

MEGA evaluations for the preparation of REACH exposure scenarios for hexamethylcyclotrisiloxane

1 Introduction

The measured data for workplace exposure evaluated in the following have been gathered and documented in accordance with the principles of the measurement system of the German social accident insurance institutions for exposure assessment (MGU¹, formerly BGMG). The quality of the MGU is upheld by a quality management system that in essence satisfies the requirements of DIN EN ISO 9001. The test laboratories are operated in accordance with DIN EN ISO 17025 “General requirements for the competence of testing and calibration laboratories”.

To measure hexamethylcyclotrisiloxane exposure at the workplace, a defined volume of air is sucked by a suitable pump through a tenax stainless steel tube. The volatile organic hazardous substance contained in the air is adsorbed by the Tenax. For analysis, the hazardous substance is evaporated in a thermal desorber and analysed by gas chromatography. After chromatographic separation, analysis is performed simultaneously by a flame ionisation detector (FID) and a mass spectrometer (MS). Qualitative analysis is performed by the MS, and quantitative analysis by the FID. The quantification limit is 3.0 µg/m³ for a test air volume of 2 L. Source: VOC (Volatile Organic Compounds) (ref. no. [8936](#)). In: IFA-Arbeitsmappe Messung von Gefahrstoffen. 45. Lfg. X/2010. Ed.: Deutsche Gesetzliche Unfallversicherung (DGUV), Berlin. Erich Schmidt, Berlin 2011 – loose-leaf edition.

All the surveyed data in the MGU are brought together in the MEGA exposure database (measured data on exposure to hazardous substances at the workplace). If individual values fall below the measurement method’s analytical quantification limit, half the value is adopted in the evaluation. The MEGA^{Pro} software developed by the IFA (formerly BGIA) makes it possible to statistically analyse the data of the MEGA exposure database on the basis of various selection criteria and evaluation strategies.

For measurements in interiors, measured values for hexamethylcyclotrisiloxane are also available in the MEGA exposure database. These are documented in the report “Innenraumarbeitsplätze – Vorgehensempfehlung für die Ermittlungen zum Arbeitsumfeld” (Ed.: Hauptverband der gewerblichen Berufsgenossenschaften (HVBG), Sankt Augustin, 2005, in German).

¹ Gabriel, S.; Koppisch, D.; Range, D.: The MGU – a monitoring system for the collection and documentation of valid workplace exposure data. Gefahrstoffe – Reinhalt. Luft 70 (2010) No. 1/2, pp. 43-49
<http://www.dguv.de/ifa>, Webcode [m200066](#)

2 Data situation and evaluation strategy

2.1 Overview of the measured values collected in the MGU, data period 2000 to 2010

There is no workplace limit for hexamethylcyclotrisiloxane.

Information on the sampling systems can be found in the IFA work folder (IFA-Arbeitsmappe, in German).

General description	Number of measured values (%)
Total	241
Type of sampling: Stationary	165 (68.5%)
Type of sampling: Personal	76 (31.5%)
Sampling time ≥ 0.5 h and exposure time ≥ 6 h (comparable to shift measurements)	186 (77.2%)
Undocumented reference to shift measurements respectively sampling time < 0.5 h <u>or</u> exposure time < 6 h	55 (22.8%)
Number of data $<$ quantification limit (Values $<$ quantification limit were adopted in statistics with half their values)	68 (28.2%)
Examples: Exposure conditions	
Without mechanical ventilation	151
With mechanical ventilation	56
No details	32
Without local exhaust ventilation	129
With local exhaust ventilation	35
No details	77
General description of hexamethylcyclotrisiloxane measurements in 52 branches of industry and 63 work areas	

2.2 Criteria for inclusion of measured data in the evaluation

- Measured data relating to exposure
- Sampling time \geq 1 hour
- Exposure time \geq 6 hours
- Data sets comprising fewer than ten measured data were disregarded.

2.3 Evaluation strategy

The evaluation was performed on the basis of industry groups (Appendix 1) and work area groups (Appendix 2) and broken down further according to type of sampling (stationary or personal).

3 Abbreviations and indices

The following abbreviations and indices are used in the evaluation tables:

+ The distribution value is below the largest analytical quantification limit in the data set.

\$ With reference to the given limit value, the percentage of values below the limit value is given.

! The number of measured values below the analytical quantification limit (a. q.) is greater than the number of measured values represented by this cumulative frequency value. No concentration is therefore given for this cumulative frequency value.

* Measured values below the analytical quantification limit of the measuring method concerned are adopted in the evaluation with half the analytical quantification limit value.

Appendix 1

Statistic evaluations for industry groups

Hexamethylcyclotrisiloxane, sampling time ≥ 0.5 h and exposure time ≥ 6 h

Industry groups, general

D.No. = Data set number/ Designation Branch of industry	Number of measured data	Number of firms	Frequency < number of values %	Number of Alls*	Largest quantification limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 29 Hexamethylcyclotrisiloxane Total	186	69	47 25.3	15	0.006		0.013	0.045	0.079
D.No. 203 Hexamethylcyclotrisiloxane Plastics, processing; Manufacture and processing of rubber products	18	3	8 44.4	2	0.005		0.009	0.036	0.04
D.No. 204 Hexamethylcyclotrisiloxane Manufacture of machinery and vehicles	29	8	2 6.9	4	0.005		0.041	0.114	0.167
D.No. 205 Hexamethylcyclotrisiloxane Wholesale trade with fuels, technical oils and fats; Wholesale trade with iron and metal haberdashery, textiles; Wholesale trade with fine mechanical products and medical commodities	34	16	8 23.5	1	0.005		0.009	0.025	0.034
D.No. 206 Hexamethylcyclotrisiloxane Transport, shipping, transport companies and similar.	23	4	1 4.3	2	0.005		0.019	0.039	0.044
D.No. 207 Hexamethylcyclotrisiloxane Research and testing institutes and laboratories	16	5	6 37.5	4	0.005		0.008	0.030	0.04

* All = social accident insurance institution

Industry groups: Stationary measurements

D.No. = Data set number/ Designation Branch of industry	Number of measured data	Number of firms	Frequency < number of values %	Number of Allis*	Largest quantification limit in mg/m ³	≤ limit value % §	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 228 Hexamethylcyclotrisiloxane Total	134	57	37 27.6	14	0.005		0.01	0.04	0.0528
D.No. 208 Hexamethylcyclotrisiloxane Plastics, processing; Manufacture and processing of rubber products	17	3	7 41.2	2	0.005		0.011	0.0365	0.04
D.No. 209 Hexamethylcyclotrisiloxane Manufacture of machinery and vehicles	18	6	2 11.1	4	0.005		0.039	0.118	0.156
D.No. 210 Hexamethylcyclotrisiloxane Wholesale trade with fuels, technical oils and fats; Wholesale trade with iron and metal haberdashery, textiles; Wholesale trade with fine mechanical products and medical commodities	24	13	5 20.8	1	0.005		0.007	0.016	0.0228
D.No. 211 Hexamethylcyclotrisiloxane Transport, shipping, transport companies and similar.	12	4	1 8.3	2	0.005		0.015	0.0278	0.0348
D.No. 212 Hexamethylcyclotrisiloxane Research and testing institutes and laboratories	16	5	6 37.5	4	0.005		0.008	0.0304	0.04

* All = social accident insurance institution

Industry groups: Personal measurements

D.No. = Data set number/ Designation Branch of industry	Number of measured data	Number of firms	Frequency < number of values %	Number of Allis*	Largest quantification limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 229 Hexamethylcyclotrisiloxane Total	52	19	10 19.2	4	0.006		0.022	0.079	0.0938
D.No. 213 Hexamethylcyclotrisiloxane Plastics, processing; Manufacture and processing of rubber products	1	1	1 100	1	0.005				
D.No. 214 Hexamethylcyclotrisiloxane Manufacture of machinery and vehicles	11	3	0	1			0.04	0.107	0.141
D.No. 215 Hexamethylcyclotrisiloxane Wholesale trade with fuels, technical oils and fats; Wholesale trade with iron and metal haberdashery, textiles; Wholesale trade with fine mechanical products and medical commodities	10	5	3 30	1	0.005		0.017	0.04	0.046
D.No. 216 Hexamethylcyclotrisiloxane Transport, shipping, transport companies and similar.	11	1	0	1			0.0215	0.0409	0.0429
D.No. 217 Hexamethylcyclotrisiloxane Research and testing institutes and laboratories	0	0	0	0					

* All = social accident insurance institution

Industry groups: Measurements with local exhaust ventilation

D.No. = Data set number/ Designation Branch of industry	Number of measured data	Number of firms	Frequency < number of values %	Number of Allis*	Largest quantification limit in mg/m ³	≤ limit value % §	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 231 Hexamethylcyclotrisiloxane Total	19	10	5 26.3	8	0.005		0.0125	0.0825	0.0901
D.No. 223 Hexamethylcyclotrisiloxane Plastics, processing; Manufacture and processing of rubber products	3	2	0	2					
D.No. 224 Hexamethylcyclotrisiloxane Manufacture of machinery and vehicles	4	1	1 25	1	0.005				
D.No. 225 Hexamethylcyclotrisiloxane Wholesale trade with fuels, technical oils and fats; Wholesale trade with iron and metal haberdashery, textiles; Wholesale trade with fine mechanical products and medical commodities	1	1	1 100	1	0.005				
D.No. 226 Hexamethylcyclotrisiloxane Transport, shipping, transport companies and similar.	0	0	0	0					
D.No. 227 Hexamethylcyclotrisiloxane Research and testing institutes and laboratories	3	2	0	2					

* All = social accident insurance institution

Industry groups: Measurements without local exhaust ventilation

D.No. = Data set number/ Designation Branch of industry	Number of measured data	Number of firms	Frequency < number of values %	Number of AIs**	Largest quantification limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 230 Hexamethylcyclotrisiloxane Total	104	40	23 22.1	10	0.005		0.012	0.036	0.0428
D.No. 218 Hexamethylcyclotrisiloxane Plastics, processing; Manufacture and processing of rubber products	0	0	0	0					
D.No. 219 Hexamethylcyclotrisiloxane Manufacture of machinery and vehicles	5	3	1 20	3	0.005				
D.No. 220 Hexamethylcyclotrisiloxane Wholesale trade with fuels, technical oils and fats; Wholesale trade with iron and metal haberdashery, textiles; Wholesale trade with fine mechanical products and medical commodities	28	11	4 14.3	1	0.005		0.009	0.0264	0.0368
D.No. 221 Hexamethylcyclotrisiloxane Transport, shipping, transport companies and similar	23	4	1 4.3	2	0.005		0.019	0.0387	0.0437
D.No. 222 Hexamethylcyclotrisiloxane Research and testing institutes and laboratories	13	5	6 46.2	4	0.005		+ 0.005	0.0307	0.0467

* AI = social accident insurance institution

Appendix 2

Statistical evaluations for work area groups

Hexamethylcyclotrisiloxane, sampling time ≥ 0.5 h and exposure time ≥ 6 h

Work area groups: General

D.No. = Data set number/ Designation Work area	Number of measured data	Number of firms	Frequency < number of values %	Number of Alls*	Largest quantification limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 232 Hexamethylcyclotrisiloxane Storing, Sorting	60	25	9 15	4	0.005		0.017	0.036	0.044
D.No. 233 Hexamethylcyclotrisiloxane Pressing, Extruder, Rolling	24	6	1 4.2	2	0.005		0.032	0.134	0.174
D.No. 234 Hexamethylcyclotrisiloxane Processing, Sanding	13	5	7 53.8	3	0.005		! a. q.	0.0178	0.0228
D.No. 235 Hexamethylcyclotrisiloxane Test facility, Quality inspection	19	9	8 42.1	5	0.006		+0.006	0.0322	0.0452
D.No. 236 Hexamethylcyclotrisiloxane Laboratory	12	4	5 41.7	3	0.005		0.006	0.0138	0.021

* All = social accident insurance institution

Work area groups: Stationary measurements

D.No. = Data set number/ Designation Work area	Number of measured data	Number of firms	Frequency < number of values %	Number of Alls*	Largest quantification limit in mg/m ³	≤ limit value % §	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 237 Hexamethylcyclotrisiloxane Storing, Sorting	33	21	7 21.2	4	0.005		0.009	0.0231	0.0305
D.No. 238 Hexamethylcyclotrisiloxane Pressing, Extruder, Rolling	18	5	0	2			0.027	0.118	0.156
D.No. 239 Hexamethylcyclotrisiloxane Processing, Sanding	7	3	5 71.4	2	0.005				
D.No. 240 Hexamethylcyclotrisiloxane Test facility, Quality inspection	17	8	7 41.2	4	0.005		0.007	0.0346	0.0496
D.No. 241 Hexamethylcyclotrisiloxane Laboratory	12	4	5 41.7	3	0.005		0.006	0.0138	0.0212

* All = social accident insurance institution

Work area groups: Personal measurements

D.No. = Data set number/ Designation Work area	Number of measured data	Number of firms	Frequency < number of values %	Number of Alls*	Largest quantification limit in mg/m ³	≤ limit value % §	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 242 Hexamethylcyclotrisiloxane Storing, Sorting	27	7	2 7.4	1	0.005		0.0235	0.0426	0.0492
D.No. 243 Hexamethylcyclotrisiloxane Pressing, Extruder, Rolling	6	3	1 16.7	2	0.005				
D.No. 244 Hexamethylcyclotrisiloxane Processing, Sanding	6	3	2 33.3	2	0.005				
D.No. 245 Hexamethylcyclotrisiloxane Test facility, Quality inspection	2	1	1 50	1	0.006				
D.No. 246 Hexamethylcyclotrisiloxane Laboratory	0	0	0	0					

* All = social accident insurance institution

Work area groups: Measurements without local exhaust ventilation

D.No. = Data set number/ Designation Work area	Number of measured data	Number of firms	Frequency < number of values %	Number of Alls*	Largest quantification limit in mg/m ³	≤ limit value % §	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 247 Hexamethylcyclotrisiloxane Storing, Sorting	52	19	6 11.5	3	0.005		0.017	0.036	0.0428
D.No. 248 Hexamethylcyclotrisiloxane Pressing, Extruder, Rolling	6	2	0	1					
D.No. 249 Hexamethylcyclotrisiloxane Processing, Sanding	3	2	1 33.3	2	0.005				
D.No. 250 Hexamethylcyclotrisiloxane B Test facility, Quality inspection	12	6	6 50	3	0.005		+	0.0308	0.0358
D.No. 251 Hexamethylcyclotrisiloxane Laboratory	7	3	3 42.9	2	0.005				

* All = social accident insurance institution

Work area groups: Measurements with local exhaust ventilation

D.No. = Data set number/ Designation Work area	Number of measured data	Number of firms	Frequency < number of values %	Number of Alls*	Largest quantification limit in mg/m ³	≤ limit value % §	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 252 Hexamethylcyclotrisiloxane Storing, Sorting	0	0	0	0					
D.No. 253 Hexamethylcyclotrisiloxane Pressing, Extruder, Rolling	1	1	1 100	1	0.005				
D.No. 254 Hexamethylcyclotrisiloxane Processing, Sanding	1	1	0	1					
D.No. 255 Hexamethylcyclotrisiloxane Test facility, Quality inspection	4	1	1 25	1	0.005				
D.No. 256 Hexamethylcyclotrisiloxane Laboratory	3	2	0	2					

* All = social accident insurance institution