Machinery Noise –
Legal requirements and standards

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• An estimated one third of European workers (more than 60 million people) are exposed to noisy conditions for more than a quarter of their working time.

• Almost 40 million – an equivalent to the entire population of Spain – are exposed to noise for at least half of their working hours!

• Noise-induced hearing loss is still one of the most common occupational diseases in Europe, accounting for about one third of all work-related diseases.

• In Germany the yearly expenditures covering disability pensions and rehabilitation costs due to noise induced hearing loss is amounting to 170 million €.
What are the reasons for the high noise levels?

Noise emission from machines is the major cause of noise at

- work places,
- in the environment.

Noise emission of machines must be reduced

- Noise reduction by design
- Transparent market to allow the purchase of quiet machines
Idea: Using market forces

• Manufacturers measure quantities characterising noise emission of machines according to International / European standards and declare the measured values

• Transparent market using clear information on the noise emission

• Machine buyers compare noise emission values provided by manufacturers and choose the quieter machine

Less noise at work and in the environment
Responsibilities and key areas for noise reduction

**Machine manufacturer**

**Emission**

**Employer**

**Immission**

**Exposure**
EU Directives dealing with machinery noise

- Machinery Directive 2006/42/EC
- "Outdoor"- Noise Directive 2000/14/EC
- Ecodesign Directive 2009/125/EC
- Physical Agents Noise Directive 2003/10/EC
Two Pillars of EU Noise Control Legislation

Lisbon Treaty establishing the EU

**Article 114, 115**
Free movement of goods, Avoidance of trade barriers

**Article 153**
Health and Safety, Minimum requirements

New Approach Directives setting essential safety and health requirements (ESHRs)

Directives to be adopted and if wanted tightened on national level

ESHRs complemented by standards

Machinery Directive (2006/42/EC)

European Directives with influence on noise at work places

Product Safety

Machinery Directive

• noise reduction at source
• noise emission declaration
• instructions for safe use

Health and Safety at work places

Physical Agents, Noise Directive (2003/10/EC)

• exposure action values
• noise exposure limits
• risk assessment
• requirements on noise reduction and hearing surveillance
Machinery must be designed and constructed in such a way that risks resulting from the emission of airborne noise are reduced to the lowest level, taking account of technical progress and the availability of means of reducing noise, in particular at source.

The level of noise emission may be assessed with reference to comparative emission data for similar machinery.
Information on airborne noise emissions according to the MD 2006/42/EC

The instructions and any sales literature describing performance characteristics must contain, at least the following information on airborne noise emissions:

- A-weighted emission sound pressure level \( L_{pA} \) at workstations, where this exceeds 70 dB(A)

- peak C-weighted instantaneous sound pressure value \( L_{pC_{peak}} \) at workstations, where this exceeds 130 dB

- sound power level where the A-weighted emission sound pressure level at workstations exceeds 80 dB(A).

- the uncertainties surrounding these values must be specified

In addition there shall be instructions for safe use; instructions relating to installation and assembly for reducing noise and where appropriate an indication to use hearing protectors.
Two complementary regulations

Manufacturers

Machinery Directive (2006/42/EC)

- minimization requirement
  - noise reduction at source
  - construction of quiet machines
- information about residual risks (noise emission)

Employers


- Risk assessment e.g. by using emission values
- Choosing quiet machines and working methods
- Noise reduction on the propagation path (workspace) etc.

Quieter machinery on the market

Less noise exposure of employees

P. Kurtz, J. Jacques
BUY QUIET, 2016-6-25, Hamburg
Two further EU Directives on products - Outdoor Noise Directive and Ecodesign Directive

**OUTDOOR Directive 2009/125/EC**

- It deals solely with the noise emission of machines to be used outdoors,
- It sets limits on the noise emission, that means for the sound power level of about 22 machines such as leave blowers and construction machines,
- It requires to mark (label) these and additional 39 machines with the guaranteed sound power level on the machine's case,
- It relies on parts of ISO 3744 but defines own operating and mounting conditions for the measurements,

**ECODESIGN Directive 2009/125/EC**

- It deals with ecodesign requirements for energy-related products,
- It primarily aims at reducing the energy consumption of products,
- It requires to provide the sound power level for some products like house hold appliances and computers,
- It sets benchmarks also for noise,
- It partly relies on harmonised standards,
Chronology of European Directives on Machinery Safety, Occupational Noise, Outdoor Noise, Ecodesign

- Machinery Directive 91/368/EC
- Machinery Directive 98/37/EC
- "Outdoor“- Directive 2000/14/EC
- Physical Agents Noise Directive 2003/10/EC
- Machinery Directive 2006/42/EC
- Ecodesign Directive 2009/125/EC

Dates:
- 1986
- 1989
- 1991
- 1993
- 1998
- 2001
- 2003
- 2006
- 2009

Machinery Directive 91/368/EC
Machinery Directive 98/37/EC
Physical Agents Noise Directive 2003/10/EC
Machinery Directive 2006/42/EC
Ecodesign Directive 2009/125/EC
### Woodworking machine, tenoning machine, Typ 8/v

**Declared dual-number - noise emission data – EN ISO 4871**

<table>
<thead>
<tr>
<th></th>
<th>idling</th>
<th>operating</th>
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<tr>
<td>A-weighted sound power level, $L_{WA}$</td>
<td>96</td>
<td>100</td>
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<tr>
<td>in dB re 1 pW</td>
<td>2</td>
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<tr>
<td>Uncertainty $K_{WA}$</td>
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<tr>
<td>A-weighted emission sound pressure level, $L_{pA}$,</td>
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<td>in dB re 20 μPa</td>
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<tr>
<td>Uncertainty $K_{pA}$</td>
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</table>

Data obtained according to noise test standard ISO 7960 using basic standards EN ISO 3744 and EN ISO 11204.
Noise emission declaration according to the OND

Chain saw with combustion engine, type TT 53

Declared single/dual number – noise emission data – EN ISO 4871

A - weighted guaranteed sound power level $L_{WA d}$ in dB re 1 pW
Uncertainty $K_{WA}$

A – weighted emission sound pressure level, $L_{pA}$, in dB re 20 mPa
Uncertainty $K_{pA}$

Load

| 104 | 2 |
| 91  | 3 |

On a label and in the instructions

In the instructions

The values were determined according to 2000/14/EC and ISO 7182 by applying the basic standards EN ISO 3744 and EN ISO 11204.

P. Kurtz, J. Jacques
BUY QUIET, 2016-8-25, Hamburg
Noise emission information according to the other Ecodesign Directive

EU energy efficiency label

Example:
Standards help to comply with the MD, OND and ECODESIGN Directive

Noise reduction measures, measurement, declaration and verification methods are laid down in harmonised European standards listed in the OJEU.

Their application triggers the presumption of conformity with the essential requirements of the MD.

**Outdoor Noise Dir. a partly exceptional Directive**
*(Global approach Directive)*

- The OND basically includes the different noise test codes with some exceptions, however, relies on the basic measurement method for the determination of the sound power level the EN ISO 3744.

- C-standards about machines covered both by the MD and OND adopt these specifications for the determination of the sound power level and additionally specify the determination of the emission sound pressure level by using the operating and mounting conditions defined in the OND.
Basic standards for determining noise emission levels

ISO 3740 series for the determination of the sound power level by sound pressure measurements

ISO 9614 for the determination of the sound power level by sound intensity measurements

ISO 11200 series for the determination of the emission sound pressure level at workstation

Basic noise emission declaration and verification standard

ISO 4871 Declaration and verification of noise emission values of machinery and equipment

More than 800 machinery specific harmonised safety standards with noise test codes included or separate noise test codes
Benefit of using noise emission information

- Selection of quiet machinery by the purchaser
- Information on the state of the art of noise reduction
- Improvement of the technical dialogue between the buyer and the supplier
- Noise exposure forecast
- High degree of transparency on the machinery market
- Point out comparatively quiet machines
- Incentive for the development of quiet machines
Quiet machines increase competitiveness as they are not only reducing social costs but also economic costs!