Technical Guidance

Embodied Carbon Lifecycle Assessment

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LCA Rev 3

Albion Valves (UK) Ltd – Embodied Carbon Lifecycle Assessment (LCA) in accordance with ISO 14011 / ISO 14040 & BS EN 15804

Contents

1. Introduction

An Embodied Carbon Lifecycle Assessment (LCA) is a document which clearly and accurately communicates to interested parties the environmental performance or impact of a given product or material over its lifetime from raw material extraction to the end of useful life.

Within the construction industry, LCAs support carbon emission reduction, by making it possible to compare the impacts of various materials and products to select the most suitable and environmentally sustainable option for Mechanical, Electrical & Plumbing (MEP).

By using data that is provided in LCAs, interested parties can choose the most environmentally sustainable option for their project, and manufacturers are able to optimise the impact of their products and market their carbon transparency.

2. Scope of This Document

The focus of this document is to allow Albion Valves (UK) Ltd the opportunity to show to all interested parties the embodied carbon emissions for products which may be supplied for MEP Projects. In this document the term “carbon” relates to all greenhouse gases that may have a detrimental impact on global warming.

This is a Self-Declared Embodied Carbon Lifecycle Assessment (LCA) that is based on CIBSE TM 65 Calculation Methodology. The total embodied carbon is reported in kgC02e of carbon dioxide equivalents regardless of the type of Greenhouse Gases (GHG) that are emitted, this allows for uniformed reporting regardless of the GHG emitted.

3. Business Benefits of LCAs

Currently, LCAs in MEP projects and manufacturing are completed on a purely voluntary basis. However, their use is rapidly growing as interested parties become more aware of the

environmental sustainability and impacts of their respective projects over their useful lifetime, and the impact these products may have on the world in which we live.

LCAs accurately reveal the impact that each product has, whether this is good or bad thus giving the relevant interested parties the ability to make factual based decisions regarding product selection.

4. Greenhouse Gases (GHG) & Carbon Dioxide Equivalents

Greenhouse Gases are the gases in the atmosphere that raise the surface temperature of planets such as Earth. What distinguishes them from other gases is that they absorb the wavelengths of radiation that a planet emits, resulting in the greenhouse effect.

The GHG inventory covers seven greenhouse gases:

- **Carbon dioxide (CO2)**

Carbon dioxide enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and other biological materials, and also as a result of certain chemical reactions (e.g., cement production). Carbon dioxide is removed from the atmosphere (or “sequestered”) when it is absorbed by plants as part of the biological carbon cycle.

- **Methane (CH4)**

Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, land use, and by the decay of organic waste in municipal solid waste landfills.

- **Nitrous oxide (N2O)**

Nitrous oxide is emitted during agricultural land use, and industrial activities; combustion of fossil fuels and solid waste; as well as during treatment of wastewater.

- **Hydrofluorocarbons (HFCs)**
- **Perfluorocarbons (PFCs)**
- **Sulphur hexafluoride (SF6)**
- **Nitrogen trifluoride (NF3)**

Hydrofluorocarbons, Perfluorocarbons, Sulfur Hexafluoride, and Nitrogen Trifluoride are synthetic, powerful greenhouse gases that are emitted from a variety of household, commercial, and industrial applications and processes. Fluorinated gases (especially hydrofluorocarbons) are sometimes used as substitutes for stratospheric ozone-depleting substances (e.g., chlorofluorocarbons, hydrochlorofluorocarbons, and halons). Fluorinated gases are typically emitted in smaller quantities than other greenhouse gases, but they are potent greenhouse gases. With global warming potentials (GWPs) that typically range from thousands to tens of thousands, they are sometimes referred to as high-GWP gases because, for a given amount of mass, they trap substantially more heat than CO2.

Conversion factors for all GHG are shown below in Table 1: -

Table 1

Greenhouse Gas	Global Warming Potential (GWP)
Carbon Dioxide (CO2)	1
Methane (CH4)	29.8
Nitrous Oxide (N2O)	273
Hydroflurocarbons (HFCs)	5 – 14600
Perfluorocarbons (PFCs)	78 – 12400
Sulphur hexafluoride (SF6)	25200
Nitrogen trifluoride (NF3)	17400

5. Embodied Carbon Calculation Methodology

Depending upon the level of information provided by a manufacturer, two calculation methods exist within CIBSE TM65. These two calculation methods are: -

- **"Basic" calculation method**

Requires information only on material content and refrigerants used (if relevant).

- **"Mid-level" calculation method**

Requires further pieces of additional information such as energy used in manufacture and location of the manufacturing plant to enable a calculation to be performed.

Albion Valves (UK) Ltd always strives to use a "Mid-Level" calculation method for all published data. If a "Mid-Level" calculation is not available for a given product, this will be highlighted on the data report.

6. References

- ISO 19011 – Guidelines for environmental auditing.
- ISO 14040 – Environmental management – Life cycle assessment.
- BS EN 15804 - Sustainability of construction works - environmental product declarations - core rules for the product category of construction products.
- CIBSE TM65 - Embodied carbon in building services: A calculation methodology (2021).

7. Appendix

Appendix 1

Cast Iron Products

Embodied Carbon Lifecycle Assessment (LCA) Results

Cast iron valves are used in various industrial and commercial applications. They are an ideal material of choice due to their durability, mechanical strength, and resistance to wear and corrosion. These valves are typically made from different grades of cast iron, such as grey iron, ductile iron, or malleable iron. They are an ideal choice when there is a need to control the flow of liquids or gases through a pipeline.

Cast Iron
Result of mid-level calculation (kgCO2e)

Ball Valves

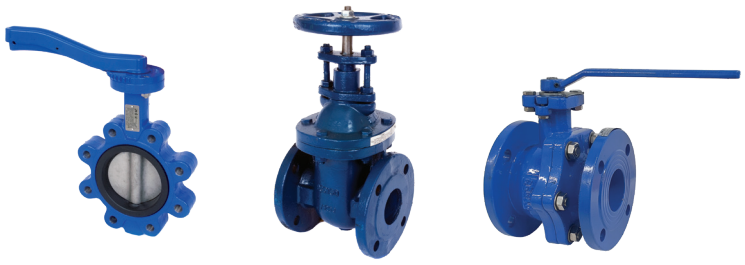
DN	25	50	65	80	100	125	150	200	250	300
ART 280	14	23	25	33	47	52	71	101	126	293

Butterfly Valves

DN	50	65	80	100	125	150	200	250	300
ART 135	17	20	27	36	42	51	97	116	153
ART 135GB	32	33	42	49	60	68	126	161	205
ART 140	31	34	40	46	58	65	98	140	195
ART 140GB	36	38	49	55	65	75	123	173	210
ART 145	17	20	27	36	42	51	97	116	153
ART 115	12	14	17	22	27	33	59	90	135
ART 115GB	27	28	32	40	51	56	69	82	112
ART 125	15	18	24	30	42	49	82	124	179
ART 125GB	20	22	33	39	49	59	107	157	204

Gate Valves

DN	50	65	80	100	125	150	200	250	300
ART 235	87	108	132	212	357	430	606	937	1220
ART 233	79	99	133	190	296	358	552	797	1107
ART 234	66	87	95	169	248	331	468	769	1053
ART 105	42	61	72	94	130	168	254	412	667
ART 210	66	74	97	120	187	234	317	575	722
ART 223	87	113	144	224	346	413	717	956	1182
ART 224	68	93	105	143	296	341	526	879	1201
ART 225	81	94	116	185	292	351	538	857	1107



Globe Valves

DN	50	65	80	100	125	150	200	250	300
ART 260	84	116	155	287	337	449	743	1129	1584

Check Valves

DN	50	65	80	100	125	150	200	250	300
ART 237	51	65	84	108	177	242	328	536	784
ART 170	65	89	108	161	259	328	521	847	1177
ART 167	80	114	151	225	300	469	737	1083	1531
ART 121	9	14	21	33	42	52	98	149	241
ART 136	5	9	11	16	23	32	49	70	129
ART 162	35	43	49	64	94	113	172	281	400
ART 163	28	35	42	58	76	105	165	285	385

Strainers

DN	50	65	80	100	125	150	200	250	300
ART 183	37	68	75	98	147	166	277	467	664
ART 185 / 185TP	37	68	75	98	147	166	277	467	664
ART 187	35	44	57	96	123	168	261	452	642

Hydronic Balancing

DN	50	65	80	100	125	150	200	250	300
ART 250	52	71	88	126	176	235	528	817	1210
ART 255	52	71	88	126	176	235	528	817	1210

Pressure Control Valves

DN	50	65	80	100	125	150	200	250	300
ART 6200	60	69	91	108	223	263	414	762	1375
ART 6800	68	82	105	124	242	283	438	778	1408
ART 6100 ON/OFF	57	68	89	104	204	262	443	727	1335
ART 6100 Modulating	57	68	89	102	203	259	437	727	1335
ART 6500	56	65	85	102	216	256	401	736	1341
ART 6600	57	65	85	101	216	256	401	736	1341

Appendix 2

Brass, DZR Brass, and Bronze Products

Embodied Carbon Lifecycle Assessment (LCA) Results

Valves manufactured from Brass, DZR Brass and Bronze are used in many industrial, commercial, and domestic applications. Both Brasses and Bronze are an ideal material for plumbing products due to its flexibility in manufacturing and performance. Brasses and Bronze are available in a wide selection of grades based on both corrosion resistance and mechanical performance and have been used successfully in plumbing products for many years.

Brass, DZR Brass, and Bronze
Result of mid-level calculation (kgCO2e)

Ball Valves

DN	1/4" DN8	3/8" DN10	1/2" DN15	3/4" DN20	1" DN25	1.1/4" DN32	1.1/2" DN40	2" DN50	2.1/2" DN65	3" DN80	4" DN100
ART 40 / ART 50	1	1	2	2	3	6	8	12	19	30	54
ART 40 (handles)	0	0	0	0	1	1	1	2	4	4	5
Tee Handles	0	0	0	0	0						
ART 257C			1	1	1	1	1	2	6		
ART 96			1	1	1						
ART 97X			1	1	1	3	3	3			
ART 59 / ART 89				3	4	7	10	17			
ART 55PRS			2	2	4	6	9	14			
ART 41	1	1	2	2	4	6	8	13			
ART 54	1	1	1	2	4	5	8	12	23	32	56
ART 54 (handles)	0	0	0	0	1	2	2	3	3	3	4
ART 18			1	1							
ART 345			2	4	6	8	12	21			
ART 340			1	2	3	5	7	11			
ART 11			2								

Gate Valves

DN	1/2" DN15	3/4" DN20	1" DN25	1.1/4" DN32	1.1/2" DN40	2" DN50	2.1/2" DN65	3" DN80	4" DN100	5" DN125	6" DN150
ART 610	2	2	3	5	6	10	18	23	41		
ART 640HW/ ART 640LS	2	2	3	5	6	10					
ART 175	3	4	5	8	11	17					
ART 615	2	3	4	8	11	18					
ART 375HW	4	5	7	10	13	20					
ART 375LS	3	4	6	9	13	19					
ART 335 (drilled and undrilled)	12	13	17	28	32	37	52	75	115	150	212
ART 325	2	3	5	7	9	14					
ART 330HW	2	2	3	5	7	11					
ART 330LS	1	2	3	5	6	10					

Globe Valves

DN	1/2” DN15	3/4” DN20	1” DN25	1.1/4” DN32	1.1/2” DN40	2” DN50
ART 350	5	6	10	14	21	33
ART 348	2	2	3	5	6	10

Check Valves

DN	3/8” DN10	1/2” DN15	3/4” DN20	1” DN25	1.1/4” DN32	1.1/2” DN40	2” DN50	2.1/2” DN65	3” DN80	4” DN100
ART 84M / ART 84R		1	2	3	3	6	8	14	19	39
ART 66	1	1	1	2	3	4	6	11	15	26
ART 36		1	2	3	4	6	11			
ART 37		1	2	3						
ART 38		1	1	2	3	3	7			
ART 39		1	1	2						
ART 360		11	12	16	27	32	35	50	74	113
ART 384		3	5	7	10	15	22			
ART 388		2	2	4	6	8	12			

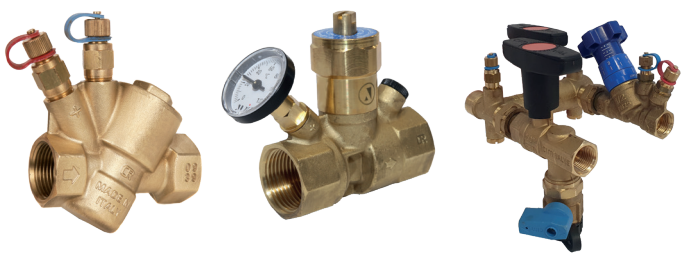
Strainers & Drain Cocks

DN	1/2” DN15	3/4” DN20	1” DN25	1.1/4” DN32	1.1/2” DN40	2” DN50	2.1/2” DN65	3” DN80	4” DN100
ART 68	1	2	3	4	6	9	14	20	32
ART 368	3	5	8	11	16	27			
ART 367	1	2	3	4	6	9			
ART 10	1	2							
ART 14	1								
ART 15	1								
ART 310	1	2							
ART 311	1	2							


Hydronic Balancing

DN	15UUL	15UL	15L	15ML	15	20	25	25L	32	40	50	N/A
ART 22			3	3	3	4	5		7	12	13	
ART 22 PRS					4	5	6		10	15	18	
ART 23			3		3	4	5		7	12	13	
ART 26			5		5	6	8		13	17	26	
ART 26 PRS					6	7	9		17	21	31	
ART 25					6	9	10		14	22	32	
ART 25 PRS					7	10	12		17	25	37	
Spare Handwheel ART 25 ART 26												2
ART 28					3	4	5		8	10	11	
ART 27	2	2	2	2	2	2	3		4	4	7	
ART 24C LP					7							
ART 24C HP					7	7	8					
ART 24									16	20	27	
ART 28DP					4	5	6		9	10	11	
ART 24 IT												2
ART 24670B												1
ART 20C LF					4	4						
ART 20C HF					4	7	8					
ART 20 LF					7	7						
ART 20 HF					7	7	9		12	21	27	
C23E												54
C23EL												54
C22VL												11

DN	15UUL	15UL	15L	15ML	15	20	25	25L	32	40	50	N/A
ART 29 / ART 29 c/w cartridge					4	4	4	13		11		
ART 32					4	4	6					
Monolink						16	25					
Monolink 22			15	15	15	20						



Appendix 3

Stainless Steel/Carbon Steel Products

Embodied Carbon Lifecycle Assessment (LCA) Results

Valves and fittings manufactured from stainless steel are used in many industrial, commercial, and domestic applications. Stainless steel is an ideal material to use due to its durability, resistance to corrosion and suitability for high pressure environments. Stainless steel products offer excellent mechanical performance and long-term reliability which contributes to a lower environmental impact.

Stainless Steel/Carbon Steel Valves and Fittings
Result of mid-level calculation (kgCO2e)

Screwed Valves

DN	1/4" DN8	3/8" DN10	1/2" DN15	3/4" DN20	1" DN25	1.1/4" DN32	1.1/2" DN40	2" DN50	2.1/2" DN65	3" DN80	4" DN100
Ball Valves											
ART 901L			1	2	3	5	6	9			
ART 902	5	5	5	10	14	23	38	58	111	169	
ART 912/922	5	5	7	12	16	27	41	66			
ART 803	9	9	10	16	23	37	54	78	158	263	
ART 993H	10	11	11	20	28	44	66	83	173	275	461
ART 995			18	30	41	71	99	141	190	296	494
ART 987T/988L	16	15	14	21	31	64	80	138	193	284	479
Gate Valves											
ART 960	7	7	9	12	15	24	30	46			
Globe Valves											
ART 961	9	8	8	11	15	26	32	48			
Check Valves											
ART 964			2	3	4	7	10	17	23	34	50
ART 965	6	6	5	8	12	18	22	36			
ART 966	4	3	5	6	9	14	22	31	54	84	146
Strainers											
ART 968	4	4	5	8	13	18	23	36	66	105	175
ART 969			40	57	80	105	133	200	284	385	444

Flanged Valves

DN	1/2" DN15	3/4" DN20	1" DN25	1.1/4" DN32	1.1/2" DN40	2" DN50	2.1/2" DN65	3" DN80	4" DN100	5" DN125	6" DN150	8" DN200
Ball Valves												
ART 924	9	11	14	22	29	42	65	92	134	276	390	768
ART 956	46	62	83	115	145	197	297	403	570			
ART 928	33	45	63	87	132	169	293	379	647			
ART 958	33	45	63	87	132	169	293	379	647			
ART 998L	25	38	53	75	102	132	196	281	428			
ART 997T	25	38	53	74	101	131	191	275	408			

DN	1.1/2” DN40	2” DN50	2.1/2” DN65	3” DN80	4” DN100	5” DN125	6” DN150	8” DN200	10” DN250	12” DN300
Check Valves										
ART 962	17	23	32	51	74	117	159	262	451	628
ART 963		18	24	29	50	70	101	170	280	442

Fittings

DN	1/2” DN15	3/4” DN20	1” DN25	1.1/4” DN32	1.1/2” DN40	2” DN50	2.1/2” DN65	3” DN80	4” DN100
90E	1	2	3	5	8	10	18	26	47
45E	1	2	3	4	6	9	15	21	35
90MF	1	2	3	5	7	11	18	28	50
ET	2	3	5	7	10	14	19	34	59
FS	1	1	2	3	4	6	11	14	23
HS	0	1	1	2	2	3	4	7	10
CSU	3	4	5	9	10	16	27	32	48
FFU	2	4	5	8	10	13	27	34	62
CSUMF	3	4	6	10	11	19	32	39	66
BN	1	2	2	4	5	8	13	22	28
WN	1	1	2	2	3	4	8	12	20
HN	1	1	2	3	4	6	13	16	25
SHP	1	1	1	2	2	3	6	9	20
HHP	1	1	2	2	3	5	9	11	20
HB	1	1	1	2	2	4	7	9	17
HA	1	2	3	4	6	10	17	23	31
RC	1	1	2	2	4	5	9	13	22

Reducing Fittings

DN	**40x25**	**40x32**	**50x25**	**50x32**	**50x40**	**65x50**	**80x50**	**100x50**	**100x80**
RB	3	2	6	5	5	8	15	28	25
DN	**40x25**	**40x32**	**50x25**	**50x32**	**50x40**	**65x50**	**80x5**	**100x50**	**100x80**
RS	5	5	7	7	7	11	16	28	28
DN	**20x15**	**25x20**	**32x25**	**40x32**	**50x40**				
RT	2	4	7	8	12				
DN	**40x25**	**40x32**	**50x25**	**50x32**	**50x40**	**65x50**	**80x50**	**100x80**	
RHN	4	4	6	6	7	12	17	23	

About Albion Valves (UK) Limited

Albion Valves (UK) Limited has been in the industrial heating and valve market for over 40 years, with this comes a wealth of knowledge and expertise that allows us to support our network of independent distributors and their customers.

Albion aims to supply a readily available, complete, quality valve solution alongside excellent cradle-to-grave support and service.

That is why we say, ‘It’s all at Albion’.

Quality

Whatever you need, you can rest assured that if it comes from Albion it has been designed and manufactured to deliver optimum performance and is accredited with the necessary approvals. Our in-house quality and technical departments are always on hand too!

Service

Our cradle-to-grave approach means you will never be on your own. Whether you need assistance with your system designs, an industry-leading turnaround time on your quote, or some help with commissioning after installation, we have a team to help!

Delivery

We know that time is money, and when a priority project depends on a part, you can trust Albion to deliver. We deliver 95% of products the next day with 99.98% accuracy!

Choice

We may have started with a single brass ball valve, but our range has grown substantially since and we can now offer a full building services valve solution, alongside a comprehensive range of valves for the industrial and process markets.

It is becoming more and more apparent to the industry, that it really is, all at Albion.