REPORT

issued by an Accredited Testing Laboratory

Contact person RISE
Maria Rådemar
Chemistry and Materials
+46 10 516 51 65
maria.rademar@ri.se

Date	Reference	Page
2019-11-20	9F026880	1 (5)

Testing

Scandinavian Trading LTD
Agneta Roeser
Unit 2, Glen Court, Canada Road
Byfleet, Surrey, KT14 7JL
United Kingdom

Emission measurements

(3 appendices)

Object

One sample of a paint system was delivered to RISE by the customer.

Product name:	**Nordic QVFR Clear (1) + (2)**
Production date:	(1): 07/08/2019, Batch No: 193222 (2): 08/08/2019, Batch No: 193220
Size of sample:	1 L, tin cans
Date of arrival to RISE:	2019-09-19
Date of analysis:	week 38 – 44, 2019

Assignment

Emission measurements according to product standard EN 16402:2013 (Paints and varnishes – Assessment of emissions of substances from coatings into indoor air – Sampling, conditioning and testing) and the horizontal standard EN 16516:2017 (Construction products: Assessment of release of dangerous substances – Determination of emissions into indor air). The measurements are performed after 28 days regarding volatile organic compounds (VOC and VVOC/SVOC), carcinogenic substances (VOC-substances, EU Regulation No 1272/2008 Annex VI, cat 1A and 1B) and aldehydes (ISO 16000-3:2011). Evaluation according to EN 16516:2017 (EU-LCI values).

Method

The paint system was applied with paint roller on one glass plate of 0.40 x 0.25 m. One coat of each paint was applied with a drying time of 4 hours between the coats. Density and spreading rate were given by the customer. The date of application was 2019-09-20, see Table 1.

Table 1.

Density	**Recommended spreading rate**		**Applied amount**
(g/cm^3)	(m^2/L)	(g/m^2)	(g/coat and paint)
1.11	10	111	11.1

The product is classified as product category 4 (Table 3, EN 16402:2013).

SWEDAC ACKREDITERING
Accred. No. 1002
Testing
ISO/IEC 17025

The specimens were placed in a separate conditioning container (with air velocity of ca 0.2 m/s) in a room with controlled climate conditions of 23 ± 2 °C and 50 ± 5 % RH. Air samplings after 28 days of conditioning were carried out on 2019-10-21, including 3 days of preconditioning.

Test conditions in the chamber:

Chamber volume:	0.25 m^3
Temperature:	23 ± 0.5 °C
Relative humidity:	50 ± 3 % RH
Surface area of test specimen:	0.10 m^2
Air exchange rate:	0.5 h^{-1}
Area specific air flow rate:	1.3 m^3/m^2 h.
Air velocity at specimen surface:	0.1 – 0.3 m/s

Tenax TA was used as adsorption medium for VOC. The tubes were thermally desorbed and analysed in accordance to RISE method 0601, similar to ISO 16000-6:2011 (Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS/FID). This means an analysis in a gas chromatograph and detection with a flame ionisation detector (FID) and mass selective detector (MS). The capillary column used is coated with 5% phenyl/ 95 % methylpolysiloxane. The FID signals are used for compound quantification. The total volatile organic compounds (TVOC) means compounds eluting between and including n-hexane to hexadecane, having boiling points in the range of about 70-260 °C. Minimum duplicate air samples were taken and the results are mean values. Sampled volumes are 3 to 6 L.

Tenax TA was also used as adsorption medium for testing of volatile carcinogenic compounds according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B), (exclusive formaldehyde), 1 µg/m^3 and above.

The samplings of aldehydes were carried out with DNPH samplers. The samplers were analysed according to RISE method 2302, similar to ISO 16000-3:2011(Indoor air - Part 3: Determination of formaldehyde and other carbonyl compounds – Active sampling method). This means analysis on a liquid chromatograph with absorbance detector. Duplicate air samples were taken and the results are mean values. Sampled volumes were 30 to 50 L.

Results

The results relate only to the items tested.

The results in Table 2 are expressed as area specific emission rates and as concentrations in a reference room. The reference room has a base area of 3 m x 4 m and a height of 2.5 m, with an air exchange rate of 0.5 h^{-1}. The wall area is 31.4 m^2, floor area is 12 m^2, small area, like a door, is 1.6 m^2 and very small area, like sealant, is 0.2 m^2. Wall area is used for the calculation of the concentrations.

Calculation of the concentration from the emission rate:

$$C = \frac{E_a \times A}{n \times V}$$

C = concentration of VOC in the reference room, in µg/m^3
E_a = area specific emission rate, in µg/m^2h
A = surface area of product in reference room, in m^2
n = air exchange rate, in changes per hour, here 0.5 h^{-1}
V = volume of the reference room, in m^3, here 30 m^3

Table 2.
Emission results of **Nordic QVFR Clear (1) + (2)** after 28 days

Volatile organic compounds	CAS number	Retention time (min)	ID[1]	Emission rate ($\mu g/m^2h$)	Concentration in reference room ($\mu g/m^3$)	LCI_i ($\mu g/m^3$)	R_i (c_i/LCI_i)
TVOC ($C_6 - C_{16}$)	--	6.9 – 39	B	< 10	< 10	--	--
Volatile Carcinogens [2]		6.9 – 39					
No substances detected	--	--	B	< 1	< 1	--	--
VOC with LCI [3]		6.9 – 39					
No substances detected	--	--	B	< 2	< 5	--	--
∑ **VOC with LCI**	--	--	B			--	--
VOC without LCI [4]		6.9 – 39					
No substances detected	--	--	B	< 2	< 5	--	--
∑ **VOC without LCI**	--	--	B	< 2	< 5	--	--
SVOC ($C_{16} - C_{22}$) [5]		39 - 52					
Unknown	--	42.8	B	4	9	--	--
∑ **SVOC**	--	--	B	4	9	--	--
VVOC (< C_6) [6]		5.3 – 6.9					
Formaldehyde [7]	50-00-0	--	A	n.d.	< 5	100	--
Acetaldehyde [7]	75-07-0	--	A	n.d.	< 5	1 200	--
∑ **VVOC**	--	--	A	< 2	< 5	--	--
R = ∑ C_i / LCI_i [8]	--	--	--	--	--	--	< 0.01

[1)] ID: A = quantified compound specific, B = quantified as toluene-equivalent
[2)] Volatile carcinogens = VOCs according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B
[3)] VOC with LCI = identified VOC-compound with LCI-value according to EU-LCI, July 2018
[4)] VOC without LCI = VOC-compound without LCI-value or not identified.
[5)] SVOC = semi-volatile organic compounds, as defined in ISO 16000-6 (not part of accreditation)
[6)] VVOC = very volatile organic compounds, as defined in ISO 16000-6 (not part of accreditation)
[7)] VVOC-aldehydes measured with DNPH samplers (ISO 16000-3)
[8)] All VVOC, VOC, SVOC and carcinogens with LCI
n.d. = not detected (detection limit is approx 1 $\mu g/m^2h$).

Only VOC-compounds with an emission rate higher than 2 $\mu g/m^2h$ are listed in Table 2, carcinogenic compounds ≥ 1 $\mu g/m^2h$. Only the compounds with a concentration in the reference room > 5 $\mu g/m^3$ are evaluated based on LCI (= lowest concentration of interest). TVOC expressed in $\mu g/m^3$ is the sum of all individual substances with concentrations ≥ 5 $\mu g/m^3$ (in toluene equivalents).

Quantification limit for TVOC is 10 $\mu g/m^2h$. Measurement uncertainty for VOC is 15 % (rel) and for formaldehyde 30 % (rel). Background of TVOC in the empty chamber was below 20 $\mu g/m^3$ and is subtracted.

See Appendix 1 for a gas chromatogram (FID spectra) and Appendix 2 for a photo of the test specimen. Appendix 3 is the sampling report received from the customer.

Summary of the test results

The test results are summarized in Table 3.

Table 3.
Summary of the emission results after 28 days of **Nordic QVFR Clear (1) + (2)**

Compounds	**Emission rate** ($\mu g/m^2h$)	**Concentration in reference room** (wall scenario) ($\mu g/m^3$)
TVOC	< 10	< 10
∑ Carcinogenic VOCs	< 1	< 1
∑ VOC with LCI	< 2	< 5
∑ VOC without LCI	< 2	< 5
∑ VVOC	< 2	< 5
Formaldehyde	< 2	< 5
∑ SVOC	4	9
$R = \sum C_i / LCI_i$	< 0.01	

Evaluation of the test results

The emission results can be compared to different Emission Labelling Systems. The Swedish **Byggvarubedömningen** has criteria regarding Emissions to indoor environment. The emissions are to be measured according to a standard method such as ISO 16000-9 after 28 days regarding TVOC, VOC and aldehydes. The requirements for the *Recommended class* is that the requirements to one of the following systems are being met: Emicode EC1, Emicode $EC1^{PLUS}$, Blue Angel, M1 (RTS) or GUT.

The results of the tested sample are compared to M1, see Table 4.

Decision rule: When comparing the measured results and requirement level, the average value of the measured results has been compared with the requirement level. No account is taken to the measurement uncertainty.

Table 4.
The test results of **Nordic QVFR Clear (1) + (2)** compared to the relevant requirements in M1

Compounds	**Requirement M1** (mg/m^2h)	**Test Results** (mg/m^2h)	**Pass / Fail**
TVOC	< 0.2	**< 0.010**	**PASS**
Formaldehyde	< 0.05	**< 0.001**	**PASS**
CMR 1A+1B	< 0.001	**< 0.001**	**PASS**
Single VOC ($\mu g/m^3$)	≤ EU-LCI	**≤ EU-LCI**	**PASS**
Ammonia	< 0.03	not measured	--
Odour	≥ 0.0	not measured	--

Results of evaluation:

The test results of TVOC, VOC and aldehydes are in compliance with the requirements of M1 after 28 days and meet the requirements of Byggvarubedömningen of the ***Recommended class*** regarding Emissions of VOC to the indoor environment.

RISE Research Institutes of Sweden AB
Chemistry and Materials - Chemistry

Performed by

Signed by: Maria Rådemar
Reason: I am the author of this document
Date & Time: 2019-11-20 13:05:23 +01:00

Maria Rådemar

Examined by

Signed by: Marcus Vestergren
Reason: Jag har granskat det här dokumentet
Date & Time: 2019-11-20 13:31:42 +01:00

Marcus Vestergren

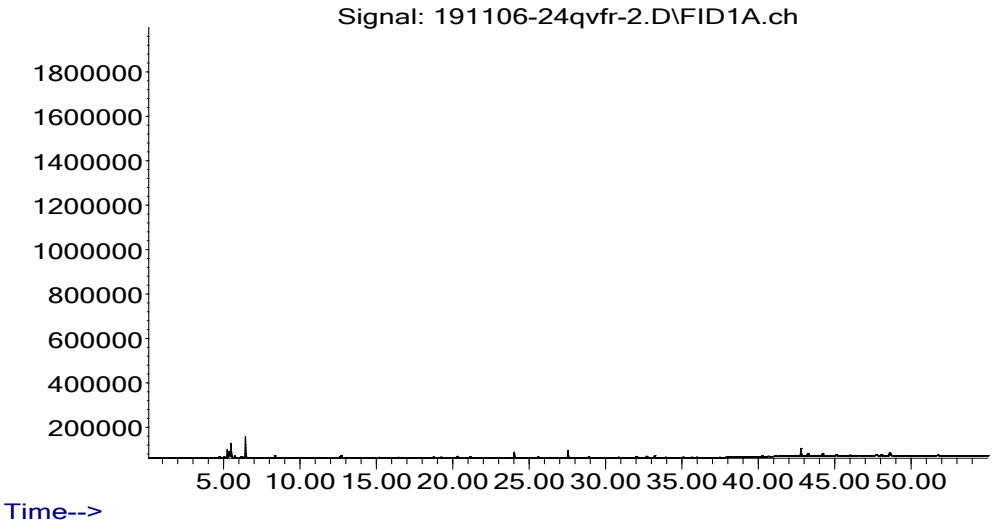
Appendices

1. Gas Chromatogram
2. Photo of the test specimen
3. Sampling report

Appendix 1

Gas chromatogram

Nordic QVFR Clear (1) + (2), after 28 days:



TVOC between C_6 and C_{16}, means compounds eluting between 6.9 and 39 minutes.

Appendix 2

Photo of the test specimen

Appendix 3

Sampling Report (paints etc)

Sampler (Name, Company, contact info): Scandinavian Trading Ltd, unit 2, Glen court, Canada Road, Byfleet, Surrey, KT14 7JL, United Kingdom	**Manufacturer of the product** (Company, address): Intumescent Systems Ltd, Envirograf House, Barfrestone, Dover, Kent CT15 7JG, United Kingdom
Name of product: Nordic QVFR Clear (1) Nordic QVFR Clear (2)	**Product category according to** EN 16402:2013, clause 5: (applies to paint) Type 4 Function: passive fire protection, inc top coat
Manufacturing Date: Nordic QVFR Clear (1): 07/08/2019 Nordic QVFR Clear (2): 08/08/2019	**Batch No:** Nordic QVFR Clear (1): 193222 Nordic QVFR Clear (2): 193220
Amount of material sampled: 1 lit of each coat	**Density (g/L):** 1.11
Solid content (vol %): (applies to paint) 33%	**Spreading rate (m^2/L):** QVFR Clear (1): 10m2/L QVFR Clear (2): 10 to 12m2 per litre
Sample is taken from: Production line ☐ Stock / Storage X Miscellaneous ☐ -where, specify:	**How was the product stored before sampling?** Indoor environment
If a sub-sample was collected from a larger material amount, describe how the sub-sample was taken:	**Packing material:** Metal Tin
Remarks:	
Confirmation: I hereby confirm that the sample was selected, taken and packed in accordance with this protocol.	
Date of sampling: 10.09.2019	**Signature:** Agneta Roeser