

MEGA evaluations for the preparation of REACH exposure scenarios for aniline

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 aniline exposure at the workplace, a defined volume of air is sucked by a suitable pump through a silica gel tube. The hazardous substance contained in the air is adsorbed by the silica gel tube. Qualitative and quantitative analysis are performed by gas chromatography with a nitrogen phosphorus detector. The quantification limit is 0.05 mg/m³ for a test air volume of 40 L. Source: Amines, aliphatic II and aromatic II (ref. no. [6073](#)). 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.

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

Aniline with a workplace limit of 7.7 mg/m³

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

General description	Number of measured values (%)
Total	165
Type of sampling: Stationary	128 (77.6%)
Type of sampling: Personal	37 (22.4%)
Sampling time ≥ 1 h and exposure time ≥ 6 h (comparable to shift measurements)	131 (79.4%)
Sampling time < 1 h <u>or</u> exposure time < 6 h	34 (20.6%)
Number of data < quantification limit (Values < quantification limit were adopted in statistics with half their values)	122 (73.9%)
Number of data > limit value	0
Number of data ≥ quantification limit and ≤ limit value	43 (26.1%)
Examples: Exposure conditions	
Without mechanical ventilation	9
With mechanical ventilation	90
No details	26
Without local exhaust ventilation	58
With local exhaust ventilation	76
No details	30

General description of
aniline measurements in
27 branches of industry and 59 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

Aniline, sampling time ≥ 1 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 quanti- fication limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 per- centile *	90 per- centile *	95 per- centile *
D.No. 545 Aniline Total	131	65	93 71	10	1	100	! a. q.	+ 0.304	+ 0.745
D.No. 554 Aniline Plastics and plastic foam, process- ing and manufacture, Manufacture and processing of rubber products	21	9	19 90.5	7	1	100	! a. q.	! a. q.	+ 0.098
D.No. 556 Aniline Iron and steel foundry	63	28	48 76.2	3	0.5	100	! a. q.	+ 0.244	0.685
D.No. 557 Aniline Light metal foundry	25	14	6 24	3	0.5	100	+ 0.1	0.95	1.325

* 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 All:	Largest quantifica- tion limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 percen- tile *	90 percen- tile *	95 percen- tile *
D.No. 571 Aniline Total	107	58	83 77.6	10	1	100	! a. q.	+ 0.25	+ 0.489
D.No. 572 Aniline Plastics and plastic foam, processing and manufacture, Manufacture and processing of rubber products	18	8	18 100	6	1	100	! a. q.	! a. q.	! a. q.
D.No. 574 Aniline Iron and steel foundry	55	27	44 80	3	0.5	100	! a. q.	+ 0.24	0.625
D.No. 575 Aniline Light metal foundry	18	12	6 33.3	3	0.5	100	+ 0.05	+ 0.338	0.533

* 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 All:	Largest quantifica- tion limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 percen- tile *	90 percen- tile *	95 percen- tile *
D.No. 576 Aniline Total	24	14	10 41.7	4	0.5	100	+ 0.036	1.088	1.376
D.No. 577 Aniline Plastics and plastic foam, processing and manufacture, Manufacture and processing of rubber products	3	2	1 33.3	2	0.05	100			
D.No. 579 Aniline Iron and steel foundry	8	4	4 50	1	0.005	100			
D.No. 580 Aniline Light metal foundry	7	3	0	1		100			

* 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 All:	Largest quantification limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 per- centile *	90 per- centile *	95 per- centile *
D.No. 563 Aniline Total	64	32	42 65.6	6	0.5	100	! a. q.	+ 0.48	1.04
D.No. 564 Aniline Plastics and plastic foam, processing and manufacture, Manufacture and processing of rubber products	12	4	11 91.7	3	0.2	100	! a. q.	! a. q.	+ 0.076
D.No. 566 Aniline Iron and steel foundry	33	16	20 60.6	3	0.5	100	! a. q.	+ 0.495	1.505
D.No. 567 Aniline Light metal foundry	8	5	0	2		100			

* 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 All:	Largest quantification limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 per- centile *	90 per- centile *	95 per- centile *
D.No. 558 Aniline Total	40	26	26 65	7	1	100	! a. q.	+ 0.47	+ 0.5
D.No. 559 Aniline Plastics and plastic foam, processing and manufacture, Manufacture and processing of rubber products	3	3	2 66.7	3	1	100			
D.No. 561 Aniline Iron and steel foundry	18	10	17 94.4	3	0.1	100	! a. q.	! a. q.	+ 0.053
D.No. 562 Aniline Light metal foundry	13	8	3 23.1	3	0.5	100	+ 0.0505	0.528	0.841

* All = social accident insurance institution

Appendix 2

Statistical evaluations for work area groups

Aniline, sampling time ≥ 1 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 AIfs*	Largest quantification limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 568 Aniline Moulding	22	7	11 50	4	0.2	100	+ 0.04	0.214	2.723
D.No. 569 Aniline Casting, Smelting	58	39	37 63.8	4	1	100	! a. q.	+ 0.552	1.118
D.No. 570 Aniline Foundry (various work areas)	17	15	15 88.2	3	0.5	100	! a. q.	+ 0.25	+ 0.318

* 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 AIfs*	Largest quantification limit in mg/m ³	≤ limit value % \$	Concentrations in mg/m ³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 581 Aniline Moulding	19	7	10 52.6	4	0.2	100	! a. q.	0.507	3.015
D.No. 582 Aniline Casting, Smelting	47	36	35 74.5	4	1	100	! a. q.	+ 0.301	+ 0.489
D.No. 583 Aniline Foundry (various work areas)	16	14	14 87.5	2	0.5	100	! a. q.	+ 0.25	+ 0.34

* 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 per- centile *	90 per- centile *	95 per- centile *
D.No. 584 Aniline Moulding	3	1	1 33.3	1	0.005	100			
D.No. 585 Aniline Casting, Smelting	11	6	2 18.2	1	0.005	100	0.4	1.388	1.445
D.No. 586 Aniline Foundry (various work areas)	1	1	1 100	1	0.005	100			

* 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 per- centile *	90 per- centile *	95 per- centile *
D.No. 587 Aniline Moulding	4	3	2 50	2	0.1	100			
D.No. 588 Aniline Casting, Smelting	24	17	15 62.5	4	1	100	! a. q.	+ 0.5	+ 0.532
D.No. 589 Aniline Foundry (various work areas)	5	5	5 100	2	0.1	100			

* 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 percen- tile *	90 percen- tile *	95 percen- tile *
D.No. 590 Aniline Moulding	16	3	7 43.8	3	0.1	100	+ 0.027	1.338	3.06
D.No. 591 Aniline Casting, Smelting	26	20	16 61.5	3	0.1	100	! a. q.	0.68	1.01
D.No. 592 Aniline Foundry (various work areas)	6	6	4 66.7	1	0.5	100			

* All = social accident insurance institution