entropy Workstation-Model 1 is given in Table 18.

Table 17 Interpretation of most significant contributors to life cycle parameters

Parameter	Most significant contributor
Global Warming Potential (GWP)	The GWP is 122 kg CO_2 eq. (GWP fossil is 230 kg CO_2 eq., GWP biogenic is -109.29 kg CO_2 eq. and GWP land use change is 0.334 kg CO_2 eq.) with major contribution from Upstream (213.00 kg CO_2 eq.), Core (15.00 kg CO_2 eq.), and Downstream (-106.00 kg CO_2 eq.). Considering Upstream impacts as 100%, manufacturing contributes the highest (~98.02%, majorly from powder coating of metal components).
Acidification Potential	The Acidification terrestrial and freshwater is 1.44 kg SO_2 eq. with major contribution from Upstream (1.63 kg SO_2 eq.), Core (0.17 kg SO_2 eq.), Downstream (-0.36 kg SO_2 eq.). Considering Upstream impacts as 100%, manufacturing contributes the highest (~98.02%, majorly from powder coated parts).
Eutrophication freshwater	The Eutrophication freshwater is 0.12 kg PO_4^{3-} eq. with major contribution from Upstream (0.14 kg P eq.), Core (7.87E-03 kg PO_4^{3-} eq.), Downstream (-2.00E-02 kg PO_4^{3-} eq.). Considering Upstream impacts as 100%, manufacturing contributes the highest (83.19%, majorly from powder coated parts).
Photochemical Ozone Creation Potential (POCP)	The POCP is 0.11 kg C_2H_4 eq. with major contribution from Upstream (0.15 kg C_2H_4 eq.), Core (7.94E-03 kg C_2H_4 eq.), Downstream (-4.89E-02 kg C_2H_4 eq.). Considering Upstream impacts as 100%, manufacturing contributes the highest (~97.59%, majorly from powder coated parts).
Abiotic depletion potential – Elements	The Abiotic depletion potential – Elements is 1.14E-03 kg Sb eq. with major contribution from Upstream (2.61E-03 kg Sb eq.), Core (8.76E-07 kg Sb eq.), Downstream (-1.47E-03 kg Sb eq.). Considering Upstream impacts as 100%, manufacturing contributes the highest (~99.96%, majorly from control box with control switch).
Abiotic depletion potential – Fossil fuels	The Abiotic depletion potential – Fossil fuels is 3722.99 MJ with major contribution from Upstream (4563.90 MJ), Core (151.22 MJ), Downstream -992.13 MJ). Considering Upstream impacts as 100%, manufacturing contributes the highest (~97.69%, majorly from powder coated parts).
Water Scarcity:	The Water Scarcity is 16.08 m^3 eq. with major contribution from Upstream (22.90 m^3), Core (1.64 m^3), Downstream (-8.46m^3). Considering Upstream impacts as 100%, manufacturing contributes the highest (~96.86%, majorly from powder coated parts and control box with control switch).

Concluding, the study provides fair understanding of environmental impacts during the various life cycle stages of the product. It also identifies the hotspots in the value chain where improvement activities can be prioritised and accordingly investment can be planned. The scope covers the ecological information to be divided into raw material production, transportation and manufacturing along with its packaging.

5 Other Environmental Information

The constituent materials used within our products are responsibly sourced and we apply the principles of Sustainable Development and of Environmental Stewardship as a standard business practice in our operations. Protecting the environment by preserving non-renewable natural resources, increasing energy efficiency, reducing the environmental emissions, limiting the impact of materials transportation to and from our operations is part of our way in doing business.

Products do not contain any substances that can be included in “Candidate List of Substances of Very High Concern for Authorization” and raw materials used are not part of the EU REACH regulation.

6 References

- GaBi 9_2020: Dokumentation der GaBi-Datensätze der Datenbank zur Ganzheitlichen Bilanzierung. LBP, Universität Stuttgart und PE International, 2012
- GaBi 9_2020: Software und Datenbank zur Ganzheitlichen Bilanzierung. LBP, Universität Stuttgart und PE International, 2012
- ISO 14020:2000 Environmental labels and declarations - General principles
- ISO 14025:2006 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- ISO 14040:2006 Environmental management- Life cycle assessment - Principles and framework
- ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines.
- PCR 2012:19, Product Category Rules (PCR) for 'FURNITURE, EXCEPT SEATS AND MATTRESSES' Version 2.01