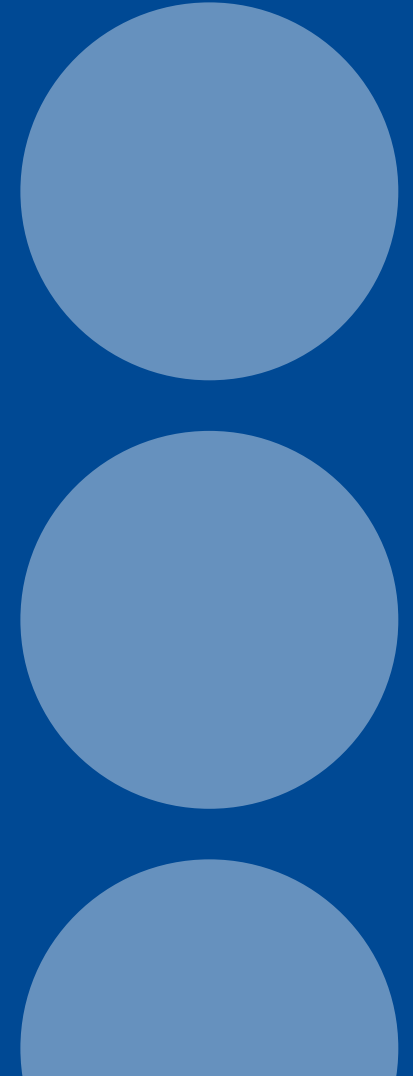


Exposure Data Related to Welding and other Maintenance Activities

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Maintenance activities ⇔ exposure to hazardous substances

- **Service and repair of machines and facilities** in which hazardous substances are
 - produced, used, stored or transported
- Hazardous substances that are **used specifically** in maintenance activities
 - cleaning agents, adhesives or paints
- Hazardous substances are **produced and emitted** during maintenance activities
 - grinding or welding

Maintenance activities ⇔ exposure to hazardous substances

Note: Exposure to hazardous substances is to be expected even without accidents!

- Maintenance work is often carried out manually
- Closed systems must be opened for maintenance

Data source MEGA

- IFA's exposure database "Measurement data relating to workplace exposure to hazardous substances"
- Established 1972
- Data are collected by the Measurement System for Exposure Assessment (MGU) of the German statutory accident insurance institutions
- Purpose of data collection:
 - prevention
 - administrative proceedings related to occupational diseases
 - research
- Additional to the measurement value contextual information is documented: task, industrial sector, technical conditions, tools and products used

Limit values and analytical methods

Hazardous substance	German limit value	Analytical methods
Inhalable dust	10 mg/m ³	Weighing
Respirable dust	1.25 mg/m ³	Weighing
Quartz (in the respirable fraction)	0.05 mg/m ³	Infrared spectroscopy X-ray diffraction analysis
Nickel and its compounds, Inhalable fraction	0.03 mg/m ³	Atomic absorption spectrometry X-ray fluorescence spectrometry Inductively coupled plasma mass spectrometry

- Results from personal sampling are shown
- Calculation of 50. and 90. percentiles from the order statistic
- If more than 50% of the samples show a result below the LOD, no 50th percentile is given.

Dust and quartz exposure during maintenance work

Hazardous substance	Time period of sampling	Local exhaust ventilation	Number of measurements	Values below LOD N	50 th percentile (mg/m ³)	90 th percentile (mg/m ³)
Inspection and test benches in the metal industry						
Inhalable dust	2005 – 2016	not	72	34	0.355	2.23
Respirable dust	2005 – 2016	differentiated	84	51	! LOD	1.06
Repair and maintenance of road and rail vehicles						
Inhalable dust	2005 – 2016	not	42	7	1.64	10.7
Respirable dust	2005 – 2016	differentiated	71	31	0.27	1.30
Maintenance in the metal industry						
Quartz	2005 – 2016	Not diff.	15	8	! LOD	0.296

Dust and quartz exposure during maintenance work

Hazardous substance	Time period of sampling	Local exhaust ventilation	Number of measurements	Values below LOD N	50 th percentile (mg/m ³)	90 th percentile
Repair and maintenance in other industrial sectors						
Inhalable dust	2005 – 2016	not	170	37	1.45	10.2
Respirable dust	2005 – 2016	differentiated	187	81	0.313	1.97
Quartz	2005 – 2016		44	29	! LOD	0.046

Dust exposure during welding



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- Fumes are emitted during welding
=> high exposure to respirable dust
- Exposure high depending on the welding process
- Exposure to metals depending on the composition of the material

Dust exposure during welding

Hazardous substance	Time period of sampling	Local exhaust ventilation	Number of measurements	Values below LOD N	50 th percentile (mg/m ³)	90 th percentile (mg/m ³)
Manual metal arc welding						
Inhalable dust	1999 – 2019	With LEV	195	42	1.3	7.2
		Without LEV	24	4	3.7	9.8
Respirable dust	1999 – 2019	With LEV	66	14	0.75	3.1
Metal inert gas welding (MIG)						
Inhalable dust	1999 – 2019	With LEV	227	47	1.6	8.2
		Without LEV	85	8	4.1	13.0
Respirable dust	1999 – 2019	With LEV	76	24	0.63	2.7
		Without LEV	19	3	1.5	2.7

Dust exposure during welding

Hazardous substance	Time period of sampling	Local exhaust ventilation	Number of measurements	Values below LOD N	50 th percentile (mg/m ³)	90 th percentile (mg/m ³)
Metal active gas welding (MAG)						
Inhalable dust	1999 – 2019	With LEV	1424	239	1.9	8.1
		Without LEV	580	21	5.5	15.0
Respirable dust	1999 – 2019	With LEV	622	132	0.84	2.8
		Without LEV	150	15	2.1	6.8
Tungsten inert gas welding (TIG)						
Inhalable dust	1999 – 2019	With LEV	453	269	! LOD	1.2
		Without LEV	363	169	0.36	1.6
Respirable dust	1999 – 2019	With LEV	171	121	! LOD	0.58
		Without LEV	113	51	0.34	0.89

Nickel exposure during welding

Nickel content of the material	Time period of sampling	Local exhaust ventilation	Number of measurements	Values below LOD N	50 th percentile (mg/m ³)	90 th percentile (mg/m ³)
Manual metal arc welding						
Less than 5%	2010 – 2016	not diff.	20	8	0.002	0.013
5 – 30 %	2010 – 2016	not diff.	23	3	0,0051	0.085
Over 30 %	2000 – 2016	not diff.	20	2	0.084	0.50
Metal active gas welding (MAG)						
Less than 5%	2010 – 2016	not diff.	367	102	0.0018	0.018
5 – 30 %	2010 – 2016	with LEV	123	11	0.022	0.14
		without LEV	26	0	0.12	0.14
Over 30 %	1994 – 2016	not diff.	37	1	0.037	0.83

Exposure data shown can be found in the following publications:

- Publication of the dust report on the internet on the IFA website (in English)
<https://www.dguv.de/ifa/publikationen/reports-download/reports-2020/ifa-report-6-2020/index-2.jsp>
- 3rd edition of the IFA report – quartz exposure at the workplace (in English)
<https://www.dguv.de/ifa/publikationen/reports-download/reports-2022/ifa-report-3-2022/index-2.jsp>
- Report on Exposures to nickel and its compounds (in German)
<https://www.dguv.de/ifa/publikationen/reports-download/reports-2021/bk-report-1-2021/index.jsp>
- Publication on welding fume exposure in Germany and adverse health effects (in German)
<https://www.asu-arbeitsmedizin.com/wissenschaft/schweissrauchexpositionen-deutschland-und-bewertung-der-gesundheitsschaedigenden>

Thank you for your attention

Time for discussion 😊

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