IMPLEMENTATION OF EC DIRECTIVE “VIBRATION” (2002/44/EC) IN GERMANY

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Abstract
The EC-Directive “Vibrations” (2002/44/EC) was implemented in Germany together with the EC-Directive “Noise” (2003/10/EC) and the ILO Convention No.148 via the “Noise- and Vibrations-Occupational Safety and Health Ordinance” (Lärm- und Vibrations-Arbeitsschutzverordnung – LärmVibrationsArbSchV), which came into force on 9th March 2007. The report provides an introduction about the EU and German regulatory frameworks, as well as estimations for the number of concerned workers and sectors in Germany. Further, it provides a comparison of the corresponding law and regulations with the requirements of 2002/44/EC. The national health surveillance procedures in case of critical vibration exposures are explained. Information is given about derogations from the ordinance and about the three different occupational diseases in Germany, which are vibration-related and acknowledged by the occupational diseases ordinance. Finally, a survey about some practical guides, risk assessment tools and other documents for the implementation of part “vibrations” of the Noise- and Vibrations-Occupational Safety and Health Ordinance in Germany is given.

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1. Introduction

The EC-Directive “Vibrations” (2002/44/EC) was implemented in Germany together with the EC-Directive “Noise” (2003/10/EC) and the ILO Convention No.148 via one ordinance, the “Noise- and Vibrations-Occupational Safety and Health Ordinance” (Lärm- und Vibrations-Arbeitsschutzverordnung – LärmVibrationsArbSchV), which came into force on 9th March 2007. Due to several specific circumstances in Germany, this is later than the Directive’s transposition period set for the implementation by 6th July 2005. It is one of the causes, that a first Governments proposal to implement the four EC Directives on the physical agents “noise, vibrations, electromagnetic fields and artificial optical radiation” by one single ordinance failed. Prevention measures based on risk assessment for safety and health risks by exposure to noise were already well established in Germany since 1974. For risk assessment and prevention measures for safety and health risks by exposure to vibrations, the Statutory accident insurance and prevention (part of the German Federal social security system; “Berufsgenossenschaften” (BG)) have prepared a draft BG-regulation already by end of the 90ies. This draft was withdrawn with view to the announced EC Directive “Vibration” and its expected national implementation. So, some further years were needed, until regulations for vibrations as detailed as by the EC Directive “Vibrations” came into force. These legal requirements are relatively new OSH-issues for many companies – especially SME’s - in Germany, taking into consideration, that the provisions of VDI 2057 (German guide, providing international state of the art knowledge about vibration exposure and risk assessment – available in German and English language) were published since the 80ies, based on extensive research activities in Germany since the 60ies (Dupuis, Zerlett, 1984). Up to March 2007, the prevention of safety and health risks to employees caused by exposure to vibration at workplaces in Germany were covered by the risk assessment and correspondingly required prevention measures as established in general by the Occupational Safety and Health Act (Arbeitsschutzgesetz) of 1996. Further, the internationally agreed standards (ISO, CEN) covering employees exposure to vibrations at workplaces were elaborated with continous participation of German representatives, implemented in Germany via the corresponding national standardisation institute (section NALS within DIN and VDI) and disseminated by the occupational health and safety institutions as well as the concerned economic actors and social partners.

The following report provides an overview to the German ordinance, implementing EC Directive “Vibrations” (2002/44/EC) and corresponding activities of employers, employees and OSH-actors in Germany,
2. Regulatory frameworks for OSH-requirements concerning exposure to vibration at workplaces in Germany

The Regulatory Framework of the European Union consists of three pillars: the “European Communities”, the “Common External- and Security Politics” and the cooperation in the areas of police and justice. The social policy, to which the OSH-issues belong, is part of the “European Communities”. Therefor, the European Directives in the OSH-sector are “EC Directives”, e.g. the EC Directive “Vibrations” (2002/44/EC). For the national implementation of the EC Directive “Vibrations”, the following Directives have to be taken into consideration:

- Framework Directive (89/391/EEC) … safety and health of workers at work,
- Use of Personal Protection Equipment Directive (89/656/EEC) … use by workers of personal protective equipment at the workplace,
- Machinery Directive (98/37/EC and Revision 2006/42/EC) and European Standards complementing this Directive,
- Special provisions for risk groups (re Art. 4 (4c) of 2002/44/EC): workers at particularly sensitive risk): pregnant workers (92/85/EEC), young people (94/33/EC); further groups of workers with specific OSH-risks are known: workers with disabilities, older workers, temporary, migrant, other precarious workers. In this area as well, the national implementations are often different.

Article 95 (Free movement of goods, Avoidance of trade barriers) of the Treaty establishing the EU is basis for the Machinery Directive, Article 137 of the Treaty is basis for occupational safety and health Directives (minimum requirements).

In Germany, e.g. the following laws and ordinances are important in this context:

- Occupational Safety and Health Act (Arbeitsschutzgesetz - ArbSchG),
- Machinery and Product Safety Act (Geräte- und Produktsicherheitsgesetz - GPSG) and corresponding ordinance (9. GPSGV – implementing the EC Machinery Directive and its Annexes),
- Ordinance on Industrial Safety and Health (especially work equipment, …) (Betriebssicherheitsverordnung – BetrSichV),
- Works (Council) Constitution Act (Betriebsverfassungsgesetz – BetrVG),
- Risk Groups: disabled people, inclusion in other OSH acts for pregnant workers and young people.

Prevention requirements concerning exposure to noise are established in Germany since 1974 (the “BG-regulation “Noise” – UVV “Noise” (BGV B3)), which implemented the fist EC Directive “Noise” from 1986 in Germany. The revision of the EC Directive “Noise” in 2003 was now in 2007 implemented together with the EC Directive “Vibration” (2002/44/EC) via the “Noise- and Vibrations-Occupational
Safety and Health Ordinance” (Lärm- und Vibrations-Arbeitsschutzverordnung – LärmVibrationsArbSchV). The 33 years-old BG-regulation “UVV “Noise” (BGV B3) was now withdrawn following the coming into force of this new ordinance. The German Government aims at providing employers in addition to the ordinance with subsequent Technical Guides (Technische Regeln) on “Noise and Vibration”, which are currently under elaboration with participation of concerned parties. These “Technical Guides” (TRLV “Lärm” and TRLV “Vibration”) will enable the employer, to achieve presumption of conformity with the ordinance, if their requirements are fulfilled. The “Technical Guides” are expected to be published in 2009. Further branch-specific guidance will be provided e.g. by the FIOSH (BAuA), the Bundesländer, the Berufsgenossenschaften, institutions of OSH-experts, manufacturers as well as employers and employees organisations.

3. Estimation of number of workers exposed to hand-arm vibration (HAV) and whole-body vibration (WBV) in Germany

Currently there are estimations available about the number of workers exposed to vibration in Germany. One estimation results in about 1,8 Mio employees exposed to hand-arm transmitted vibration with risks for health and safety in Germany (Christ, 2002). Further estimations are based on a German microcensus 2001 and rates of exposure to vibration in UK from 1998 (Table 1).

Table 1 – Estimation of number of workers exposed to vibration in Germany
(Basis of data: German Microcensus 2001 and rates of exposure to vibration in UK 1998; Mohr, 2004)
Further data about types of exposure, main sources of vibration and main sectors in Germany are available as part of the publication of the EU Agency OSH, Bilbao: "Literature study and policy and practice overview on vibration".

4. Sectors/ Branches in Germany with mechanical vibration considered an important occupational risk factor

There are some main sectors/ branches in Germany, where exposure to vibration at work is recognised in recent years as a safety and health risk. The number of assumed diseases (reported to the “Berufsgenossenschaften”) and the compensation of occupational diseases caused by exposure to vibration serve as indicators. Some main concerned sectors are for hand-transmitted vibration: construction/ mining, metal/ mechanical engineering industry, forestry/ agriculture, temporary employees. For whole-body vibration some relevant sectors are construction, forestry, transport (trains, vehicles, ships), mining, agriculture, metal/ mechanical engineering industry.

5. Comparison of the law and regulations in Germany with the measures established by the 2002/44/EC Directive

The “Noise- and Vibrations-Occupational Safety and Health Ordinance” (Lärm- und Vibrations-Arbeitsschutzverordnung – LärminVibrationsArbSchV) came into force on 9th March 2007. It implemented the EC Directives 2002/44/EC and
2003/10/EC. The ordinance provides legislative requirements for employers for the protection of workers from risks to their health and safety arising or likely to arise from exposure to noise as well as to mechanical vibration (Fig. 1).

The legislative framework for the implementation of 2002/44/EC in Germany – beside this specific ordinance - is given by the Occupational Safety and Health Act (Arbeitsschutzgesetz - ArbSchG), the Machinery and Product Safety Act (Geräte- und Produktsicherheitsgesetz - GPSG) and the corresponding ordinance (9. GPSGV – implementing the EC Machinery Directive and its annexes), the Ordinance on Industrial Safety and Health (Betriebssicherheitsverordnung – BetrSichV) or the Works (Council) Constitution Act (Betriebsverfassungsgesetz – BetrVG) for the consultation and participation of workers and several further specific safety and health ordinances.

Aim and scope of the “LärmVibrationsArbSchV” are in line with the EC Directive, except of the mining sector (for which a separat ordinance was earlier updated – the “Gesundheitsbergverordnung - GesBergV”) and the military area.

The daily exposure value as defined in the Annex referred to in Art. 3 of the EC
Directive is defined at the § 2 “Definitions” as “Daily-Vibration-Exposure-Value (Tages-Vibrationsexpositionswert) A(8)” with reference to the Annex (mainly copied from the EC Directive), but without explicit reference to ISO 5349-1(2001) and ISO 2631-1(1997). These standards are the latest versions accordingly to the “state of the art technique” and therefore it was not necessary to include the specific standards numbers with a specific reference-year into the ordinance.

One definition provides an important clarification – the definition of the “state of the art technique” (§ 2 (7)), referring to the state of development of progressive (“fortschrittlich”) procedures, appliances/ technical provisions or kind of operations, which seems to have proven the practical appropriateness of a measure to protect the health and safety of workers. To determine the “state of art technique”, especially comparable procedures, appliances/ technical provision or kind of operations have to be included into the determination, which have been successfully field-tested in practice. The same relies to the requirements for occupational medicine and industrial hygiene. This definition of the “state of the art technique” is important, as it specifies the framework and reference for any prevention measure required by the employer, e.g. the application of the minimisation principle “the risks arising from exposure to mechanical vibration shall be eliminated at their source or reduced to a minimum” or the determination of prevention measures resulting from the risk assessment.

As far as possible, the employer should determine the risks by using publicly available information from manufacturers or importers (the juridical person or entity, which put a machine on the market) “concerning the level of emission from the work equipment used, and based on the observation of specific work practices” and avoid measurements. But, when is measurement necessary? The German ordinance clarifies this question by the requirement for a measurement according to specific provisions of § 4 “Measurements” in the case, if it is not possible to determine with certainty, whether the exposure action or limit values are met.

Particular attention to vibration specific risk assessment issues is highlighted at the German ordinance as well. The “level, type and duration of exposure” is meant to include any exposure to intermittent vibration or repeated shocks, even if this is not explicitly mentioned. The provisions for measurement are widely the same as at the EC Directive. One additional concrete requirement is included, as the employer has to store the documentation of the measurement at minimum 30 years in “a suitable form so as to permit consultation at a later stage.”
The German ordinance implemented the exposure action values and exposure limit values for exposure to hand-arm-vibration and to whole-body-vibration identically from the EC Directive “Vibration” by § 9 of the German ordinance (Fig. 2) - with one exception for the exposure limit value for whole-body vibration in z-axis: in z-axis the exposure limit value is 0.8 m/s² instead of 1.15 m/s², in x-/y-axis (further explanation under para 5.), as there is sound scientific evidence, that diseases for the spine resulting from longterm exposure to whole-body-vibration may occur at lower exposure values as 1,15 m/s².

<table>
<thead>
<tr>
<th>§ 9 Exposure limit value and action value for vibrations</th>
<th>Hand-Arm-Vibrations</th>
<th>Whole-Body-Vibrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily-Vibrations-exposure-value A(8)</td>
<td>A(8) = 5,0 m/s²</td>
<td>A(8) = 0,8 m/s²</td>
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<tr>
<td></td>
<td>z-direction (vertical)</td>
<td>z-direction (vertical)</td>
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<tr>
<td></td>
<td>A(8) = 1,15 m/s²</td>
<td>A(8) = 0,5 m/s²</td>
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<tr>
<td></td>
<td>x-/y-directions (horizontal)</td>
<td>x-/y-directions (horizontal)</td>
</tr>
<tr>
<td>Exposure action values</td>
<td>A(8) = 2,5 m/s²</td>
<td>A(8) = 0,5 m/s²</td>
</tr>
</tbody>
</table>

Figure 2 – Exposure limit values and exposure action values of the German Ordinance for exposure to hand-arm-vibration and whole-body-vibration.

Figure 3 shows the corresponding measures, which the employer has to fulfill at or above the exposure limit value or the exposure action value.
Figure 3 – “Traffic-light-principle” of the Ordinance with exposure limit value and exposure action value for hand-arm-vibration.

Provisions aimed at avoiding or reducing exposure (§ 10) contain the minimisation-principle in para (1). One addition highlights the well known “hierarchy”, that technical measures to minimise vibration exposure are predominantly to be applied before organisational measures. The measures from Art. 5 (2) EC Directive were implemented as well with some additional modifications at § 10(2) of the German ordinance, e.g. appropriate work schedules “with sufficient time-periods without stressing/ hazard exposure to vibration” instead of “with adequate rest periods”.

The requirements concerning measures above the exposure limit values are identical with the EC Directive. The „vibration-minimisation-programm“ of Art. 5(2) is implemented with a separat para 10(4) at the ordinance, referring to a programme with technical and organisational measures.

Worker information and training is required in more detail by the German implementation: following Art. 6 EC Directive “the employer shall ensure that
workers who are exposed to the risks from mechanical vibration at work and/or their representatives receive information and training” – the German ordinance refers the term “... exposed to the risks...” to the exposure action value. Further, the worker information has to be provided before the start of the job and afterwards regularly and everytime, if important changes of the job occur. To enable the early detection of health disturbances, as an additional requirement it is introduced by the German ordinance, that workers have to receive during the information/training a general medical consultation (in addition to the individual health surveillance provisions) – under specific conditions with involvement of a doctor.

The requirements for health surveillance are described at two paragraphs of the German ordinance: § 14 for addressing the obligations of employers,

- to offer health surveillance to workers with exposure to vibration above the exposure action value and
- to mandatory provide health surveillance to workers with exposure to vibration at or above the level of the exposure limit value.

Another paragraph (§ 13) provides requirements for the health surveillance in line with current German regulatory approaches to health surveillance as for other occupational noxes. A revision and modernisation of the whole occupational health surveillance system in Germany is under way and a corresponding general ordinance is announced. The latest key provisions are now already implemented for exposure to vibration with the new ordinance. A national state of the art set of health surveillance procedures for exposure to vibration was developed by the Berufsgenossenschaften by end of 2005 on behalf of the Government and resulted in the Berufsgenossenschaftlichen Grundsatz for health surveillance “Strain on the musculoskeletal system including vibration” (G 46) with a supplementary part on exposure to vibration. The currently 46 different “Berufsgenossenschaftlichen Grundsätze” for several occupational noxes are available as DGUV-Handbook of Guidelines for occupational medicine examinations, accepted in Germany as basis for qualitatively consistent procedures in occupational medical prophylaxis (Edition 2007 – also available in English language).

Derogations: authorities are entitled to allow derogations, if an employer explains in a report, why the requirements would create a severe business risk for his company and which measures could ensure, that workers are sufficiently protected. The derogations have to be checked and if possible withdrawn after 4 years at the latest.

For exposure of a worker to vibration, which varies markedly from time to time,
option of averaging the exposure value over 40 hours (Art. 10 (2,3) of 2002/44/EC) is not given in Germany. Transitional periods are only forseen for two areas:

- for military applications/ appliances by 1st July 2011, the exposure limit value may achieve $A(8) = 1,15 \text{ m/s}^2$.

- for construction machines and appliances, manufactured earlier as 1997, and if the measures according to the ordinance are provided, which are not able to meet the exposure limit values for whole-body vibration, it is allowed, that the exposure limit value for z-axis of $A(8) = 0,8 \text{ m/s}^2$ may achieve until 31st December 2011 at the latest $A(8) = 1,15 \text{ m/s}^2$.

Finally, a catalogue of administrative offences and criminal offences is included.

6. Adoption or deviation of the German regulations from the daily exposure action values and daily exposure limit values established by the Directive

The exposure action values and the exposure limit values of EC Directive 2002/44/EC are implemented in Germany via the “Noise- and Vibrations-Occupational Safety and Health Ordinance” (Lärm- und Vibrations-Arbeitsschutzverordnung – LärmVibrationsArbSchV) with one exemption:

Due to scientific knowledge about health risk by exposure to whole-body vibration above $A(8) = 0,8 \text{ m/s}^2$ (and even above lower exposure (e.g. Seidel, 2005)), a compromise was deliberated with representatives from the construction industry. Generally, the exposure limit value for exposure to whole-body vibration is defined as follows:

$A(8) = 1,15 \text{ m/s}^2$ in x- and y-axis and $A(8) = 0,8 \text{ m/s}^2$ in z-axis. As derogation there is a compromise involved for construction machines and appliances (as described at the end of para 4. of this report). As one measure, health surveillance to workers with exposure to vibration at or above the level of the exposure limit values is mandatory.

7. Dissemination of the provisions of the new German ordinance among employers and employees in Germany

In Germany, the dissemination of the provisions of the “Noise- and Vibrations-Occupational Safety and Health Ordinance” (Lärm- und Vibrations-Arbeitsschutzverordnung – LärmVibrationsArbSchV) has started with its coming into force on 9th March 2007. Actors at all levels of companies, the social partners and the OSH-institutions at Bundesländer, Berufsgenossenschaften/ Unfallversicherungsträger as well as manufacturers
and user associations are providing information, checklists, guidance and best practice to employers and employees. Meetings, conferences and fairs are used, to inform employers, which are responsible for the practical implementation of the ordinance provisions, as well as company OSH-experts and employees. The internet is used for dissemination of information, e.g. www.bg-vibrationen.de or www.bg-schwingungen.de, and further offers from the Bundesländer like www.las-bb.de/karla. An European handbook “Vibrations” as practical guide for companies to implement the EC Directive “Vibration”, which was prepared on behalf of the European Commission and which is addressed as “non-binding guide” to the 27 European Memberstates, was published in 2008. It is available to download or order – currently in English language, but soon available in several other European languages - from:

(Search for "vibrations"). This EU Handbook was (based on an earlier version by the consortium, which has prepared the handbook) adapted to the German legislative framework already in 2007 and published by the German Ministry for Labor and Social Affairs in 2007 (www.bg-vibrationen.de).

8. Disorders and/or diseases considered to be caused by mechanical vibration (HAV and WBV) and compensated in Germany

The German occupational disease ordinance (Berufskrankheitenverordnung – BKV) covers three occupational disease numbers related to occupational exposure to vibration. The Statutory accident insurance and prevention institutions (Unfallversicherungsträger/ Berufsgenossenschaften) are responsible for the corresponding procedures to determine and to assess the right for compensation following the BKV-regulation in close contact with the concerned employees and the companies, where the exposure to vibration occurred during the occupational biography of the individual worker. For the guidance of occupational physicians related to the reporting of diseases to the institutions for compensation (“Unfallversicherungsträger/ Berufsgenossenschaften”), the German Ministry of Labor and the Ministry of Health established a scientific committee, which elaborates guidance documents about health risks, technical preconditions at the work conditions and medical disease patterns. Guidance documents (so called “BK-Merkblätter”) provide the current knowledge summarised by the consulting scientific committee at the Ministry about occupational diseases caused by exposure to vibration. For diseases at hand-arm-bones and -joints, it is the occupational disease No. BK 2103 (in 2005 there were 440 assumed/ reported cases, 106 acknowledged cases and 63 cases with compensation) and a second disease-number for vascular and/or neurological disorders, the occupational disease No. BK 2104 (“White Finger
Syndrom”/ VVS: in 2005 there were 71 assumed/reported cases, 11 acknowledged cases and 9 cases with compensation. For whole-body vibration, a guidance document for the occupational physicians provide the current knowledge summarised by the consulting scientific committee at the Ministry with respect to the relation between exposure and the probability of long-term effects on the lumbar spine (Decree on occupational diseases. Guidance concerning occupational diseases. Bek. des BMGS vom 1. Juni 2005 – 414-45222-2110. Berufskrankheiten-Verordnung. Merkblätter zu Berufskrankheiten. Bek. des BMGS vom 1. Juni 2005 – 414-45222-2110). The document contains a table with ranges of daily exposure data according to VDI 2057 Part 1 and the EC-Directive 2002/44/EC together with corresponding verbal risk assessments for exposure durations (i) between 5 and 10 years as well as (ii) longer than 10 years. In 2005 there were 396 assumed/reported cases, 14 acknowledged cases and 11 cases with compensation, caused by whole-body vibration.

Literature

Berufsgenossenschaftlicher Grundsatz for health surveillance (2007) “Strain on the musculoskeletal system including vibration” (G 46) with a supplementary part on exposure to vibration. In: DGUV (Hrsg.): Berufsgenossenschaftliche Grundsätze für arbeitsmedizinische Vorsorgeuntersuchungen. 4. vollständig neu bearbeitete Ausgabe, Gentner Verlag, Stuttgart, 2007


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Mohr, Detlev: Eine einfache Methode zur Beurteilung stoßhaltiger Ganzkörper-Schwingungen. VDI Tagung Humanschwingungen, 2004

Seidel, Helmut: On the relationship between whole-body vibration exposure and spinal health risk. Industrial Health 43 (2005), 361-377
Decree on occupational diseases, published by the German Ministry for Labor and Social Affairs (only for BK 2110: the German Ministry for Health (BMGS)) - Guidance documents concerning occupational diseases ("BK-Merkblatt"), caused by exposure to vibration:


- Statutory accident insurance and prevention (part of the German social security system)
- The German Berufsgenossenschaften/ UVT’s are:
  - self-administered by employers and employees (50:50)
  - exclusively funded by the employers
- Mandatory "liability insurance" for all employers (German Social Law Code (SGB VII))
- Branch-specific-approach (from 2010: 9 + 17 UVT’s) with following tasks/activities:
  - Prevention of accidents, occupational diseases, work-related health-risks, provision of first aid (Prevention)
  - Restoration of health and working capacity (Rehabilitation)
- Provision of financial compensation (e.g. pensions)