



**Declaration Owner**

Sloan Valve Company  
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**Product**

Sloan Diaphragm Flushometers

**Functional Unit**

1 packaged, installed unit with a Reference Service Life of 10 years in a building with an Estimated Service Life of 75 years

**EPD Number and Period of Validity**

SCS-EPD-08147  
EPD Valid August 10, 2022 through August 9, 2027

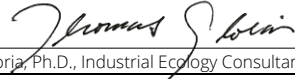
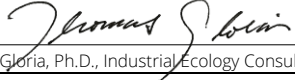
**Product Category Rule**

UL. PCR Guidance for Building-Related Products and Services  
Part A: Life Cycle Assessment Calculation Rules and Report  
Requirements. Version 3.2. December 2018.  
UL PCR Guidance for Building-Related Products and Services  
Part B: Kitchen and Bath Fixture Fittings and Accessory Products  
EPD Requirements. Version 1.0. October 2020.

**Program Operator**

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Program Operator:	SCS Global Services
Declaration URL Link:	<a href="https://www.scsglobalservices.com/certified-green-products-guide">https://www.scsglobalservices.com/certified-green-products-guide</a>
LCA Practitioner:	Beth Cassese, SCS Global Services
LCA Software and LCI database:	OpenLCA 1.10.3 software and the Ecoinvent v3.8 database
Product's Intended Application:	For use with toilet or urinal fixtures as the dispensing unit for the water supplied.
Product RSL:	10 Years (ESL 75 Years)
Markets of Applicability:	North America
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Grave
LCIA Method and Version:	CML-IA Baseline and TRACI 2.1
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
LCA Reviewer:	 Thomas Gloria, Ph.D., Industrial Ecology Consultants
Product Category Rule:	UL PCR Guidance for Building-Related Products and Services Part B: Kitchen and Bath Fixture Fittings and Accessory Products EPD Requirements. Version 1.0. October 2020.
PCR Review conducted by:	Jim Mellentine, Angela Fisher, Christopher Marozzi
Independent verification of the declaration and data, according to ISO 14025 and the PCR	<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
EPD Verifier:	 Thomas Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	<ul style="list-style-type: none"> <li>1. ABOUT Sloan.....2</li> <li>2. PRODUCT.....2</li> <li>3. LCA: METHODOLOGICAL FRAMEWORK .....5</li> <li>4. LCA: TECHNICAL INFORMATION AND SCENARIOS ..... 10</li> <li>5. LCA: Results ..... 14</li> <li>6. LCA: INTERPRETATION ..... 18</li> <li>7. ADDITIONAL ENVIRONMENTAL INFORMATION ..... 18</li> <li>8. REFERENCES ..... 20</li> </ul>
<p><b>Disclaimers:</b> This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.</p> <p><b>Scope of Results Reported:</b> The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.</p> <p><b>Accuracy of Results:</b> Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.</p> <p><b>Comparability:</b> The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.</p> <p>In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.</p>	

# 1. ABOUT Sloan

Sloan is the world’s leading manufacturer of commercial plumbing systems and has been in operation since 1906. Headquartered in Franklin Park, Illinois, USA, the company is at the forefront of the green building movement and provides smart, sustainable restroom solutions by manufacturing water-efficient products such as flushometers, electronic faucets, sink systems, soap dispensing systems, and vitreous china fixtures for commercial, industrial, and institutional markets worldwide.

The Sloan diaphragm flushometers are manufactured at Sloan facility in Franklin Park, IL, with a majority of the brass components being manufactured by the Sloan foundry in Augusta, Arkansas.

# 2. PRODUCT

## 2.1 Product Description

Sloan flushometer products belong to the Commercial Plumbing Fixtures specification code, CSI code 22 42 43 and the UNSPSC code 30180000.

A flushometer is a flush valve mechanism designed to flush toilets and urinals. Many present-day commercial applications use flushometers in place of standard flush valves as they are less water intensive. The flushometer is a plumbing device that does not require a storage tank filled with water for flushing. Rather, it conserves more water over time and for every flush through delivery of a metered amount of water at much higher pressure compared to that of a standard flush valve. The product systems under study include the following products.



Royal Flushometers



Regal Flushometers



Sloan Flushometers

### Product Features:

#### Royal

- Permex® Synthetic Rubber Diaphragm w/Dual Filtered By-Pass
- ADA Compliant Handle w/Triple Seal Packing
- Bak-Chek® Control Stop w/Free Spinning Vandal Resistant Cap
- High Back Pressure Vacuum Breaker w/ One Piece Bottom Hex Coupling
- Sweat Kit with Cast Set Screw Wall Flange
- High Copper-Low Zinc Brass Castings
- Non-Hold Open & No External Volume Adjustment to Ensure Water Conservation
- Fixed Volume Accuracy w/ CID Technology

**Regal**

- Natural Rubber Segment Diaphragm w/Fixed Metering By-Pass Orifice
- ADA Compliant Handle
- Bak-Chek® Control Stop w/ Threaded Vandal Resistant Cap
- High Copper-Low Zinc Brass Castings
- Non-Hold Open & No External Volume Adjustment to Ensure Water Conservation
- Fixed Volume Accuracy w/ Para-Flo® Technology

**Sloan**

- Permex® Synthetic Rubber Diaphragm with Linear Filtered By-Pass Orifice
- ADA Compliant Handle
- Bak-Chek® Control Stop w/ Vandal Resistant Stop Cap
- High Copper-Low Zinc Brass Castings
- Non-Hold Open & No External Volume Adjustment to Ensure Water Conservation
- Fixed Volume Accuracy w/ CID Technology

**Table 1.** Sloan Diaphragm Flushometer Models Represented in this EPD.

Toilets		Urinal	
Model	Flush Volume	Model	Flush Volume
ROYAL 111 – 1.28	1.28 gpf/ 4.8 Lpf	ROYAL 186 – 0.125	0.125 gpf/ 0.5 Lpf
ROYAL 111 RW	1.28 gpf/ 4.8 Lpf	ROYAL 186 – 0.25	0.25 gpf/ 1.0 Lpf
ROYAL 113 – 1.28	1.28 gpf/ 4.8 Lpf	ROYAL 186 – 0.5	0.5 gpf/ 1.9 Lpf
ROYAL 115 – 1.28	1.28 gpf/ 4.8 Lpf	ROYAL 186 – 0.125 RW	0.125 gpf/ 0.5 Lpf
ROYAL 116 – 1.28	1.28 gpf/ 4.8 Lpf	ROYAL 186 – 0.25 RW	0.25 gpf/ 1.0 Lpf
REGAL 111 – 1.28 XL	1.28 gpf/ 4.8 Lpf	ROYAL 186 – 0.5 RW	0.5 gpf/ 1.9 Lpf
REGAL 115 – 1.28 XL	1.28 gpf/ 4.8 Lpf	REGAL 186 – 0.125	0.125 gpf/ 0.5 Lpf
SLOAN 111 – 1.28	1.28 gpf/ 4.8 Lpf	REGAL 186 – 0.5 XL	0.5 gpf/ 1.9 Lpf
SLOAN 113 – 1.28	1.28 gpf/ 4.8 Lpf	SLOAN 186 – 0.125	0.125 gpf/ 0.5 Lpf
SLOAN 115 – 1.28	1.28 gpf/ 4.8 Lpf	SLOAN 186 – 0.5	0.5 gpf/ 1.9 Lpf
SLOAN 116 – 1.28	1.28 gpf/ 4.8 Lpf		
WES 111 Dual Flush*	1.28 gpf/ 4.8 Lpf		

\*Dual flush flushometer, with 1.6gpf/6.1 Lpf (regular flush) and 1.1 gpf/4.2 Lpf (reduced flush) options.

**2.2 Application**

Sloan flushometers are designed for use with toilet or urinal fixtures as the dispensing unit for the water supplied. The flushometers are primarily installed in commercial, industrial, and institutional markets worldwide.

**2.3 Representative Product**

All three of the diaphragm flushometer product lines share the same raw material component breakdown, mass, and the same manufacturing process, with the main differences being the internal configurations and slight shape changes to the exterior design. The Royal flushometer was selected as the representative product for the diaphragm flushometers in this study.

2.4 Flow Diagram

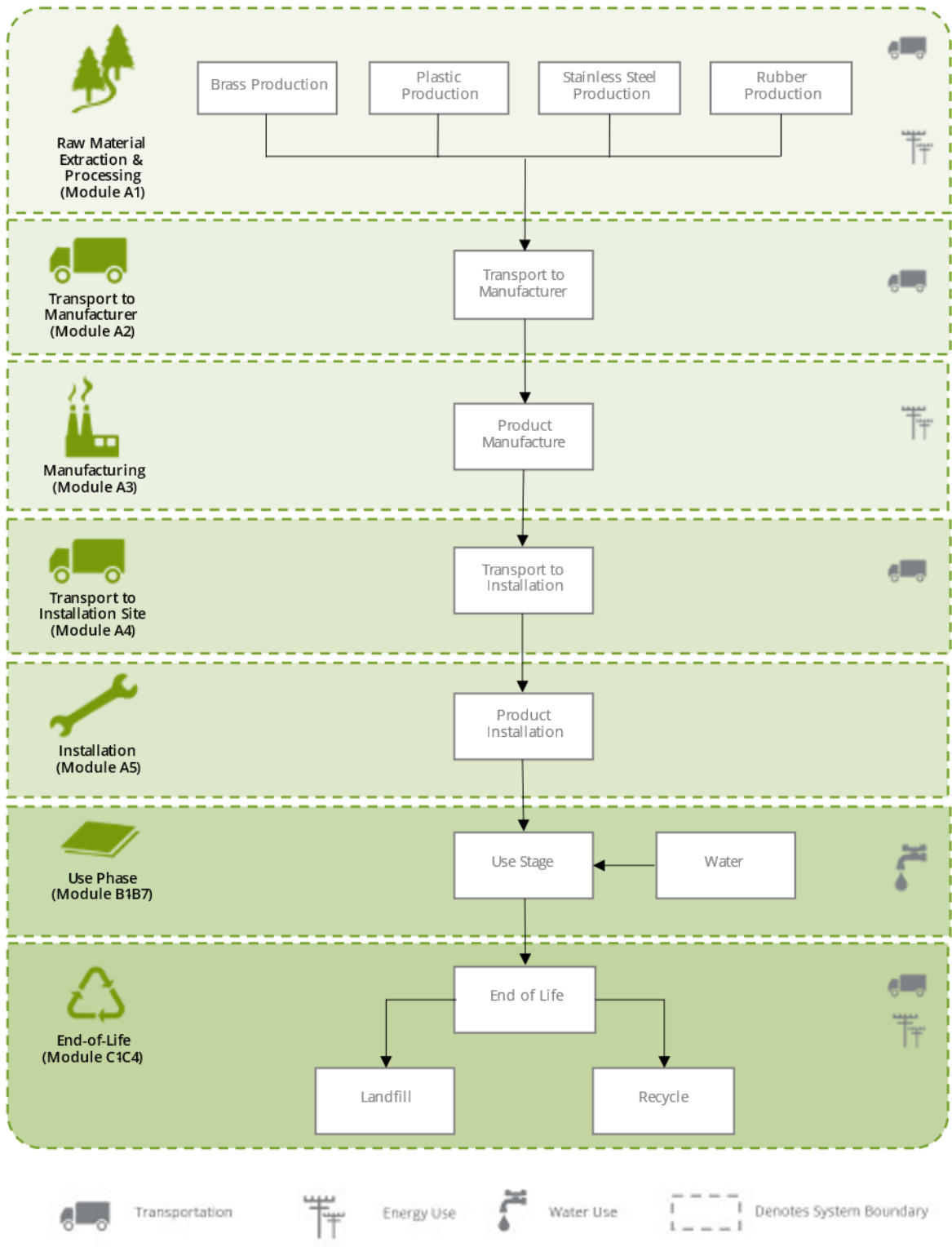


Figure 1. Flow diagram for the Sloan Diaphragm Flushometers.

## 2.5 Material Composition

**Table 2.** *Sloan Diaphragm Flushometer Material Components.*

Material	Mass (kg)	Percentage of Total Mass	Pre-Consumer Recycled Content	Post-Consumer Recycled Content
Brass	2.58	90.0%	67-99%	0%
HDPE	0.082	2.86%	0%	0%
ABS	0.041	1.42%	0%	0%
Stainless Steel	0.040	1.39%	0%	0%
EPDM	0.032	1.12%	0%	0%
Zinc	0.027	0.95%	0%	0%
Celcon	0.026	0.92%	0%	0%
Delrin	0.019	0.65%	0%	0%
Rubber	0.009	0.31%	0%	0%
Other	0.012	0.41%	0%	0%
<b>Total</b>	<b>2.87</b>	<b>100%</b>	-	-

## 2.5 Technical Requirements

**Table 3.** *Sloan Diaphragm Flushometer Technical Requirements.*

Property	Test Method	Unit	Value
Flow rate		Gallons per flush Liters per minute	0.125 – 1.28 0.5 – 4.8
Operational water pressure	ASME A112.18.1-2018/ CSA B125.1-18	PSI	Max: 80 Min: 15

## 3. LCA: METHODOLOGICAL FRAMEWORK

### 3.1 Functional Unit

The functional unit used in the study is one (1) packaged, installed unit with a reference service life (RSL) of 10 years. The building estimated service life (ESL) is assumed to be 75-years in order to be consistent with ASHRAE 189.1 (2014, Section 9.5.1).

**Table 4.** *Sloan Diaphragm Flushometer Functional Unit Properties.*

Property	Unit	Value
Functional Unit	One (1) packaged, installed product	
RSL	Years	10
ESL	Years	75
Mass	kg	2.87



### 3.2 System Boundary

The scope of the EPD is cradle-to-grave, including raw material extraction and processing; raw material transportation; product manufacture, including packaging; product distribution; installation; use; and end-of-life.

**Table 5.** Sloan Diaphragm Flushometer System Boundaries.

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

X = Included in system boundary

MND = Module not declared

### 3.3 Allocation

Manufacturing resource use was allocated to the products based on mass. Impacts from transportation were allocated based on the mass of material and distance transported.

### 3.3 Cut-off criteria

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results.

### 3.4 Data Sources

Primary data were provided by Sloan for the Franklin Park and Augusta facilities. In addition, primary data was collected for the brass supplier, H. Kramer, in Chicago, IL. The principal source of secondary LCI data is the Ecoinvent 3.8 database.

**Table 6.** LCI datasets and associated databases used to model the Sloan Diaphragm Flushometer products.

Component	Dataset	Data Source	Publication Date
<b>Product</b>			
ABS	market for acrylonitrile-butadiene-styrene copolymer   acrylonitrile-butadiene-styrene copolymer   Cutoff, U	Ecoinvent 3.8	2021
	market for injection moulding   injection moulding   Cutoff, U	Ecoinvent 3.8	2021
Brass (H. Kramer)	market for borax, anhydrous, powder   borax, anhydrous, powder   Cutoff, U	Ecoinvent 3.8	2021
	market for lead smelter slag   lead smelter slag   Cutoff, U	Ecoinvent 3.8	2021
	market for soda ash, dense   soda ash, dense   Cutoff, U	Ecoinvent 3.8	2021
	market for scrap copper   scrap copper   Cutoff, U	Ecoinvent 3.8	2021
	market for zinc scrap, post-consumer   zinc scrap, post-consumer   Cutoff, U	Ecoinvent 3.8	2021
Celcon	market for polypropylene, granulate   polypropylene, granulate   Cutoff, U	Ecoinvent 3.8	2021
	market for injection moulding   injection moulding   Cutoff, U	Ecoinvent 3.8	2021
Delrin	market for polypropylene, granulate   polypropylene, granulate   Cutoff, U	Ecoinvent 3.8	2021
	market for injection moulding   injection moulding   Cutoff, U	Ecoinvent 3.8	2021
EPDM	market for synthetic rubber   synthetic rubber   Cutoff, U	Ecoinvent 3.8	2021
	market for injection moulding   injection moulding   Cutoff, U	Ecoinvent 3.8	2021

Component	Dataset	Data Source	Publication Date
HDPE	market for polyethylene, high density, granulate   polyethylene, high density, granulate   Cutoff, U	Ecoinvent 3.8	2021
	market for injection moulding   injection moulding   Cutoff, U	Ecoinvent 3.8	2021
LDPE	market for polyethylene, low density, granulate   polyethylene, low density, granulate   Cutoff, U	Ecoinvent 3.8	2021
	market for injection moulding   injection moulding   Cutoff, U	Ecoinvent 3.8	2021
Molykote	market for lubricating oil   lubricating oil   Cutoff, U	Ecoinvent 3.8	2021
Noryl	market for polypropylene, granulate   polypropylene, granulate   Cutoff, U	Ecoinvent 3.8	2021
	market for injection moulding   injection moulding   Cutoff, U	Ecoinvent 3.8	2021
Nylon	market for nylon 6-6   nylon 6-6   Cutoff, U	Ecoinvent 3.8	2021
	market for injection moulding   injection moulding   Cutoff, U	Ecoinvent 3.8	2021
Other Brass	market for brass   brass   Cutoff, U	Ecoinvent 3.8	2021
	market for casting, brass   casting, brass   Cutoff, U	Ecoinvent 3.8	2021
	market for lead smelter slag   lead smelter slag   Cutoff, U	Ecoinvent 3.8	2021
	market for scrap copper   scrap copper   Cutoff, U	Ecoinvent 3.8	2021
	market for zinc scrap, post-consumer   zinc scrap, post-consumer   Cutoff, U	Ecoinvent 3.8	2021
Rubber	market for synthetic rubber   synthetic rubber   Cutoff, U	Ecoinvent 3.8	2021
	market for injection moulding   injection moulding   Cutoff, U	Ecoinvent 3.8	2021
Stainless Steel	market for steel, chromium steel 18/8   steel, chromium steel 18/8   Cutoff, U	Ecoinvent 3.8	2021
	market for casting, steel, lost-wax   casting, steel, lost-wax   Cutoff, U	Ecoinvent 3.8	2021
Vulcanized Fiber	market for cellulose fibre   cellulose fibre   Cutoff, U	Ecoinvent 3.8	2021
	market for blow moulding   blow moulding   Cutoff, U	Ecoinvent 3.8	2021
Zinc	market for zinc   zinc   Cutoff, U	Ecoinvent 3.8	2021
	market for metal working, average for metal product manufacturing   metal working, average for metal product manufacturing   Cutoff, U	Ecoinvent 3.8	2021
<b>Package</b>			
Cardboard	market for corrugated board box   corrugated board box   Cutoff, U	Ecoinvent 3.8	2021
Paper	market for kraft paper   kraft paper   Cutoff, U	Ecoinvent 3.8	2021
Pulp Tray	market for deinked pulp, wet lap   deinked pulp, wet lap   Cutoff, U	Ecoinvent 3.8	2021
<b>Transport</b>			
Truck	market for transport, freight, lorry 16-32 metric ton, EURO4   transport, freight, lorry 16-32 metric ton, EURO4   Cutoff, U	Ecoinvent 3.8	2021
Ship	market for transport, freight, sea, container ship   transport, freight, sea, container ship   Cutoff, U	Ecoinvent 3.8	2021
<b>Manufacture</b>			
Augusta, AR Electricity	SRMV eGRID	EPA	2019
Franklin Park, IL Electricity	RFCW eGRID	EPA	2019
H. Kramer (Chicago, IL) Electricity	RFCW eGRID	EPA	2019
Hard Coal (H. Kramer)	market for hard coal   hard coal   Cutoff, U	Ecoinvent 3.8	2021
Natural Gas	market for heat, district or industrial, natural gas   heat, district or industrial, natural gas   Cutoff, U	Ecoinvent 3.8	2021
Propane	market for propane   propane   Cutoff, U	Ecoinvent 3.8	2021
Water	market for tap water   tap water   Cutoff, U	Ecoinvent 3.8	2021
<b>Waste</b>			
Hazardous Waste	market for hazardous waste, for incineration   hazardous waste, for incineration   Cutoff, U	Ecoinvent 3.8	2021
Landfill	market for inert waste, for final disposal   inert waste, for final disposal   Cutoff, U	Ecoinvent 3.8	2021
Wastewater	market for wastewater, average   wastewater, average   Cutoff, U	Ecoinvent 3.8	2021



### 3.5 Data Quality

**Table 7.** *Data Quality Assessment.*

Data Quality Parameter	Data Quality Discussion
<b>Time-Related Coverage:</b> Age of data and the minimum length of time over which data is collected	The manufacturer provided primary data on product manufacturing for the Franklin Park facility on annual production for 2020. Primary data for the intermediate processing of brass components, including brass ingot production, and sand-casting operations, were provided by the H. Kramer supplier and the Sloan foundry respectively, based on annual production for 2020. Representative datasets (secondary data) for upstream and background processes are generally less than 5 years old.
<b>Geographical Coverage:</b> Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data modelled for the specific eGRID subregions represented in this study. Surrogate data used in the assessment are representative of global or European operations and are considered sufficiently similar to actual processes.
<b>Technology Coverage:</b> Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative component datasets, specific to the type of material, are used to represent the actual processes, as appropriate.
<b>Precision:</b> Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one more years and over multiple operations, which is expected to reduce the variability of results.
<b>Completeness:</b> Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
<b>Representativeness:</b> Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
<b>Consistency:</b> Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.8 data where available. Different portions of the product life cycle are equally considered.
<b>Reproducibility:</b> Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of the data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
<b>Sources of the Data:</b> Description of all primary and secondary data sources	Data representing energy use at Sloan's manufacturing facilities represent a 12-month average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI data, Ecoinvent v3.8 data are used.
<b>Uncertainty of the Information:</b> Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the products and packaging is low. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment methodology includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

### 3.6 Period under review

The period of review is based on a 12-month period from January 2020 through December 2020.

### 3.7 Comparability

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

### 3.8 Estimates and Assumptions

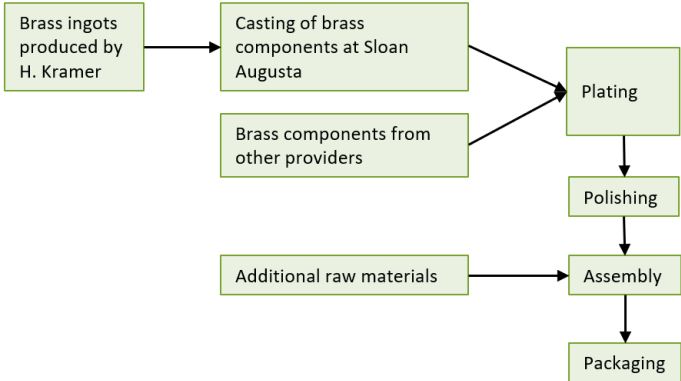
- Specific data were not available on acetal polymers in the product recipe such as Celcon M90 and Delrin 500. Secondary datasets for polypropylene were used from the Ecoinvent database to represent these polymers in the LCA model.
- The brass raw material inputs are assumed to be 67.3% [1] recycled material, based on the U.S. EPA Advancing Sustainable Materials Management Fact Sheet.
- The Franklin Park facility is located in the RFCW EPA eGRID subregion, the Augusta foundry is located in the SRMV EPA eGRID subregion, and the Andover facility manufacturing the sensor components is located in the NEWE EPA eGRID subregion. Ecoinvent datasets for the EPA subregion were modified to reflect the eGRID electricity supply mixes for RFCW, SRMV, and NEWE subregions to estimate resource use and emissions from electricity use at the facilities.
- Product transport from point of purchase to the building site is assumed to be 500 km as required by the Part B PCR.
- Product transport from the Sloan distribution center in Los Angeles, CA to points of purchase was assumed to be 2725 km, representing an average of several major cities across the United States.
- Installation of the products is assumed to be manual, requiring no additional materials or energy use.
- Transport of the packaging waste at installation is assumed to be 100 km as required by the Part B PCR.
- Transport of the product at end-of-life to waste processing and disposal is assumed to be 100 km as required by the Part B PCR.
- The Reference Service Life (RSL) of the products was modeled as 10 years, as required by the Part B PCR.
- The Estimated Service Life (ESL) of the building/construction works was assumed to be 75 years, as required by the Part B PCR, in order to be consistent with ASHRAE 189.1 (2014, Section 9.5.1).
- The maintenance of the products is assumed to include daily cleaning with a cleaning solution of 10 ml of 1% sodium lauryl sulfate solution as specified in the Part B PCR.
- The repair of the products is assumed to include the component part replacement of several of the internal component parts, 1-2 times over the RSL, according to manufacturer experts.
- The products are assumed to require no replacement during the 10-year RSL, but in accordance with the Part A PCR and Part B PCR, requires replacement 6.5 times over the 75-year ESL.
- The use phase modules B5 (Refurbishment) and B6 (Operational Energy Use) are assumed to have no impacts, as there is no resource or energy use associated with these modules.
- The use phase modules are modelled for the building/construction works ESL of 75 years.
- For the product end-of-life, disposal of product is assumed to follow the disposal scenario indicated in the Part A PCR.

## 4. LCA: TECHNICAL INFORMATION AND SCENARIOS

### 4.1 Manufacture

The manufacturing facility is located at 10500 Seymour Avenue, Franklin Park, IL 60131 and the foundry is located at 2719 Business HWY 33 South, Augusta, AR 72006.

The brass component parts of the flushometers cast at the Sloan foundry in Augusta and then shipped to the Franklin Park facility for polishing, plating, and assembly. This module also includes the packaging for the products prior to shipping.



### 4.2 Packaging

**Table 8.** Sloan Diaphragm Flushometer Packaging Material Components.

Packaging material	Mass (kg)	Percentage of Total Mass	Pre-Consumer Recycled Content	Post-Consumer Recycled Content
Shipping Carton	0.193	38.4%	0%	0%
Inner Carton	0.153	30.4%	0%	0%
Pulp Tray	0.144	28.6%	0%	0%
Paper	0.013	2.60%	0%	0%
<b>Total</b>	<b>0.503</b>	<b>100%</b>	-	-

### 4.3 Transportation

**Table 9.** Sloan Diaphragm Flushometer Transportation Summary.

Name	Unit	Value
Fuel type	-	Diesel
Liters of fuel	l/100 km	18.7
Vehicle Type	-	Freight Truck
Transport Distance	km	6455
<i>Franklin Park, IL to Los Angeles, CA</i>	<i>km</i>	<i>3230</i>
<i>Los Angeles, CA to various US cities (average)</i>	<i>km</i>	<i>2725</i>
<i>Point of purchase to installation (per PCR)</i>	<i>km</i>	<i>500</i>
Capacity utilization	%	50
Gross mass of products transported <sup>1</sup>	kg	3.37

<sup>1</sup> including packaging

#### 4.4 Installation

The installation of the flushometer products is completed using manual labor and does not require additional ancillary materials. Waste is generated from the disposal of the packaging materials and is modeled as required in the Part A PCR.

**Table 10.** *Sloan Diaphragm Flushometer Installation Summary.*

Name	Unit	Diaphragm Flushometer
Ancillary materials	kg	0
Net freshwater consumption specified by water source and fate	m <sup>3</sup>	0
Other resources	kg	0
Electricity consumption	kwh	0
Other energy carriers	MJ	0
Product loss per functional unit	kg	0
Waste materials at the construction site before waste processing, generated by product installation	kg	0
Output materials resulting from on-site waste processing	kg	0
Mass of packaging waste specified by type	kg	0.503
	<i>Recycle</i> kg	0.378
	<i>Landfill</i> kg	0.101
	<i>Incineration</i> kg	0.025
Biogenic carbon contained in packaging	kg CO <sub>2</sub>	0.923
Direct emissions to ambient air, soil, and water	kg	0
VOC emissions	µg/m <sup>3</sup>	0

#### 4.5 Use

**Table 11.** *Sloan Diaphragm Flushometer Maintenance Summary.*

Maintenance	Unit	Diaphragm Flushometer
Description of process	-	Daily cleaning with 10 ml 1% sodium lauryl sulfate solution
Maintenance cycle	Cycles/RSL	3650
Maintenance cycle	Cycles/ESL	27,375
Net freshwater consumption		
	<i>City water disposed to sewer</i> m <sup>3</sup>	0.010
Ancillary materials		
	<i>Sodium lauryl sulfate solution</i> kg	0.365
Other resources	kg	0
Energy input	kWh	0
Other energy carriers	kWh	0
Power output of equipment	kW	0
Waste materials from maintenance	kg	0
Direct emissions to ambient air, soil, and water	kg	0
Further assumptions for scenario development	-	-

**Table 12.** Sloan Diaphragm Flushometer Repair Summary.

Repair	Unit	Diaphragm Flushometer
Repair process information	-	Per manufacturer, some parts require replacement to repair product
Inspection process information	-	N/A
Repair cycle	Cycles/RSL	1-2
Repair cycle	Cycles/ESL	75-115
Net freshwater consumption	m <sup>3</sup>	0
Ancillary materials	kg	0.867
	<i>Brass</i>	kg
		0.627
	<i>ABS</i>	kg
		0.045
	<i>Celcon</i>	kg
		0.022
	<i>Delriin</i>	kg
		0.012
	<i>EPDM</i>	kg
		0.021
	<i>HDPE</i>	kg
		0.077
	<i>Molykote</i>	kg
		0.003
	<i>Noryl</i>	kg
		0.001
	<i>Nylon</i>	kg
		0.011
	<i>Stainless Steel</i>	kg
		0.047
	<i>Vulcanized Fiber</i>	kg
		0.001
Energy input	kWh	0
Waste materials from repair	kg	0.867
	<i>Landfill</i>	kg
		0.867
Direct emissions to ambient air, soil, and water	kg	0
Further assumption for scenario development	-	-

**Table 13.** Sloan Diaphragm Flushometer Replacement Summary.

Replacement	Unit	Diaphragm Flushometer
Reference Service Life	Years	10
Replacement cycle (ESL/RSL)-1	-	6.5
Energy input	kWh	0
Net freshwater consumption	m <sup>3</sup>	0
Ancillary materials	kg	0
Replacement of materials	kg	2.87
Direct emissions to ambient air, soil, and water	kg	0
Further assumptions for scenario development	-	-

**Table 14.** Sloan Diaphragm Flushometer Refurbishment Summary.

Refurbishment	Unit	Diaphragm Flushometer
Refurbishment process	-	N/A
Refurbishment cycle	Cycles/RSL	0
Refurbishment cycle	Cycles/ESL	0
Energy input	kWh	0
Net freshwater consumption	m <sup>3</sup>	0
Material input	kg	0
Waste materials	kg	0
Direct emissions to ambient air, soil, and water	kg	0
Further assumption for scenario development	-	-

**Table 15.** Sloan Diaphragm Flushometer Operational Energy and Water Use Summary.

Operational Energy and Water Use	Unit	Toilet Fixtures		Urinal Fixtures		
		1.11 gpf (4.2 Lpf)	1.28 gpf (4.8 Lpf)	0.125 gpf (0.473 Lpf)	0.25 gpf (0.946 Lpf)	0.5 gpf (1.89 Lpf)
Net freshwater consumption						
<i>City water to sewer</i>	m <sup>3</sup> /RSL	650	756	73.8	148	295
Ancillary materials	kg	0	0	0	0	0
Energy input	kWh	0	0	0	0	0
Equipment power output	kW	0	0	0	0	0
Characteristic performance	-	-	-	-	-	-
Direct emissions to ambient air, soil, water	kg	0	0	0	0	0
Further assumptions for scenario development (per PCR)						
<i>Number of users per product</i>	-	30		30		
<i>Number of uses per user per day</i>	-	2		2		
<i>Number of use days per year</i>	-	260		260		

\* For dual flush products, the Part B PCR specifies the flush volume is calculated using a 2:1 ratio to achieve an 'equivalent flush'. The 'equivalent flush' of the dual flush products within the Diaphragm product line fall within the ranges of the single flush product volumes specified for Toilet Fixtures.

#### 4.6 End-of-Life

**Table 16.** Sloan Diaphragm Flushometer End-of-Life Summary.

End-of-life	Unit	Diaphragm Flushometer	
Assumptions for scenario development		Manual deconstruction, followed by 100 km truck transport to final disposal in landfill	
Collection process	Collected separately	kg	0
	Collected with mixed construction waste	kg	2.87
Recovery	Reuse	kg	0
	Recycling	kg	2.25
	Landfill	kg	0.618
	Incineration	kg	0
	Incineration with energy recovery	kg	0
	Energy conversion	-	-
Disposal	Product of material for final deposition	kg	0.618
Removals of biogenic carbon (excluding packaging)	kg CO <sub>2</sub>		0

## 5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. All LCA results are stated to three significant figures in agreement with the PCR for this product and therefore the sum of the total values may not exactly equal 100%. Modules with zero (0) impacts: B1, B5, B6, C1, and C3 are omitted from the results tables. Module B7, Operational Water Use, is reported separately for the various flush volume applications available. The following environmental impact category indicators are reported using characterization factors using the CML-IA impact assessment method and the TRACI 2.1 impact assessment method.

**Table 17.** *Mandatory Environmental Impact Assessment Categories.*

CML-IA Impact Category	Unit	TRACI 2.1 Impact Category	Unit
<b>GWP:</b> Global Warming Potential	kg CO <sub>2</sub> eq.	<b>GWP:</b> Global Warming Potential	kg CO <sub>2</sub> eq.
<b>ODP:</b> Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	<b>ODP:</b> Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.
<b>AP:</b> Acidification Potential of soil and water	kg SO <sub>2</sub> eq.	<b>AP:</b> Acidification Potential of soil and water	kg SO <sub>2</sub> eq.
<b>EP:</b> Eutrophication Potential	kg PO <sub>4</sub> <sup>3-</sup> eq.	<b>EP:</b> Eutrophication Potential	kg N eq.
<b>POCP:</b> Photochemical Oxidant Creation Potential	kg C <sub>2</sub> H <sub>4</sub> eq.	<b>SFP:</b> Smog Formation Potential	kg O <sub>3</sub> eq.
<b>ADPE:</b> Abiotic Depletion Potential, elements	kg Sb eq	<b>FFD:</b> Fossil Fuel Depletion	MJ Surplus
<b>ADPF:</b> biotic Depletion Potential, fossil fuels	MJ		

These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes. The following inventory parameters, specified by the PCR, are also reported.

**Table 18.** *Additional Transparency Categories.*

Resources	Unit	Waste and Outflows	Unit
<b>RPR<sub>E</sub>:</b> Renewable primary resources used as energy carrier (fuel)	MJ, LHV	<b>HWD:</b> Hazardous waste disposed	kg
<b>RPR<sub>M</sub>:</b> Renewable primary resources with energy content used as material	MJ, LHV	<b>NHWD:</b> Non-hazardous waste disposed	kg
<b>NRPR<sub>E</sub>:</b> Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	<b>RWD:</b> Radioactive waste, conditioned, to final repository	kg
<b>NRPR<sub>M</sub>:</b> Non-renewable primary resources with energy content used as material	MJ, LHV	<b>CRU:</b> Components for re-use	kg
<b>SM:</b> Secondary materials	kg	<b>MR:</b> Materials for recycling	kg
<b>RSF:</b> Renewable secondary fuels	MJ, LHV	<b>MER:</b> Materials for energy recovery	kg
<b>NRSF:</b> Non-renewable secondary fuels	MJ, LHV	<b>EE:</b> Recovered energy exported from the product system	kg
<b>RE:</b> Recovered energy	MJ, LHV	<b>EE:</b> Recovered energy exported from the product system	MJ, LHV
<b>FW:</b> Use of new freshwater resources	m <sup>3</sup>		





### Sloan Diaphragm Flushometer Results

Table 19. Impact indicator results for Sloan Diaphragm Flushometers.

CML Impact Method	GWP	ODP	AP	EP	POCP	ADPE	ADPF
	kg CO <sub>2</sub> eq	kg CFC-11 eq	kg SO <sub>2</sub> eq	kg PO <sub>4</sub> <sup>3-</sup> eq	kg C <sub>2</sub> H <sub>4</sub> eq	kg Sb eq	MJ
A1	14.2	1.05x10 <sup>-6</sup>	0.330	0.121	0.013	0.011	155
A2	0.857	1.49x10 <sup>-7</sup>	0.004	0.001	1.30x10 <sup>-4</sup>	2.92x10 <sup>-6</sup>	12.6
A3	2.37	2.33x10 <sup>-7</sup>	0.005	0.003	3.90x10 <sup>-4</sup>	7.22x10 <sup>-6</sup>	26.1
<b>A1-A3 Total:</b>	<b>17.4</b>	<b>1.43x10<sup>-6</sup></b>	<b>0.340</b>	<b>0.125</b>	<b>0.013</b>	<b>0.011</b>	<b>194</b>
A4	3.71	6.45x10 <sup>-7</sup>	0.014	0.003	4.90x10 <sup>-4</sup>	1.29x10 <sup>-5</sup>	55.0
A5	0.071	8.33x10 <sup>-9</sup>	1.20x10 <sup>-4</sup>	7.52x10 <sup>-5</sup>	4.35x10 <sup>-6</sup>	1.60x10 <sup>-7</sup>	0.432
B2	14.8	8.95x10 <sup>-7</sup>	0.046	0.230	0.008	1.20x10 <sup>-4</sup>	55.7
B3	33.6	2.67x10 <sup>-6</sup>	0.417	0.149	0.017	0.012	412
B4	138	1.36x10 <sup>-5</sup>	2.30	0.836	0.091	0.070	1630
C2	0.049	8.50x10 <sup>-9</sup>	1.90x10 <sup>-4</sup>	4.40x10 <sup>-5</sup>	6.40x10 <sup>-6</sup>	1.70x10 <sup>-7</sup>	0.725
C3	0.077	1.20x10 <sup>-8</sup>	4.60x10 <sup>-4</sup>	9.87x10 <sup>-5</sup>	1.45x10 <sup>-5</sup>	2.63x10 <sup>-7</sup>	1.10
C4	0.005	1.34x10 <sup>-9</sup>	3.18x10 <sup>-5</sup>	7.20x10 <sup>-6</sup>	1.27x10 <sup>-6</sup>	1.44x10 <sup>-8</sup>	0.118
TRACI Impact Method	GWP	ODP	AP	EP	SFP	FFD	
	kg CO <sub>2</sub> eq	kg CFC-11 eq	kg SO <sub>2</sub> eq	kg N eq	kg O <sub>3</sub> eq	MJ Surplus	
A1	13.9	1.29x10 <sup>-6</sup>	0.299	0.266	1.50	18.7	
A2	0.856	1.98x10 <sup>-7</sup>	0.005	0.001	0.105	1.81	
A3	2.29	2.81x10 <sup>-7</sup>	0.006	0.005	0.061	3.96	
<b>A1-A3 Total:</b>	<b>17.1</b>	<b>1.77x10<sup>-6</sup></b>	<b>0.309</b>	<b>0.272</b>	<b>1.66</b>	<b>24.5</b>	
A4	3.71	8.59x10 <sup>-7</sup>	0.017	0.004	0.405	7.85	
A5	0.071	9.84x10 <sup>-9</sup>	1.30x10 <sup>-5</sup>	1.60x10 <sup>-4</sup>	0.002	0.058	
B2	14.7	9.98x10 <sup>-7</sup>	0.051	0.529	0.608	5.57	
B3	32.9	3.29x10 <sup>-6</sup>	0.385	0.318	2.35	54.3	
B4	136	1.73x10 <sup>-5</sup>	2.12	1.80	13.5	212	
C2	0.049	1.13x10 <sup>-8</sup>	2.20x10 <sup>-4</sup>	5.33x10 <sup>-5</sup>	0.005	0.103	
C3	0.077	1.59x10 <sup>-8</sup>	0.001	1.00x10 <sup>-4</sup>	0.013	0.153	
C4	0.005	1.78x10 <sup>-9</sup>	3.76x10 <sup>-5</sup>	7.94x10 <sup>-6</sup>	0.001	0.017	

**Table 20.** Additional Resource Use and Waste indicators for the Sloan Diaphragm Flushometers.

INA = Indicator not assessed, | Neg.= Negligible

Resource Use	RPR <sub>E</sub>	RPR <sub>M</sub>	NRPR <sub>E</sub>	NRPR <sub>M</sub>	SM	RSF	NRSF	RE	FW
	MJ	MJ	MJ	MJ	kg	MJ	MJ	MJ	m <sup>3</sup>
A1	37.9	0.00	169	INA	2.18	Neg.	Neg.	Neg.	0.233
A2	0.146	0.00	12.8	INA	0.00	Neg.	Neg.	Neg.	0.002
A3	4.74	0.00	27.0	INA	0.00	Neg.	Neg.	Neg.	0.009
<b>A1-A3 Total:</b>	<b>32.8</b>	<b>0.00</b>	<b>209</b>	<b>INA</b>	<b>2.18</b>	<b>Neg.</b>	<b>Neg.</b>	<b>Neg.</b>	<b>0.244</b>
A4	0.641	0.00	55.7	INA	0.00	Neg.	Neg.	Neg.	0.007
A5	0.014	0.00	0.449	INA	0.00	Neg.	Neg.	Neg.	2.60x10 <sup>-4</sup>
B2	251	0.00	72.2	INA	0.00	Neg.	Neg.	Neg.	0.916
B3	48.4	0.00	440	INA	0.572	Neg.	Neg.	Neg.	0.377
B4	218	0.00	1730	INA	14.2	Neg.	Neg.	Neg.	1.64
C2	0.008	0.00	0.734	INA	0.00	Neg.	Neg.	Neg.	9.61x10 <sup>-5</sup>
C3	0.023	0.00	1.12	INA	0.00	Neg.	Neg.	Neg.	1.93x10 <sup>-4</sup>
C4	0.001	0.00	0.119	INA	0.00	Neg.	Neg.	Neg.	1.00x10 <sup>-4</sup>
Waste & Output	HWD	NHWD	HLRW/ILLRW	CRU	MR	MER	EE		
	kg	kg	kg	kg	kg	kg	MJ, LHV		
A1	0.003	4.67	4.50x10 <sup>-4</sup>	0.00	0.00	Neg.	Neg.		
A2	3.32x10 <sup>-5</sup>	0.633	8.38x10 <sup>-5</sup>	0.00	0.00	Neg.	Neg.		
A3	4.36x10 <sup>-5</sup>	1.21	3.76x10 <sup>-5</sup>	0.00	0.00	Neg.	Neg.		
<b>A1-A3 Total:</b>	<b>0.003</b>	<b>6.51</b>	<b>5.71x10<sup>-4</sup></b>	<b>0.00</b>	<b>0.00</b>	<b>Neg.</b>	<b>Neg.</b>		
A4	1.50x10 <sup>-4</sup>	2.83	3.60x10 <sup>-4</sup>	0.00	0.00	Neg.	Neg.		
A5	1.45x10 <sup>-6</sup>	0.498	2.73x10 <sup>-6</sup>	0.00	0.378	Neg.	Neg.		
B2	0.007	2.63	2.20x10 <sup>-4</sup>	0.00	0.00	Neg.	Neg.		
B3	0.004	17.5	0.001	0.00	0.00	Neg.	Neg.		
B4	0.024	82.9	0.006	0.00	17.1	Neg.	Neg.		
C2	1.94x10 <sup>-6</sup>	0.037	4.80x10 <sup>-6</sup>	0.00	0.00	Neg.	Neg.		
C3	2.84x10 <sup>-6</sup>	0.063	7.24x10 <sup>-6</sup>	0.00	0.00	Neg.	Neg.		
C4	2.12x10 <sup>-7</sup>	0.619	7.78x10 <sup>-7</sup>	0.00	2.25	Neg.	Neg.		

**Sloan Diaphragm Flushometer Results (B7 – Operational Water Use)****Table 21.** Impact indicator results for Sloan Diaphragm Flushometers Module B7.

CML Impact Method		Toilet Fixtures		Urinal Fixtures		
		1.1 gpf (4.2 Lpf)	1.28 gpf (4.8 Lpf)	0.125 gpf (0.473 Lpf)	0.25 gpf (0.946 Lpf)	0.5 gpf (1.89 Lpf)
GWP	kg CO <sub>2</sub> eq	7660	8910	870	1740	3480
ODP	kg CFC-11 eq	0.002	0.002	2.01x10 <sup>-4</sup>	4.01x10 <sup>-4</sup>	0.001
AP	kg SO <sub>2</sub> eq	42.0	48.8	4.77	9.54	19.1
EP	kg PO <sub>4</sub> <sup>3-</sup> eq	77.0	89.7	8.76	17.5	35.0
POCP	kg C <sub>2</sub> H <sub>4</sub> eq	2.00	2.32	0.227	0.454	0.907
ADPE	kg Sb eq	0.067	0.078	0.008	0.015	0.031
ADPF	MJ	82,900	96,400	9420	18,800	37,700
TRACI Impact Method		Toilet Fixtures		Urinal Fixtures		
		1.1 gpf (4.2 Lpf)	1.28 gpf (4.8 Lpf)	0.125 gpf (0.473 Lpf)	0.25 gpf (0.946 Lpf)	0.5 gpf (1.89 Lpf)
GWP	kg CO <sub>2</sub> eq	7610	8860	865	1730	3460
ODP	kg CFC-11 eq	0.002	0.002	2.13x10 <sup>-4</sup>	4.27x10 <sup>-4</sup>	0.001
AP	kg SO <sub>2</sub> eq	44.5	51.8	5.06	10.1	20.2
EP	kg N eq	177	206	20.1	40.2	80.4
SFP	kg O <sub>3</sub> eq	515	599	58.5	117	234
FFD	MJ Surplus	7260	8450	825	1650	3301

**Table 22.** Additional Resource Use and Waste indicators for the Sloan Diaphragm Flushometers Module B7.

INA = Indicator not assessed, | Neg.= Negligible

Resource Use		Toilet Fixtures		Urinal Fixtures		
		1.1 gpf (4.2 Lpf)	1.28 gpf (4.8 Lpf)	0.125 gpf (0.473 Lpf)	0.25 gpf (0.946 Lpf)	0.5 gpf (1.89 Lpf)
RPR <sub>E</sub>	Mj, LHV	9720	11,300	1100	2210	4420
RPR <sub>M</sub>	Mj, LHV	0.00	0.00	0.00	0.00	0.00
NRPR <sub>E</sub>	Mj, LHV	97,200	113,000	11,000	22,100	44,200
NRPR <sub>M</sub>	Mj, LHV	INA	INA	INA	INA	INA
SM	kg	0.00	0.00	0.00	0.00	0.00
RSF	Mj, LHV	Neg.	Neg.	Neg.	Neg.	Neg.
NRSF	Mj, LHV	Neg.	Neg.	Neg.	Neg.	Neg.
RE	Mj, LHV	Neg.	Neg.	Neg.	Neg.	Neg.
FW	m <sup>3</sup>	668	778	76.0	152	304
Waste & Output		Toilet Fixtures		Urinal Fixtures		
		1.1 gpf (4.2 Lpf)	1.28 gpf (4.8 Lpf)	0.125 gpf (0.473 Lpf)	0.25 gpf (0.946 Lpf)	0.5 gpf (1.89 Lpf)
HWD	kg	0.775	0.902	0.088	0.176	0.352
NHWD	Kg	3380	3930	384	767	1540
HLRW/ILLRW	kg	0.314	0.366	0.036	0.071	0.143
CRU	kg	0.00	0.00	0.00	0.00	0.00
MR	kg	0.00	0.00	0.00	0.00	0.00
MER	kg	Neg.	Neg.	Neg.	Neg.	Neg.
EE	Mj, LHV	Neg.	Neg.	Neg.	Neg.	Neg.

## 6. LCA: INTERPRETATION

The interpretation phase conforms to ISO 14044. The interpretation included the use of evaluation and sensitivity checks to steer the iterative process during the assessment, and a final evaluation including completeness, sensitivity, and consistency checks, at the end of the study.

The contributions to total impact indicator results are dominated by the use phase impacts, specifically, the operational water use module (B7) with as much as 90% of the overall impacts and secondly by the use phase replacement module (B4). When examining the results without the use phase impacts, the results are dominated by the raw material module (A1) with the manufacturing module (A3) and product transportation module (A4) also showing significant impacts.

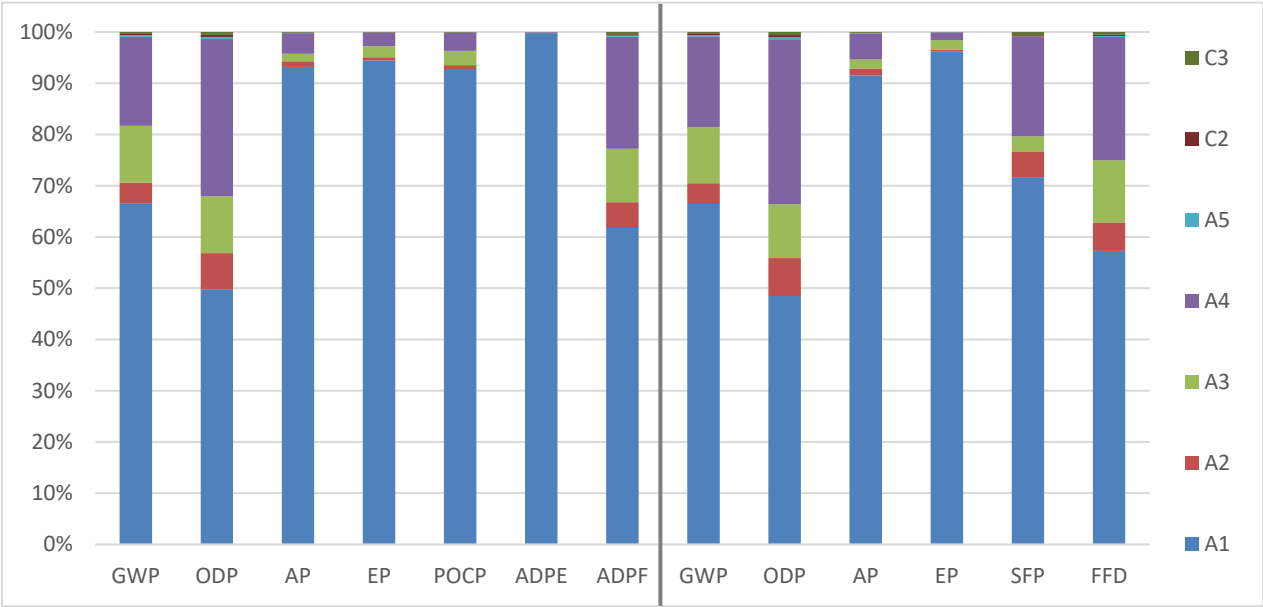


Figure 2. Contribution analysis for the Sloan Diaphragm Flushometers (excluding use phase).

## 7. ADDITIONAL ENVIRONMENTAL INFORMATION

Sloan is a proud member of the United States Green Building Council (USGBC) and through the use of Leadership in Energy and Environmental Design (LEED) Green Building Rating System, Sloan recognizes and validates the importance of best-on-class building strategies and practices of high performing green buildings. Sloan’s flushometers within this EPD can be used to help achieve water efficiency goals as well as gaining USGBC LEED v4 points and complying with building codes.

No environmental or health impacts are expected due to extraordinary effects including fire and/or water damage and product destruction

For more information on Sloan’s certifications and environmental initiatives please visit the website at [www.sloan.com](http://www.sloan.com).

## 8. REFERENCES

1. Advancing Sustainable Materials Management: 2018 Fact Sheet: Assessing Trends in Materials Generation and Management in the United States. U.S. EPA. December 2020. <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/advancing-sustainable-materials-management>
2. CML-IA Characterization Factors. Leiden University, Institute of Environmental Sciences. April 2013. <https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors>
3. Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI). U.S. EPA.
4. Ecoinvent v3.8 2021. Swiss Center for Life Cycle Inventories, 2010. <http://www.ecoinvent.org>
5. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
6. ISO 14040: 2006/Amd 1:2020 Environmental Management – Life cycle assessment – Principles and Framework
7. ISO 14044: 2006/Amd 1:2017/ Amd 2:2020 Environmental Management – Life cycle assessment – Requirements and Guidelines.
8. ISO 21930: 2017 Sustainability in building construction – Environmental declaration of building products.
9. Life Cycle Assessment of Diaphragm and Piston Manual Flushometers. SCS Global Services Final Report. Prepared for Sloan Valve Company. March 2022.
10. SCS Type III Environmental Declaration Program: Program Operator Manual. V11.0 November 2021. SCS Global Services.
11. European Joint Research Commission. International Reference Life Cycle Data System handbook. *General guide for Life Cycle Assessment – Detailed Guidance*. © European Union, 2010.
12. UL. PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. December 2018.
13. UL PCR Guidance for Building-Related Products and Services Part B: Kitchen and Bath Fixture Fittings and Accessory Products EPD Requirements. Version 1.0. October 2020.

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