



## A+A 2017: Essay on Ergonomics & Workplace Design

### Basic Requirements of People-Friendly Design of the Workplace

From 17 to 19 October the international trade fair A+A 2017 featuring the 35<sup>th</sup> International Congress for Occupational Safety and Occupational Medicine offers a comprehensive range of information on the topic of ergonomics and workplace design. In conjunction with a definition of the term “ergonomics” and its sub-topics this line-up will be elucidated below according to thematic focal points by Prof. Dr. Ralf Pieper of Wuppertal University.

#### What is Ergonomics?

The invented term ergonomics was coined in 1857 by the Polish natural scientist Wojciech B. Jastrzebowski from a combination of two Ancient Greek words

- *ergon* meaning “work” and
- *nomos* meaning “principle” or “law”

as the “science of activity”. In this context Jastrzebowski made a distinction between the “science of damaging activities” and a “science of useful activities”. He focused his further definition on “useful activities” and set out a series of further correlations such as

- “Labour”,
- “Entertainment”,
- “Thinking” and
- “Devotion”.

These attributions which can more easily be associated with an anthropological and culturalistic viewpoint, which were also charged with a religious connotation by Jastrzebowski, are without any social consideration. This means that they at no point reflect the spirit of industrialisation that occurred in 1857 in the first generally perceived

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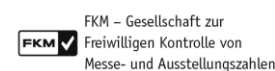
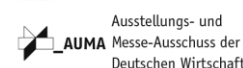
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world market crisis. With Jastrzebowski one seeks in vain for a description of the industrial or other working conditions and the social and political climate of workers or an examination of the forms of power and hegemony, conflicts and resistance in labour relations. After long disciplinary development ergonomics now focuses on the design

- of products including software ergonomics
- working conditions as part of employment relationships.

Overarching requirements made of ergonomics arise from the digitalisation of living and working conditions, the requirements of age and ageing-appropriate, inclusive and non-discriminatory design as well as eco design. Here ergonomics is integrated into company and inter-company labour and wage policies of social partners. Norms<sup>1</sup> play a key role here as does the Commission for Occupational Health and Safety and Standardization (Kommission Arbeitsschutz und Normung – KAN)<sup>2</sup> funded in this context by social partners, the state, statutory accident insurance and the German norms board DIN.

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**Definition of Ergonomics according to the Federal Institute for Occupational Safety and Health (BAuA), 2010, p. 158**

*Ergonomics means*

- *the scientific discipline that deals with understanding the interactions between human and other elements within a system and*
- *the professional branch that applies the theory, principles, data and methods to the design of work systems aimed at optimising human well-being and the performance of the entire system.*

In terms of the discipline itself a differentiation is made between

- physical/corporeal (especially anthropometry, bio-mechanics, physical forces, perception and sensory perception),
- cognitive (especially information processing) and

<sup>1</sup> C.f. <http://www.din.de/de/mitwirken/normenausschuesse/naerg/newsletter-ergonomienormung-aktuell-01-2017-235442>

<sup>2</sup>. DF. <https://www.kan.de/arbeitsgebiete/ergonomie/>



- organisation-related (especially labour organisation, workflows, working hours, working environment)

ergonomics<sup>3</sup> where the systemic, activity-related contexts between these sub-sections is pointed out with a view to the necessary general overview of physical and mental health<sup>4</sup>.

### **Ergonomics as an Operational Support Task**

Since 1974 the German Occupational Safety Act (Arbeitssicherheitsgesetz – ASiG) has stated that it is a specific and, at the same time, general task of employers to appoint expert support in the form of works physicians, safety engineers and other specialist staff for occupational safety

- when designing the workplace, workflows and the working environment,
- in occupational-physiological, occupational-psychological and industrial hygiene questions, in particular working rhythms, working hours and break time regulations as well as
- in other ergonomics issues.

This basically describes what areas of activity in occupational prevention the field of ergonomics covers<sup>5</sup> and, at the same time, what the central areas of research for work science are.

This joint task of works physicians and occupational safety specialists, who by law must be independent of company instructions, can be seen in the light of the goals to be achieved by appointing them in accordance with § 1 of the German Occupational Safety Act (Arbeitssicherheitsgesetz – ASiG):

- Application of regulations serving safety and occupational health corresponding to specific occupational conditions

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<sup>3</sup>. See M. Adler, H.-J. Herrmann, M. Koldehoff, V. Meuser, S. Scheuer, H. Müller-Arnecke, A. Windel, T. Bleyer: *Ergonomiekompodium. Anwendung Ergonomischer Regeln und Prüfung der Gebrauchstauglichkeit von Produkten*, Edited by.: BAuA, 2010, p. 15

<sup>4</sup>. See *ibid* p. 16

<sup>5</sup>. See fundamentally: and in lieu of all others: Laurig, in: *Handbuch Arbeitswissenschaft* (Edited by: Luczak/Volpert, 1997, p. 125 et seq.)



- Realisation of established occupational health and safety findings to improve occupational safety as well as
- Achievement of the highest possible level of effectiveness of the measures serving occupational safety.

*The Congress Event on **DGUV Regulation 2 (German Social Accident Insurance)** on Wednesday, 18/10/2017, deals with a multi-professional approach to consulting in the field of activity "Work Science/Ergonomics".*

*The topic is also an aspect of "**Focus on Professions – Qualifications for the Digitalised World of Work**" on Friday, 20/10/2017.*

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### **Organisational Fields of Ergonomics and Ergonomics as a General Employer Obligation**

Employer obligations arising from the German Occupational Safety Act (Arbeitssicherheitsgesetz – ASiG) in terms of ergonomics and their related support tasks are clearly laid out and defined in

- the Working Hours Act of 1994,
- the Occupational Safety Act of 1996 and
- Workplace Ordinance 1976/2004/2016,
- The working appliance usage ordinance (= Industrial Safety Ordinance 2002/2015) and
- Ordinance on Occupational Healthcare 2008/2013.

Here the corresponding occupational safety measures to be determined, laid down and implemented by the employer, as defined in § 2, Section 1 of the Working Conditions Act (Arbeitsschutzgesetz – ArbSchG), comprise the prevention of accidents at work, work-related health hazards (i.e. work-related illnesses and occupational illnesses) including measures for people-friendly workplace design. This also particularly applies to the humane operational organisation (for instance with a view to forms of business autonomy and mobile professions) as well as working hours. Consequently, employers must establish an overarching works prevention policy pursuant to § 4, No. 4 of the





Working Conditions Act (Arbeitsschutzgesetz – ArbSchG) when planning occupational safety measures.

*The A+A Congress deals with contemporary prevention in a series of events, for instance:*

*“Prevention 4.0”, Tuesday, 17/10/2017*

*“Prevention and Management Culture”, Tuesday, 17/10/2017*

*“Working Hours”, Tuesday, 17/10/2017*

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### **Ergonomics when Designing Work Systems and Using Work Appliances**

When providing and using work appliances the employer must, pursuant to § 3 of the Industrial Safety Ordinance (Betriebssicherheitsverordnung – BetrSichV), taking into consideration all hazards that arise from the work appliances themselves, the working environment and the working tools/equipment in relation to all activities (industrial work, services, healthcare, education, training etc.). This means a series of aspects relating immediately to ergonomics must be taken into consideration such as fitness for use of working appliances including ergonomic, age and ageing-appropriate design, the safety-relevant and ergonomic contexts between the workplace, working appliances, work procedures, work organisation, workflow, working hours and work tasks as well as the physical and mental burdens of employees that arise when using working appliances. In Technical Rules for Industrial Safety 1151 (Technische Regel Betriebssicherheit TRBS 1151) these aspects to be taken into consideration by the employer are laid down with presumption of conformity. Fundamental concepts of ergonomics are anchored in their definitions: work system, interaction and the stress-strain model (“Belastungs-Beanspruchungs-Modell”)<sup>6</sup>.



On the basis of the hazard assessment pursuant to § 3 of the Industrial Safety Ordinance (Betriebssicherheitsverordnung – BetrSichV), included in the judgement of working conditions pursuant to § 5 of the

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<sup>6</sup>. See Laurig, loc. cit.



Working Conditions Act (Arbeitsschutzgesetz – ArbSchG), measures must be laid down pursuant to § 6 of the Industrial Safety Ordinance (Betriebssicherheitsverordnung – BetrSichV). In accordance with this the employer must ensure that the working appliance is used safely and that the principles of ergonomics are observed. The use of working appliances must be set up and organised in such a way that stresses and incorrect strains that might endanger the health and safety of employees are avoided or, if this is not possible, reduced to a minimum. The employer must ensure employees are in a position to use the working appliance without endangering themselves or other persons. In addition, § 6 of the Industrial Safety Ordinance (Betriebssicherheitsverordnung – BetrSichV) requires that, for instance, principles of humane workplace design are respected. This means the working appliances including their interface with humans must be adapted to the physical characteristics and abilities of the employees and biomechanical stresses must be avoided during use that might have damaging effects on users. To be taken into consideration here is the working environment, the location of access points and the centre of gravity of the working appliances, the necessary posture, body movement, distance to the body, necessary personal protective equipment as well as mental strain of the employees. Furthermore, employees must have sufficient freedom of movement. Working speeds and work rhythms must be avoided that could lead to endangering the employees. Moreover, operating and supervising activities must be avoided that require unlimited and lengthy concentration.

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*The Congress Event on the “Industrial Safety Ordinance” on Wednesday, 18/10/2017, among other things deals with hazard assessments concerning the use of working appliances.*

### **Ergonomics, Workplaces and Work Stations**

When setting up and operating workplaces employers must, pursuant to § 3a, Section 1, of the Workplace Ordinance (Arbeitsstättenverordnung – ArbStättV) 2016, implement corresponding occupational safety



measures and take into consideration the current state of development of technology, works medicine and hygiene, ergonomic requirements as well as technical regulations. This relates to all work stations, in particular monitor-based and teleworking stations (specifically in this context compare the requirements made on working conditions as well as on monitor-based and teleworking work stations in No. 3 and No. 6 of the Appendix of the Workplace Ordinance (Arbeitsstättenverordnung – ArbStättV)) taking into consideration the Industrial Safety Ordinance (Betriebssicherheitsverordnung – BetrSichV) relating to working appliances and the Load-Handling Ordinance (Lasthandhabungsverordnung – LasthandhabV) aimed at physical strains (handling of loads).

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*The Congress Event on the “Workplace Ordinance” on Friday, 20/10/2017, deals with the ergonomics-related topics of lighting, acoustics etc. This will be supplemented by the Congress Event “Sedentary Work” on Tuesday, 17/10/2017.*

*The Congress Event “Ergonomics in Open Officescapes” on Tuesday, 17/10/2017, focuses on aspects of spatial acoustics through to sociological and psychological findings.*

*A+A 2017 will feature the special area “WorkplaceDesign” with ergonomics exhibitors including office furniture manufacturers. The focus here lies on the topic of movement in the office. Further topics include: air humidification, acoustic solutions, vibration strains, new lighting concepts.*



### Focus Theme “Workplace Design”

A focal theme in Workplace Design is the ergonomic design of workplaces and work processes in production and at the office, in particular the communication of good practice taking into consideration the criteria of people-friendly workplace design, man-machine interfaces, prevention and economic efficiency. Health impairments due to bad working conditions and the associated drops in performance and downtimes also impact companies’ economic results. Over the past few years good and healthy work has therefore come increasingly to the fore in the discussion of the role of human capital in a company. Current



topics now also include, for example, age-appropriate arrangement of workplaces, interface design, lighting, climate and acoustics.

As part of the special shows exhibitors will be presented with a contribution on the stage in Hall 10. There will be simultaneous interpretation for all lectures.

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#### **Selected Topics of the A+A Stage Programme in Hall 10**

- *Presentation of the 2017 ErgoPack model*
- *Ergonomically shaped and safer knives at the workplace*
- *Agile health management pursuant to § 20b of the German Social Insurance Code V (Soziales Gesetzbuch – SGB V)*
- *The active workplace – no more lack of movement in the office*
- *Take a break: the underestimated potential of organised staff breaks*
- *Multi-parametric workplace analysis by means of mobile biomechanical measuring sensors*
- *Prevention using the age simulation suit*
- *New prevention concepts in interactive care*
- *Relaxation at the workplace*
- *Work 4.0 in SMEs: organise preventatively, handle expertly!*
- *Office 4.0: production location of the knowledge economy*
- *Extra-aural noise impact in the office as part of hazard assessment of mental strains*
- *Design work inclusively – through ergonomics and technology*
- *Check list for accessibility: how to design digital, work-related ease of accessibility in your company*
- *Ergonomics and advertising, make ergonomics visible/comprehensible!*



### **Co-Determining Ergonomics**

The Works Constitution Act (“Betriebsverfassungsgesetz”) of 1972, which lays down the rights of employees to elect works councils that represent their interests towards employers within the company, contains its own paragraph on the central fields of ergonomics, entitled “Fourth Paragraph – Design of the Workplace, Workflows and Working Environment”). The involvement, participation and co-determination of the works council is a key design instrument here. The same applies to staff councils. Rights and obligations of individual employees are laid down by the Working Conditions Act (Arbeitsschutzgesetz – ArbSchG).





*The Congress Event “**Works and Staff Councils as Part of Industrial Safety**” on Thursday, 19/10/2017, among other things deals with the options for handling the representation of interests in ergonomic workplace design.*

### **Ergonomics as a Manufacturer’s Obligation**

The law on technical working appliances of 1968 already obliged manufacturers and importers of technical working appliances to observe work safety and accident prevention regulations. At that time consumer protection relating to household appliances and toys was already included and today this is comprehensively anchored in the Product Safety Act (Produktsicherheitsgesetz) in conjunction with European single market laws (Product Safety Directive and, for instance, the Machinery Directive as well as norms) as well as in other legal provisions. This means inherent safety as well as principles for inherent ergonomics are required when placing products on the market (incorporated in risk assessments, operating instructions).

*On Wednesday, 18/10/2017, the Congress Event “**Safe Machines**” will, among other things, deal with ergonomic aspects of design and risk assessment.*

### **Ergonomics and Health Promotion in the Workplace and Living Environments**

Already by virtue of its context ergonomics relates to fitness for use and product ergonomics as well as to the design of working conditions in the workplace and also to the conditions of all forms of activity in other living environments. Ergonomic principles therefore have to be appropriately linked to measures for both living environment-oriented and workplace-centred health promotion. This in particular applies to fitness for use as well as the related “user experience” from the perspective of humane design of working and living conditions.

*On Tuesday, 17/10/2017, the Congress Event “**Practice of Health Promotion at the Workplace**” deals with aspects supplementing safety at the workplace.*

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## Ergonomics and Qualification

The overarching requirements of physical, cognitive and organisational ergonomics have to be included in appropriate qualification measures. Consequently, pursuant to § 2, No. 7 of the Working Conditions Act (Arbeitsschutzgesetz – ArbSchG) employers must issue appropriate instructions. When transferring tasks to employees employers must, pursuant to § 7 of the Working Conditions Act (Arbeitsschutzgesetz – ArbSchG) and depending on the type of activities, take into consideration whether employees are able to observe the provisions and measures relating to safety and health protection when fulfilling tasks. Pursuant to § 12 of the Working Conditions Act (Arbeitsschutzgesetz – ArbSchG) a suitable instruction must be given.

*The Congress Event “Behaviour-Oriented Occupational Safety” on Thursday, 19/10/2017, deals with ergonomic aspects of flanking, person-related measures in occupational safety.*

## Ergonomics, Inclusion and Anti-Discrimination

Ergonomic principles must be observed when carrying out measures for groups of employees in particular need of protection pursuant to § 4, No. 6 of the Working Conditions Act (Arbeitsschutzgesetz – ArbSchG). Measures also have to be adopted for the elimination and prevention of discrimination (c.f. § 12 of the General Equal Treatment Act (Allgemeines Gleichbehandlungsgesetz – AGG), for instance from the point of view that, pursuant to § 4, No. 8 of the Working Conditions Act (Arbeitsschutzgesetz – ArbSchG), directly or indirectly gender-specific provisions are only permitted if this is imperative due to biological reasons and also in view of an age or ageing-appropriate design of working conditions.

Ergonomic principles have to be observed if the employer has to fit out and operate the workplace in the event of their employing disabled persons pursuant to § 3a, Section 2 of the Workplace Ordinance (Arbeitsstättenverordnung – ArbStättV) in such a way that the special health and safety concerns of these employees are taken into consideration.

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The **Congress Event "Representative Body for the Severely Disabled and Prevention"** on Thursday, 19/10/2017 will focus, among other things, on barrier-free accessibility.

The Congress Event **"Maternity Protection Act"** on Tuesday, 17/10/2017, deals with the new regulations relating to equality.

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### **Ergonomics and Digitalisation**

The digitalisation of working and living conditions will comprehensively alter the requirements for risk assessment as well as the technical, organisational and person-related measures. For this reason, ergonomically oriented yardsticks of social technology appraisal have to be integrated into the assessment. This will, for instance, apply to monitor-based and teleworking work stations as well as mobile activities. Work system design including software ergonomics as well as data protection are particularly important here. Pursuant to No. 6.5, Section 5, Appendix of the Workplace Ordinance (Arbeitsstättenverordnung – ArbStättV) labour supervision may not be carried out in terms of the qualitative or quantitative results without employees knowing. This is enshrined in the fundamental right to informational self-determination and in employees' data protection in accordance with current data protection provisions.

The **congress and trade fair** pick up on the aspect of digitalisation of working conditions in a variety of ways, for instance on Thursday, 19/10/2017, with the Congress Event **"Industry 4.0"**.



### **Ergonomics and Sustainability**

According to Germany's Federal Environment Agency, eco design aims to find solutions within an integrated life cycle analysis to reduce the environmental impact of a product overall. Consequently, this adds eco-friendliness to the classic line-up of requirements in product development such as functionality, safety, ergonomics and value for money. Eco design is therefore a comprehensive design task of sustainable corporate management.



Current information on A+A 2017 and the 35<sup>th</sup> International Congress for Occupational Safety and Occupational Medicine can be found online at [www.aplusa.de](http://www.aplusa.de) and [www.basi.de/aa-kongress/](http://www.basi.de/aa-kongress/)

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