

Confirmation

LEED v4.1

On 16 March 2020, Eurofins Product Testing A/S received a sample of a chemical anchor with the product name:

AC200+

supplied by

DEWALT Industrial Tool Co. (Black & Decker)

The sample was supplied as being representative of the manufactured product, and it has been tested in accordance with the relevant ISO 16000, EN 16516, CDPH 01350, ISO 11890-2, ASTM D2369 testing standards in the latest versions (See test report no. 392-2020-00129401_H_EN_02 and no. 392-2020-00129402_XG_EN_02).

The test results of the tested sample indicate that the product qualifies for LEED v4.1 BETA (July 2019) specifications on VOC emissions and VOC content by complying with:

VOC emissions specifications in LEED EQ credit "Low-emitting products":

- The requirements of Option 1 of LEED v4.1 BETA (July 2019): CDPH-IAQ (California Department of Public Health (CDPH) Standard Method v1.2-2017 (worst case relative to v1.0-2010)); and a TVOC below 0.5 mg/m³ in both office and class room.

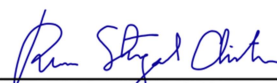
VOC content specifications in LEED EQ credit "Low-emitting products":

- The requirements of the South Coast Air Quality Management District (SCAQMD) Rule 1168 (2017) regarding multipurpose construction adhesives having a VOC content below 70 g/L.

29 April 2020



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VOC EMISSION TEST REPORT

CDPH

29 April 2020

1 Sample Information

Sample name	AC200+
Batch no.	79005720
Production date	26/02/2020
Product type	Chemical anchor
Sample reception	16/03/2020

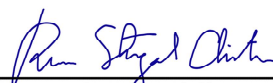
2 Brief Evaluation of the Results

Regulation or protocol	Conclusion	Version of regulation or protocol
CDPH	Pass	CDPH/EHLB/Standard Method V1.2. (January 2017)

Full details based on the testing and direct comparison with limit values are available in the following pages



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3 Applied Test Methods

3.1 General Test References

Regulation, protocol or standard	Version	Reporting limit VOC [$\mu\text{g}/\text{m}^3$]	Calculation of TVOC	Combined uncertainty ^a [RSD(%)]
EN 16516	October 2017	5	Toluene equivalents	22%
ISO 16000 -3 -6 -9 -11	2006-2011 depending on part	2	Toluene equivalents	22%
ASTM D5116-10	2010	-	-	-
CDPH	CDPH/EHLB/Standard Method V1.2. (January 2017)	2	Toluene equivalents	22%

3.2 Specific Laboratory Sampling and Analyses

Procedure	External Method	Internal SOP	Quantification limit / sampling volume	Analytical principle	Uncertainty ^a [RSD(%)]
Sample preparation	ISO 16000-11:2006, EN16402:2013, CDPH:2017, AgBB:2018, EMICODE:2019	71M549810	-	-	-
Emission chamber testing	ISO 16000-9:2006, EN 16516:2017	71M549811	-	Chamber and air control	-
Sampling of VOC	ISO 16000-6:2011, EN 16516:2017	71M549812	5 L	Tenax TA	-
Analysis of VOC	ISO 16000-6:2011, EN 16516:2017	71M542808B	1 $\mu\text{g}/\text{m}^3$	ATD-GC/MS	10%
Sampling of aldehydes	ISO 16000-3:2011, EN 16516:2017	71M549812	35 L	DNPH	-
Analysis of aldehydes	ISO 16000-3:2011, EN 717-1:2004, EN 16516:2017	71M548400	3-6 $\mu\text{g}/\text{m}^3$	HPLC-UV	10%
Sampling on Charcoal tubes	ISO 16200-1:2001	71M546081	60 L	charcoal	-
Analysis of Charcoal tubes	ISO-16200-1:2001	71M546081	20 $\mu\text{g}/\text{m}^3$	Headspace-GC/MS	10%

The results are only valid for the tested sample(s).

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4 Test Parameters, Sample Preparation and Deviations

4.1 VOC Emission Chamber Test Parameters

Parameter	Value	Parameter	Value
Chamber volume, V[L]	119	Preconditioning period	-
Air Change rate, $n[h^{-1}]$	1.0	Test period	02/04/2020 - 16/04/2020
Relative humidity of supply air, RH [%]	50 ± 3	Area specific ventilation rate, $q [m/h \text{ or } m^3/m^2/h]$	143
Temperature of supply air, T [°C]	23 ± 1	Loading factor [m^2/m^3]	0.007
		Test scenario	Very small area

4.2 Preparation of the Test Specimen

The sample was applied onto a glass plate and drawn off over a model giving a 3 mm thick and uniform layer with a broadness of 10 mm.

4.3 Picture of Sample



4.4 Deviations from Referenced Protocols and Regulations

The loading factor was less than the lowest factor of $0.3 m^2/m^3$ that CDPH method specifies for testing; CDPH method does not specify a clear loading factor in any model room. Instead, the loading factor as specified in EN 16516 was applied both during testing and for calculation of the air concentration in office and classroom.

The “Chain of Custody” was not supplied by the client and is consequently not contained in the report.

5 Results

5.1 VOC Emission Test Results after 11 Days

	CAS No.	Specific Conc. [µg/m ³]	Specific SER [µg/(m ² ·h)]	Toluene eq. [µg/m ³]	Toluene SER [µg/(m ² ·h)]
TVOC (C5-C17)tol. eq.				190	28000
Aldehydes					
Formaldehyde	50-00-0	< 3	< 500		
Acetaldehyde	75-07-0	< 3	< 500		

5.2 VOC Emission Test Results after 12 Days

	CAS No.	Specific Conc. [µg/m ³]	Specific SER [µg/(m ² ·h)]	Toluene eq. [µg/m ³]	Toluene SER [µg/(m ² ·h)]
TVOC (C5-C17)tol. eq.				230	32000
Aldehydes					
Formaldehyde	50-00-0	< 3	< 500		
Acetaldehyde	75-07-0	< 3	< 500		

5.3 VOC Emission Test Results after 14 Days

	CAS No.	Retention time [min]	ID-Cat	SER [µg/(m ² ·h)]	Classroom Conc. [µg/m ³]	Office Conc. [µg/m ³]	½ CREL [µg/m ³]
VOC (C5-C17)							
Phenol *	108-95-2	8.19	1	320	2.7	0.3	100
2-Ethyl-1-hexanol	104-76-7	8.92	1	490	4.2	0.5	
2-Phenoxy ethanol *	122-99-6	11.36	1	500	4.3	0.5	
Not identified *		11.61	4	590	5.0	0.6	
1,4-Butylene glycol dimethacrylate *	2082-81-7	14.46	2	56000	480	58	
TVOC (C5-C17)tol. eq.				57000	490	59	
Aldehydes							
Formaldehyde	50-00-0		1	< 500	< 5	< 1	9
Acetaldehyde	75-07-0		1	< 500	< 5	< 1	70

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6 Summary and Evaluation of the Results

6.1 Comparison with Limit Values of CDPH

Parameter	Test after 14 days			
	CAS No. Single compounds	Concentration in Classroom [µg/m³]	Concentration in Office Room [µg/m³]	½ CREL [µg/m³]
TVOC (C5-C17)tol. eq.	-	490	59	-
Single compounds (with defined CREL values)				
Phenol *	108-95-2	2.7	0.3	100
Formaldehyde	50-00-0	< 5	< 1	≤ 9
Acetaldehyde	75-07-0	< 5	< 1	≤ 70

6.1.1 Conversion of Emission Rates to CDPH Reference Room Concentrations

The CDPH method requires calculation of the measured emission rates into concentrations in given reference rooms. The equation and parameters figured below have been applied to calculate the concentrations in an office room or a classroom as required in the CDPH. The area used in the calculation varies depending on the expected usage of the product and therefore several entries can be found. Small and Very Small areas are not provided within the CDPH but are adapted from definitions given in EN 16516 and ISO 16000-9.

$$C_{\text{Calculated}} = \frac{SER_A \cdot A}{n \cdot V}$$

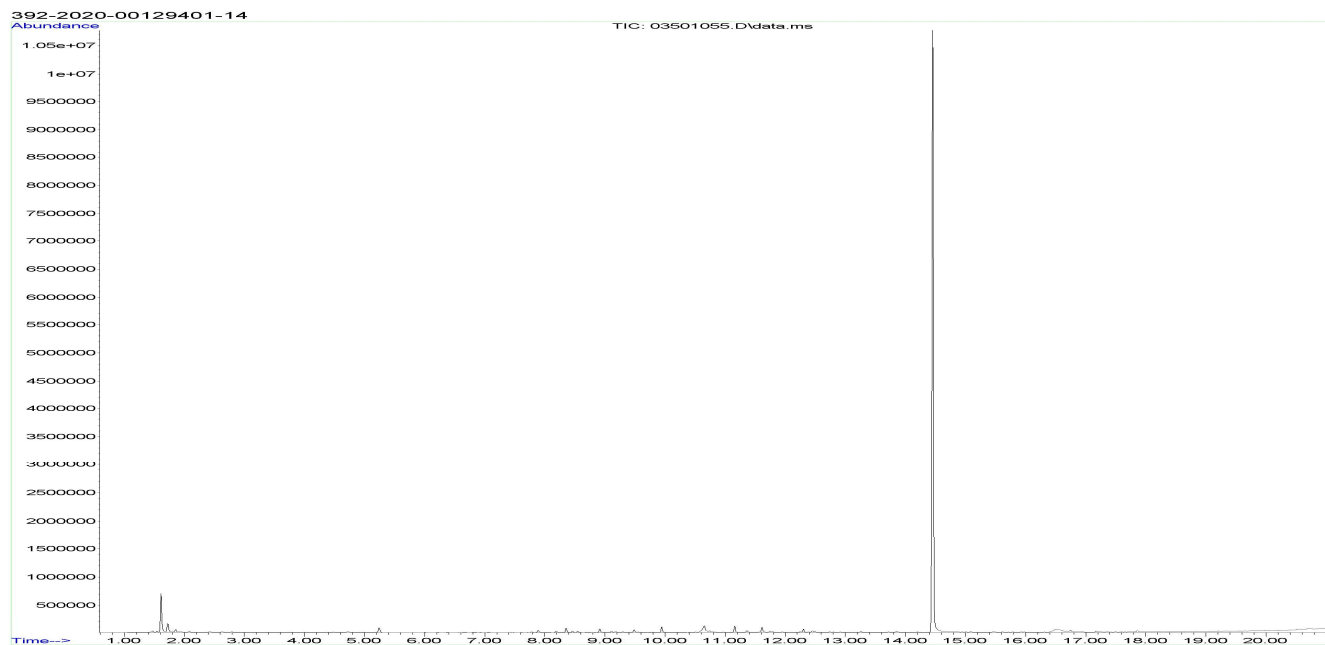
		Classroom parameters	Office Room parameters
SER	Area specific emission rate, µg/(m²h)	As tested	As tested
n	Air change, h ⁻¹	0.82	0.68
V	Volume of reference room, m³	231	30.6
A	Floor area, m²	89.2	11.1
	Walls area, m²	94.3	33.4
	Ceiling and Wall, m²	183.8	N/A
	Door and Millwork, m²	1.89	1.89
	Desk or Chair, units	27	1
	Very Small areas, m²	1.62	0.021
	Small areas, m²	11.55	1.53

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7 Appendices

7.1 Chromatogram of VOC Emissions after 14 Days



7.2 How to Understand the Results

7.2.1 Acronyms Used in the Report

- < Means less than
- > Means bigger than
- * Not a part of our accreditation
- ± Please see section regarding uncertainty in the Appendices.
- § Deviation from method. Please see deviation section
- a The method is not optimal for very volatile compounds. For these substances smaller results and a higher measurement uncertainty cannot be ruled out.
- b The component originates from the substrate and is thus removed.
- c The results have been corrected by the emission from the substrate.
- d Very polar organic compounds are not suitable for reliable quantification using Tenax TA adsorbent and HP-5 GC column. A high degree of uncertainty must be expected.
- e The component may be overestimated due to contribution from the system
- SER Specific Emission Rate.

7.2.2 Explanation of ID Category

Categories of Identity:

- 1: Identified by comparison with a mass spectrum obtained from library and supported by other information and quantified through specific calibration.
- 2: Identified by comparison with a mass spectrum obtained from library and supported by other information. Quantified as toluene equivalent.
- 3: Identified with a lower match by comparison with a mass spectrum obtained from a library. Quantified as toluene equivalent.
- 4: Not identified, quantified as toluene equivalent.

7.3 Description of VOC Emission Test

7.3.1 Test Chamber

The test chamber is made of stainless steel. A multi-step air clean-up is performed before loading the chamber, and a blank check of the empty chamber is performed.

The chamber operation parameters are as described in the test method section. (EN 16516, ISO 16000-9, internal method no.: 71M549811).

7.3.2 Expression of the Test Results

All test results are calculated as specific emission rate, and as extrapolated air concentration in the European Reference Room (EN 16516, AgBB, EMICODE, M1 and Indoor Air Comfort).

7.3.3 Testing of Carcinogenic VOCs

The emission of carcinogens (EU Categories C1A and C1B, as per European law) is tested by drawing sample air from the test chamber outlet through Tenax TA tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by ATD-GC/MS (automated thermal desorption coupled with gas chromatography and mass spectroscopy using 30 m HP-5 (slightly polar) column with 0.25 mm ID and 0.25 μ m film, Agilent) (EN 16516, ISO 16000-6, internal methods no.: 71M549812 / 71M542808B).

All identified carcinogenic VOCs are listed; if a carcinogenic VOC is not listed then it has not been detected. Quantification is performed using the TIC signal and authentic response factors, or the relative response factors relative to toluene for the individual compounds.

This test only covers substances that can be adsorbed on Tenax TA and can be thermally desorbed. If other emissions occur, then these substances cannot be detected (or with limited reliability only).

7.3.4 Testing of VOC

The emissions of volatile organic compounds are tested by drawing sample air from the test chamber outlet through Tenax TA tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by ATD-GC/MS using HP-5 column (30 m, 0.25mm ID, 0.25 μ m film).

This test only covers substances which can be adsorbed on Tenax TA and can be thermally desorbed. If emissions of substances outside these specifications occur then these substances cannot be detected (or with limited reliability only).

7.3.5 Testing of Aldehydes

The presence of aldehydes is tested by drawing air samples from the test chamber outlet through DNPH-coated silicagel tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by HPLC and UV-/diode array detection.

The absence of formaldehyde and other aldehydes is stated if UV detector response at the specific wavelength is lacking at the specific retention time in the chromatogram. Otherwise it is checked whether the reporting limit is exceeded. In this case the identity is finally checked by comparing full scan sample UV spectra with full scan standard UV spectra.

7.3.6 Testing of Charcoal tubes

The presence of low boiling VOC is tested by drawing air samples from the test chamber outlet through charcoal tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by HS-GC/MS using a stabilwax column. This test only covers substances which has a CREL value and are not possible to sample on Tenax tubes.

7.4 Quality Assurance

Before loading the test chamber, a blank check of the empty chamber is performed and compliance with background concentrations in accordance with EN 16516 / ISO 16000-9 is determined.

Air sampling at the chamber outlet and subsequent analysis is performed in duplicate. Relative humidity, temperature and air change rate in the chambers is logged every 5 minutes and checked daily. A double determination is performed on random samples at a regular interval and results are registered in a control chart to ensure the uncertainty and reproducibility of the method.

The stability of the analytical system is checked by a general function test of device and column, and by use of control charts for monitoring the response of individual substances prior to each analytical sequence.

7.5 Accreditation

The testing methods described above are accredited on line with EN ISO/IEC 17025 by DANAK (no. 522). This accreditation is valid worldwide due to mutual approvals of the national accreditation bodies (ILAC/IAF, see also www.eurofins.com/galten.aspx#accreditation).

Not all parameters are covered by this accreditation. The accreditation does not cover parameters marked with an asterisk (*), however analysis of these parameters is conducted at the same level of quality as for the accredited parameters.

7.6 Uncertainty of the Test Method

The relative standard deviation of the overall analysis is 22%. The expanded uncertainty U_m equals 2 x RSD. For further information please visit www.eurofins.dk/uncertainty.

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VOC TEST REPORT

VOC Content

29 April 2020

1 Sample Information

Sample name	AC200+
Sample no.	392-2020-00129402
Production date	26-02-2020
Batch No.	79005720
Sample reception	16/03/2020

2 Brief Evaluation of the Results

Regulation or protocol	Conclusion	Version of regulation or protocol
SCAQMD Rule 1168	Pass	October 2017
LEED v4.1 (VOC Content)	Pass	

Full details based on the testing and direct comparison with limit values are available in the following pages



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3 Applied Test Methods

3.1 General Test References

Regulation, protocol or standard	Scope	Version
SCAQMD Rule 1168	Adhesive and sealant applications	October 2017

3.2 Specific Laboratory Sampling and Analyses

Test	Regulation, protocol or standard	Version	Internal SOP	Limit of detection	Uncertainty
				[g/L]	Um _a
Solids Content	ASTM D2369	2010	71 M 544830	1	10
VOC	ASTM D2369	2010	71 M 544830	1	10

3.3 Preparation of the Test Specimen

The sample was mixed according to the manufacturers specification. The sample was left to cure for 24 hours before applying a portion of the sample to the test dish.

4 Results

	Remarks on the test results	Results	Unit
Density *	Supplied by the Customer	1.77	g/mL
Water Content *	Supplied by the Customer	5.56	g/L
Solids Content	Tested by the lab	97.4	% (w/w)
VOC content (less water)	Calculated based on the results above	41	g/L
VOC content (less water)	Calculated based on the results above	2.3	% (w/w)

4.1 Comparison with Limit Values of VOC Content (less Water)

Parameter	Results	Product type	Regulation or protocol	VOC limit
	[g/L]			[g/L]
VOC content	41	Multipurpose construction adhesive	SCAQMD Rule 1168	70

5 Appendices

5.1 How to Understand the Results

5.1.1 Acronyms Used in the Report

- < Means less than
- > Means bigger than
- * Not a part of our accreditation
- α Please see section regarding uncertainty in the Appendices.
- 1 Analysed by another Eurofins laboratory

5.2 Description of VOC Content Test

5.2.1 Testing of VOC

Volatile content of the sample was determined gravimetrically by heating to 110 °C in 60 minutes. Multicomponent products are mixed according to the manufacturer's instructions and allowed to cure before heating.

The result is the average of two replicates. The result was calculated as:

$$VOC = \frac{([g \text{ All Volatiles}] - [g \text{ Water}] - [g \text{ Exempt Compounds}])}{([liter \text{ Material}] - [liter \text{ Water}] - [liter \text{ Exempt Compounds}])}$$

5.3 Uncertainty of the Test Method

Um(%): The expanded uncertainty Um is equal to 2 x RSD%.