CONSTRUCTION INDUSTRY COUNCIL

CIC GREEN PRODUCT CERTIFICATION

Variable Refrigerant Flow Split Type System

Assessment Standard

(Version 1.1)

Last updated: 1 April 2019

Variable Refrigerant Flow Split Type System

Summary of Assessment Criteria

CORE CRITERIA

Criteria	*Requirements*	*Verification*	*Points*		*Index*
			Basic	*+Bonus*	
Product Information	The following product information on the product packaging, product catalogue and/or company website shall be provided for compliance: • Basic product specifications • The intended use of the product • Instructions for correct use and storage to maximize the lifetime of the product • Recommended operating conditions • Recommended maintenance instructions for the product • Installation method • Instructions for consumer product disposal • Country of origin	Documentation including, but not limited to, product label, product catalogue, MSDS, and written declaration	**5**		*4.1.2 (page 3)*

<table>
<tr>
<td>Serviceability</td>
<td>Quality, durability and performance properties of the product shall be demonstrated through at least <u>FIVE</u> testing items including, but not limited to, the followings:
<table>
<tr><th>Testing items</th><th>Relevant Types/ Conditions</th></tr>
<tr><td>Reference SEER/ SEERon</td><td rowspan="2">--</td></tr>
<tr><td>Reference SCOP/ SCOPon/ SCOPnet</td></tr>
<tr><td>Strength pressure test</td><td rowspan="4">Before installation</td></tr>
<tr><td>Tightness test</td></tr>
<tr><td>Functional test</td></tr>
<tr><td>Conformity test</td></tr>
<tr><td>Rating capacity test</td><td rowspan="4">After installation</td></tr>
<tr><td>Power consumptions</td></tr>
<tr><td>Air flow rate measurement</td></tr>
<tr><td>Heat recovery test</td></tr>
<tr><td>Starting test</td><td rowspan="8">Operating requirements</td></tr>
<tr><td>Test at maximum operating conditions</td></tr>
<tr><td>Freeze-up test</td></tr>
<tr><td>Outside the operating range</td></tr>
<tr><td>Shutting off the heat transfer medium flows</td></tr>
<tr><td>Complete power supply failure</td></tr>
<tr><td>Condensate draining and enclosure sweat test</td></tr>
<tr><td>Defrosting</td></tr>
<tr><td>Tightness test</td><td rowspan="7">Tightness performance of components and joints</td></tr>
<tr><td>Torque</td></tr>
<tr><td>Pressure-temperature vibration tests (PTV)</td></tr>
<tr><td>Freezing test</td></tr>
<tr><td>Vacuum Test</td></tr>
<tr><td>Compatibility Screening Test</td></tr>
<tr><td>Fatigue test</td></tr>
</table>
</td>
<td>Documentation including, but not limited to, test reports, product catalogue and MSDS</td>
<td>5</td>
<td></td>
<td>4.1.3 (page 4)</td>
</tr>
</table>

Refrigerant Safety Management	o Products shall conduct the leakage testing and the refrigerant. Manufacturer shall provide a factory testing report including the information of testing methodology and all calculation details leading to the end result of refrigerant leakage rate for compliance. **(basic points)** o Products shall be incorporated a leak detection system and send the alert to the Building Management System (BMS) for the leakage. The leakage detection system shall be able to communicate with Building Management System (BMS) via an open standard communication interface including but not limited to BACnet, ZigBee and LonWorks. **(+5 bonus points)**	Documentation including, but not limited to, test reports, product catalogue, MSDS and written declaration	**5**	+5	*4.4.5 (page 8)*
Energy Efficiency	Product shall demonstrate the COP at full load that exceeds requirements of the latest Building Energy Codes: • at least 5% (10 Basic) • at least 8% (+5 Bonus) • at least 10% (+10 Bonus) • at least 12% (+15 Bonus) • at least 15% (+20 Bonus) Standard rating condition shall be referred to the latest Building Energy Codes.	Documentation including, but not limited to, test reports, product catalogue and MSDS	**10**	+5/+10/ +15/+20	*4.3.1 (page 6)*
Paint Used	o The concentration of the following heavy metal or their compounds in the paints used on the products shall be less than 0.01% by weight of the product. • Cadmium (Cd) • Lead (Pb) • Chromium VI (Cr(VI)) • Mercury (Hg)	Laboratory test report(s) and any production documentation	**10**		*4.2.1 (page 5)*

<table>
<tr><td></td><td>If the paints used on the products contain the Barium (excluding barium sulfate) or its compounds, the concentration shall be less than 0.1% by weight of the product.

o Volatile organic compounds content of the paint used on the products shall be equal to or less than 500g/L minus water.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Noise Level</td><td>Noise level of both outdoor and indoor units shall be complied with the following requirement.

<table><tr><th rowspan="2">Nominal Cooling Capacity (kW)</th><th colspan="2">Limit [dB (A)]</th></tr><tr><th>Indoor</th><th>Outdoor</th></tr><tr><td><2.5</td><td>≤40</td><td>-</td></tr><tr><td>≥2.5 to <4.0</td><td>≤45</td><td>-</td></tr><tr><td>≥4.0 to <10.0</td><td>≤50</td><td>≤60</td></tr><tr><td>≥10.0 to <35.0</td><td>≤55</td><td>≤65</td></tr><tr><td>≥35.0</td><td>≤55</td><td>≤70</td></tr></table></td><td>Documentation including, but not limited to, test reports, product catalogue and MSDS</td><td>10</td><td></td><td>4.2.4 (page 6)</td></tr>
<tr><td>Plastic Parts</td><td>Products shall not contain any halogenated plastic parts contained in the outdoor and indoor unit. (i.e. such as PVC for the plastic case parts and the halogenated compounds containing in the plastic parts)

The concentration of the following phthalates in the plastic parts of the outdoor and indoor unit shall below 0.1% by weight of the product.

• Bis(2-ethylhexyl) phthalate (DEHP)
• Dibutyl phthalate (DBP)
• benzylbutylphthalate (BBP)
• Diisononylphthalate (DINP)
• Diisodecylphthalate (DIDP)
• Di-n-octylphthalate (DNOP)</td><td>Laboratory test report(s) and any production documentation</td><td>5</td><td></td><td>4.2.2 (page 5)</td></tr>
<tr><td colspan="3">Subtotal:</td><td>50</td><td>+25</td><td></td></tr>
</table>

NON-CORE CRITERIA

Criteria	***Requirements***	***Verification***	***Points +Bonus***	***Index***
Environmental Management System	Manufacturer shall possess valid certification of ISO 14001, EU Eco-Management and Audit Scheme (EMAS) or Cradle-to-Cradle.	A valid certificate issued by accredited certification body	+5	*4.1.1 (page 3)*
Flame Retardants	Concentration of the following flame retardants in the product shall be below 0.1% by weight of the product. • Polybrominated diphenyl ether • Polybrominated biphenyls • Short-chained chlorinated paraffin • Halogenated organic compounds • Hexabromocyclododecane	Laboratory test report(s), and any production documentation	+5	*4.2.3 (page 6)*
Reuse and Recycling	Applicant shall provide information on reuse and recycling and biodegradability of the products including but not limited to the following for compliance: • Product shall not be impregnated, labelled, coated or treated in a manner preventing post-consumer recycling • Information related to the degradation or recycling of products Manufacturer shall demonstrate the reuse of existing refrigerant pipework, refrigerant joints and branch pipes when replacing the VRF system.	Documentation of reuse, recycling and waste management of products including, but not limited to, product catalogue, MSDS, and written declaration	+5	*4.4.1 (page 7)*
Automation System	Products shall be able to communicate with Building Management System (BMS) via an open standard communication interface including but not limited to BACnet, ZigBee and LonWorks for controlling and monitoring from BMS.	Documentation including, but not limited to, product catalogue, MSDS and written declaration	+5	*4.4.3 (page 7)*

Packaging Requirement	• All packaging shall be able to be reused/ recycled in the country • All plastic packaging (if applicable) shall be made of plastics that are able to be recycled in the country where the product is sold and shall not contain halogenated plastics • Packaging shall not be impregnated, labelled, coated or otherwise treated in a manner, which would prevent or significantly limit recycling (i.e. metallic labels). • Packaging shall provide the nature of the materials used for the packaging in order to facilitate identification and classification based on European Parliament and Council Directive 94/62/EC on packaging and packaging waste.	Documentation including, but not limited to, product catalogue, MSDS and written declaration	+5	*4.4.2 (page 7)*
		Subtotal:	**+25**	

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1. INTRODUCTION

1.1 PURPOSE

The CIC Green Product Certification *(formerly known as HKGBC Green Product Accreditation and Standards [HK G-PASS])* (herein after referred as the "Scheme") is an environmental labelling scheme owned by the Construction Industry Council (CIC) and implemented by the Hong Kong Green Building Council (HKGBC) which aims to help consumers, building professionals and policy makers identify environmentally preferable building materials and products. This Assessment Standard (hereafter referred as the "Standard") sets out the assessment criteria and their benchmarks for Variable Refrigerant Flow Split Type System to govern the application and award of a label under the Scheme. The Standard also defines the verification methods to determine which labelling grade should be awarded to the product according to the assessment criteria.

This Standard neither modifies nor supersedes laws and regulations. Compliance with this Standard is not a substitute for, and does not assure, compliance with any applicable laws or regulations. Compliance with all applicable laws and regulations is a prerequisite for the manufacturing and marketing of the product.

1.2 BACKGROUND

Variable refrigerant flow split type system can place a significant burden on the environment, from raw material extraction to potential health hazards in the use phase. With increasing environmental claims of variable refrigerant flow split type system in the market, a more comprehensive and systematic approach to assess the environmental impacts of the variable refrigerant flow split type system shall be developed. The aim of this Standard is to help designers and end-users choosing greener products by conserving resources, reducing the amount of waste disposal in landfills and reducing the impact to human health throughout the life cycle of the variable refrigerant flow split type. The development of the assessment criteria in this Standard has made references to worldwide relevant eco-labelling schemes and some existing life cycle assessment (LCA) studies.

2. SCOPE

The Standard applies to the air conditioning system configurations that meet the definition and condition of a Variable Refrigerant Flow (VRF) system. A VRF system is an air conditioning system with a single outdoor condensing unit connected to multiple indoor units in order to control the amount of refrigerant flowing to the multiple evaporators (indoor units) and to enable the use of many evaporators of different capacities and configurations for individualized comfort control, simultaneous heating and cooling in different zones and heat recovery from one zone to another.

Note:
Each application should specify the product code / serial number.

CIC or an appointed third party would conduct a random check of the labelled product during the validity period of the label. One of the laboratory tests listed below will be selected and performed to verify the compliance of the product with the criteria stated in the Assessment Standard. Applicant shall be responsible for the cost of the laboratory test.

3. DEFINITIONS

Applicant:	Organisation which apply for the label under the CIC Green Product Certification of the Construction Industry Council
ASTM:	American Society for Testing and Materials
BS:	British Standards
CIC:	Construction Industry Council
COP:	Coefficient of Performance
CNAS:	China National Accreditation Service for Conformity Assessment
HKAS:	Hong Kong Accreditation Service
HKGBC:	The Hong Kong Green Building Council Limited
HOKLAS:	The Hong Kong Laboratory Accreditation Scheme
IARC:	International Agency for Research on Cancer
ISO:	International Organisation for Standardisation
MSDS:	Material safety data sheet. To qualify as suitable, MSDS and information therein must not be more than 5-years old
US EPA:	United States Environmental Protection Agency

4. EVALUATION CRITERIA

A product to be assessed shall meet all the minimum requirements of the "Core Criteria" in order to be awarded a "Green" (i.e. a "pass" grade) Label under the Scheme. Bonus points may be awarded if the product meets the "Non-core Criteria" and a "Bronze", "Silver", "Gold" or "Platinum" Label will be awarded according to the total points accumulated (see Section 5 for details). All submissions and documentation shall be endorsed by the Chief Executive Officer or other authorised persons of the Applicant to demonstrate conformance to the assessment criteria. All certifications, laboratory reports and documentations must be valid during the assessment process and labelling period. All laboratory reports and documentation shall be within 5 years from the date of issue. The chemical tests should be conducted by either a third party or the manufacturer who has received the ISO17025 certification or relevant national accreditation systems, e.g. HOKLAS, CNAS, etc. CIC or an appointed third party would conduct a random check of the labelled product during the period of validity of the label, through laboratory test to verify the compliance with the criteria as stated in the Standard. Manufacturer shall bear the cost of the laboratory test.

4.1 GENERAL REQUIREMENTS

4.1.1 Environmental Management System

5 Points (Non-core Criterion)

Manufacturer shall possess valid ISO 14001 certificates, EU Eco-Management and Audit Scheme (EMAS) or Cradle-to-Cradle.

Note:

BS EN ISO 14001 is the international standard which provides an outline of how to meet the environmental policy and objectives for the business of the applicant.

Eco-Management and Audit Scheme (EMAS) is an environmental management tool which enables organizations to assess, manage and continuously improve their environmental performance

Cradle to Cradle design is a biomimetic approach to the design of products and systems. It models human industry on nature's processes viewing materials as nutrients circulating in healthy, safe metabolisms.

Verification

A valid certificate issued by local or oversea accredited certification body.

4.1.2 Product Information

5 Points (Core Criterion)

The following product information on the product packaging, product catalogue and/or company website shall be provided for compliance:

- Basic product specifications
- The intended use of the product
- Instructions for correct use and storage to maximise the lifetime of the product
- Recommended operating conditions
- Recommended maintenance instructions for the product
- Installation method
- Instructions for consumer product disposal
- Country of origin

Verification

Documentation including, but not limited to, product label, product catalogue, MSDS, and written declaration.

4.1.3 Serviceability

5 Points (Core Criterion)

Quality, durability and performance properties of the product shall be demonstrated through at least FIVE testing items (as applicable to product type) including, but not limited to, the following, in accordance with relevant testing methods (or later version); other related testing methods are also acceptable with justification provided by the applicant:

Testing items	Relevant Types/ Conditions	Testing Methods/ Standards
Reference SEER/ SEERon	--	BS EN 14825:2013
Reference SCOP/ SCOPon/ SCOPnet		
Strength pressure test	Before installation	BS EN 378-2:2016
Tightness test		
Functional test		
Conformity test		
Rating capacity test	After installation	BS EN 14511-3:2013
Power consumptions		
Air flow rate measurement		
Heat recovery test		
Starting test	Operating requirements	BS EN 14511-4:2013
Test at maximum operating conditions		
Freeze-up test		
Outside the operating range		
Shutting off the heat transfer medium flows		
Complete power supply failure		

Condensate draining and enclosure sweat test		
Defrosting		
Tightness test	Tightness performance of components and joints	BS EN 16084:2011
Torque		
Pressure-temperature vibration tests (PTV)		
Freezing test		
Vacuum Test		
Compatibility Screening Test		
Fatigue test		

Note:
BS EN 14825:2013 specifies the temperatures and part load conditions and the calculation methods for the determination of seasonal energy efficiency SEER and SEERon, seasonal coefficient of performance SCOP, SCOPon and SCOPnet, and seasonal space heating energy efficiency.

BS EN 378:2008 specifies the definitions of refrigerating systems and heat pumps, and classification and selection criteria applicable to refrigerating systems.

BS EN 14511 specifies the terms, test conditions, test method and minimum operating requirement for the rating of air conditioners, liquid chilling packages and heat pumps, using either, air, water or brine as heat transfer media, with electrically driven compressors when used for space heating and/or cooling.

BS EN 16084 describes the qualification procedure for type approval of the tightness of hermetically sealed and closed components, joints and parts used in refrigerating systems and heat pumps

Verification

Documentation including, but not limited to, test reports, product catalogue and MSDS.

4.2 HUMAN TOXICITY

4.2.1 Paint Used

10 Points (Core Criterion)

Paints used on the products shall not contain the following heavy metals or their compounds.

If the paints used on the products contain the following heavy metal or their compounds, the concentration shall be less than 0.01% by weight of the product.

- Cadmium

- Lead
- Chromium VI
- Mercury

If the paints used on the products contain the barium (excluding barium sulfate) or its compounds, the concentration shall be less than 0.1% by weight of the product.

AND, Volatile organic compound content of the paint used on the products shall be equal to or less than 500g/L minus water.

Verification
Laboratory test report(s) and relevant production documentation.

4.2.2 Plastic Parts

10 Points (Core Criterion)
Products shall not contain any halogenated plastic parts contained in the outdoor and indoor unit. (i.e. such as PVC for the plastic case parts and the halogenated compounds containing in the plastic parts)

The concentration of phthalate in the plastic parts of the outdoor and indoor unit shall below 0.1% by weight of the product.

The limited phthalates including the following types:

- Bis(2-ethylhexyl) phthalate (DEHP)
- Dibutyl phthalate (DBP)
- benzylbutylphthalate (BBP)
- Diisononylphthalate (DINP)
- Diisodecylphthalate (DIDP)
- Di-n-octylphthalate (DNOP)

Applicant shall test all the above phthalates in according to National or International standard such as CPSC-CH-C1001-09.3.

Note:
CPSC-CH-C1001-09.2 is a document which provide detailed information on test methods that will be used by the U.S. Consumer Product Safety Commission's (CPSC) testing laboratory (LSC) for the analysis of phthalate content in children's toys and child care articles covered by the standard set forth in the Consumer Product Safety Improvement Act Section 108.

Verification
Laboratory test report(s) and relevant production documentation.

4.2.3 Flame Retardants

5 Points (Non-core Criterion)

Concentration of the flame retardants in the product shall be below 0.1% by weight of the product. The restricted fire retardants including the following types:

- Polybrominated diphenyl ether
- Polybrominated biphenyls
- Short-chained chlorinated paraffin
- Halogenated organic compounds
- Hexabromocyclododecane

Products shall be tested based on the requirement as stated in BS EN 62321:2009 (or later version); other related testing methods are also acceptable with justification provided by the applicant.

Verification

Laboratory test report(s) and relevant production documentation.

4.2.4 Noise Level

10 Points (Core Criterion)

Noise level of both outdoor and indoor units shall be complied with the following requirement.

Capacity (KW)	Limit [dB (A)]	
	Indoor	Outdoor
<2.5	≤40	-
<4.0	≤45	-
<10.0	≤50	≤60
<35.0	≤55	≤65
≥35.0	≤55	≤70

Products shall be tested based on the requirement as stated in AHRI Standard 575-2008 (or later version); other related testing methods are also acceptable with justification provided by the applicant.

Verification

Documentation including, but not limited to, test reports, product catalogue and MSDS

4.3 RESOURCE CONSUMPTION

4.3.1 Energy Efficiency

10 Basic Points + 20 Bonus Points (Core Criterion)

Product shall demonstrate the COP at full load that exceeds requirements of the latest Building Energy Codes:

- at least 5% (10 Basic)
- at least 8% (+5 Bonus)
- at least 10% (+10 Bonus)
- at least 12% (+15 Bonus)
- at least 15% (+20 Bonus)

Standard rating condition shall be referred to the latest Building Energy Codes.

Verification

Documentation including, but not limited to, test reports, product catalogue and MSDS.

4.4 ECOSYSTEM IMPACT

4.4.1 Reuse and Recycling

5 Points (Non-core Criterion)

Applicant shall provide information on reuse, recycling and biodegradability of the products including, but not limited to, the following for compliance:

- Product shall not be impregnated, labelled, coated or treated in a manner preventing post-consumer recycling;
- Information related to the degradation or recycling of products.

Manufacturer shall demonstrate the reuse of existing refrigerant pipework, refrigerant joints and branch pipes when replacing the VRF system.

Verification

Documentation of reuse, recycling and waste management of products including, but not limited to, product catalogue, MSDS, and written declaration

4.4.2 Packaging Requirement

5 Points (Non-core Criterion)

- All packaging shall be able to be reused/recycled in the country.
- All plastic packaging (if applicable) shall be made of plastics that are able to be recycled in the country where the product is sold and shall not contain halogenated plastics.
- Packaging shall not be impregnated, labelled, coated or otherwise treated in a manner, which would prevent or significantly limit recycling (i.e. metallic labels).
- Packaging shall provide the nature of the materials used for the packaging in

order to facilitate identification and classification based on European Parliament and Council Directive 94/62/EC on packaging and packaging waste

Verification

Documentation including, but not limited to, product catalogue, MSDS, and written declaration.

4.2.4 Automation System

5 Points (Non-core Criterion)

Product shall be able to communicate with Building Management System (BMS) via an open standard communication interface including but not limited to BACnet, ZigBee and LonWorks for controlling and monitoring from BMS.

Verification

Documentation including, but not limited to, product catalogue, MSDS and written declaration.

4.2.4 Refrigerant Safety Management

5 Basic Points + 5 Bonus Points (Core Criterion)

BASIC Requirement

Products shall conduct the leakage testing and the refrigerant. Manufacturer shall provide a factory testing report including the information of testing methodology and all calculation details leading to the end result of refrigerant leakage rate.

BONUS Requirement

Products shall be incorporated a leak detection system and send the alert to the Building Management System (BMS) for the leakage. The leakage detection system shall be able to communicate with Building Management System (BMS) via an open standard communication interface including but not limited to BACnet, ZigBee and LonWorks.

Verification

Documentation including, but not limited to, test reports, product catalogue, MSDS and written declaration.

5. SCORING AND GRADING

The points for meeting each criterion stated in Section 4 are summarised in Table 1.

Table 1: Points to be awarded under the assessment criteria of this Standard

Evaluation criteria	***Points***	
	Basic	***+Bonus***
4.1.1 Environmental Management System		+5
4.1.2 Product Information [CORE]	5	
4.1.3 Serviceability [CORE]	5	
4.2.1 Paint Used [CORE]	10	
4.2.2 Plastic Parts [CORE]	5	
4.2.3 Flame Retardants		+5
4.3.1 Energy Efficiency [CORE]	10	+5/+10/+15/+20
4.4.1 Reuse and Recycling		+5
4.4.2 Packaging Requirement		+5
4.4.3 Automation System		+5
4.4.4 Noise Level[CORE]	10	
4.4.5 Refrigerant Safety Management [CORE]	5	+5
	50	**+50**
Total:	**100**	

The minimum requirement to be awarded a “Green” Label under this product category is to obtain 50 points by meeting all minimum requirements laid down in the “Core Criteria”.

Table 5: Benchmarks for grading

Grade to be awarded	***Points required***
Platinum	90 or above
Gold	80 – 89
Silver	70 – 79
Bronze	60 – 69
Green	50 – 59
No Label	Below 50