

Current figures on the defeating of safeguards

Results of a survey (2020 to 2022)

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1 Introduction

Defeating of safeguards is a frequent cause of serious work accidents on machinery. A research project conducted by the former Institute for Occupational Safety and Health of the German Social Accident Insurance (BGIA) and the German Social Accident Insurance Institutions for the metalworking industry (which have since merged) was the first to examine background issues and causes. The study published in 2006 revealed that over a third of all safeguards on metalworking machines were bypassed.¹ Since then, the topic has increasingly been addressed by directives, regulations and standards. Manufacturers and operators of machinery alike are now obliged to prevent possible incentives for the defeating of safeguards from arising, and to take thorough measures to prevent defeating itself. Despite this, occupational accidents caused by the defeating of safeguards occur time and again, and safety experts across all industries report a sustained incidence of defeating.

To compare this observation with reliable statistics, the Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) conducted a survey between 2020 and 2022. In a total of 16 questions, survey participants were asked for their assessment of the current incidence of defeating. In the interests of obtaining as many returned questionnaires as possible, the time required to complete the questionnaire was kept below five minutes. Occupational safety experts from companies operating machinery in trade and industry were defined as the target group for the survey. It was distributed at OSH trade fairs and seminars, in trade journals and online periodicals, and through targeted advertising on social media channels such as Facebook, Twitter, LinkedIn, Xing and Instagram. In total, 839 people took part in the survey.

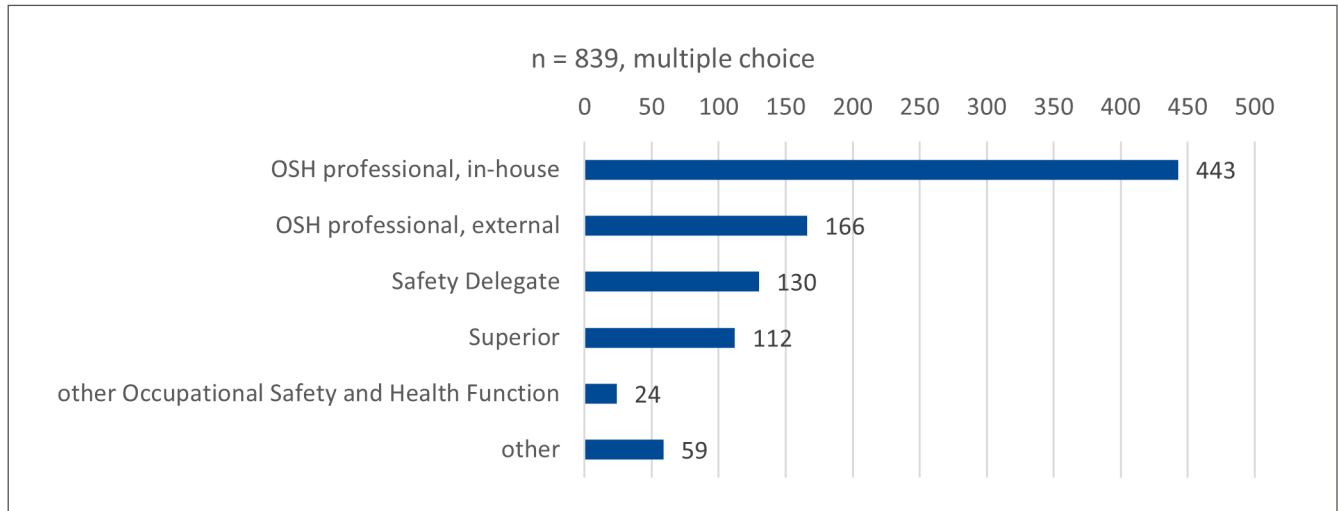
The results of the survey are presented below.

¹ *Apfeld, R.; Huelke, M.; Lüken, K. et al.: Manipulation von Schutzeinrichtungen an Maschinen, Hrsg.: Hauptverband der gewerblichen Berufsgenossenschaften (HVBG), Sankt Augustin 2006.*

2 Respondent's background

2.1 Function

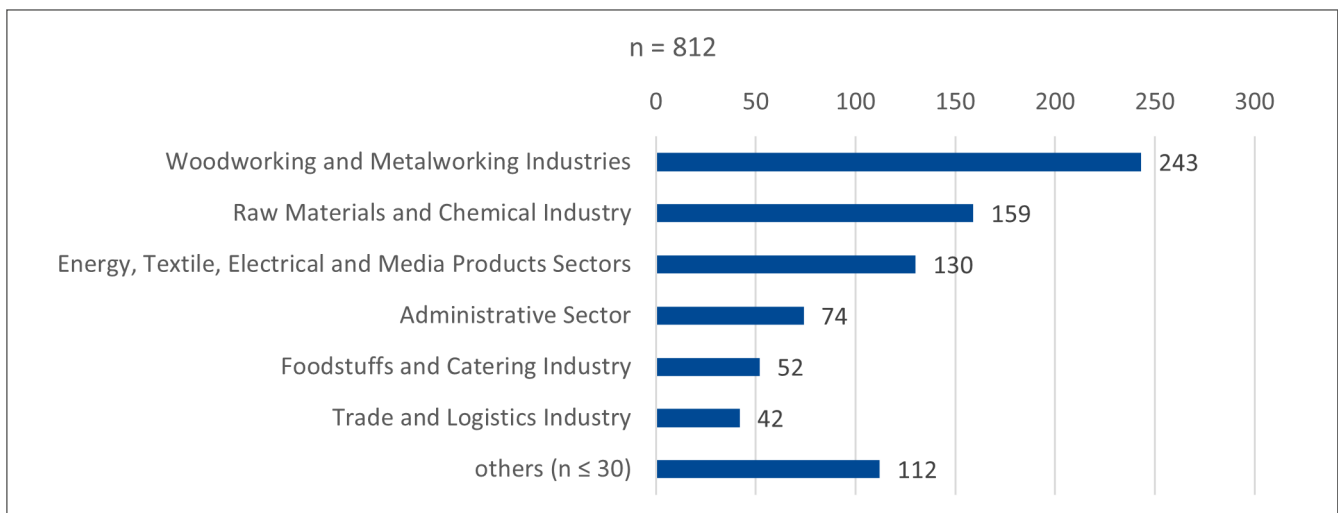
Question 1: What is your vocational function?



Just under 70% of the survey participants are in-house or external OSH professionals. Safety delegates account for a further 15%. Almost 13% of those surveyed work in positions of authority; a further 2% are tasked with occupational safety in some other capacity. The remaining survey participants (almost 7%), who are not explicitly linked to occupational safety, comprise people from other areas related in some way to machinery.

2.2 Sector

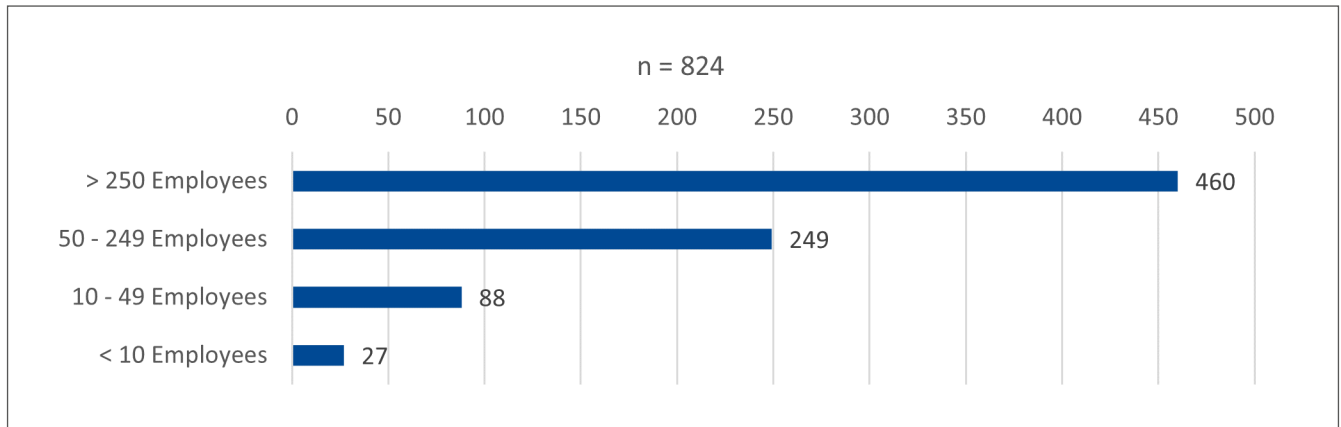
Question 2: Which accident insurance institution is the insurer of your company/primarily the insurer of the companies you supervise?



To assign the company concerned to a particular sector, the survey participants were asked to name its accident insurance institution. All German Social Accident Insurance Institutions for trade and industry and several of those for the public sector are represented in the survey results. The high number of completed questionnaires (> 100) for three sectors (woodworking and metalworking industries, raw materials and chemical industry and energy, textile, electrical and media products sector) provide a more specific picture (see 3.3).

2.3 Company size

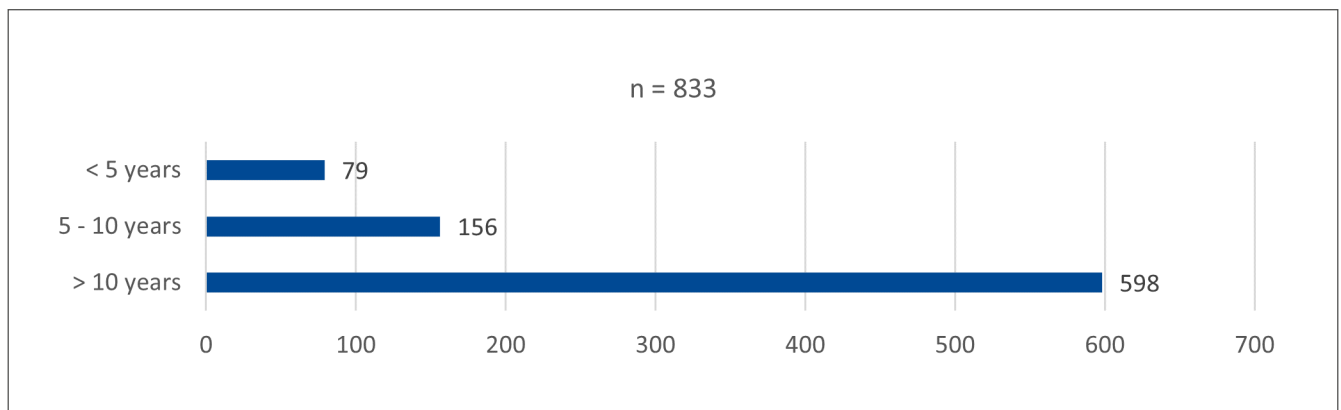
Question 3: How large is the workforce in your company/the companies you supervise (average)?



To determine possible correlations with the incidence of defeating, the survey participants were also asked to state the size of their companies' workforces. 55.8% of those surveyed work in or for large companies (250 or more employees), 30.2% in or for medium-sized companies (50 to 249 employees) and 14% in or for small and micro-enterprises (1 to 49 employees). The correlation between the size of the company and the incidence of defeating revealed by the analysis of the figures is explained in Section 6.2.

2.4 Professional experience

Question 4: How many years' professional experience do you have?

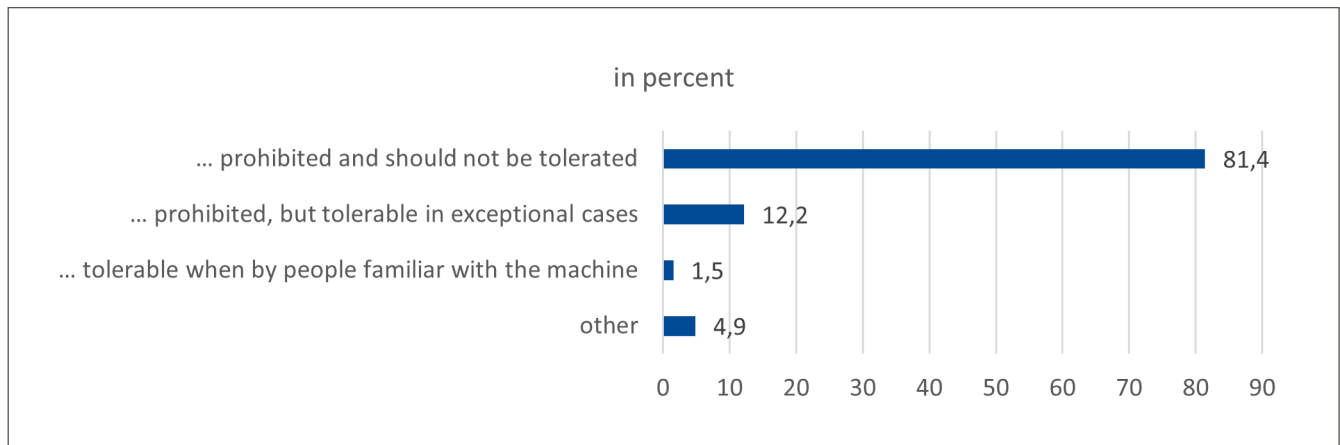
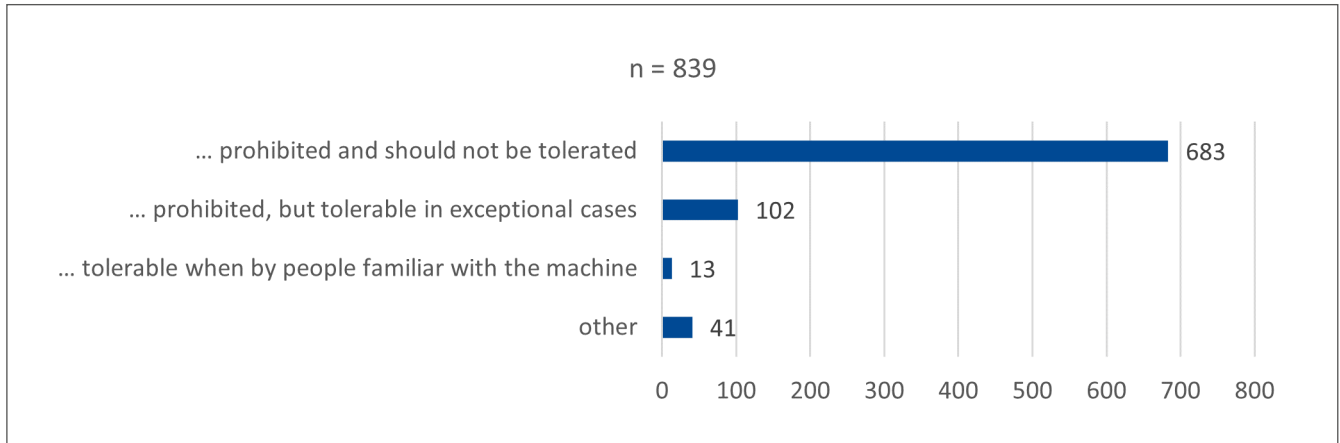


The great majority of respondents (71.2%) have over 10 years' professional experience. 13.4% have between 5 and 10 years' professional experience, 9.5% less than 5 years.

3 Assessment of the incidence of defeating

3.1 Acceptance of defeating

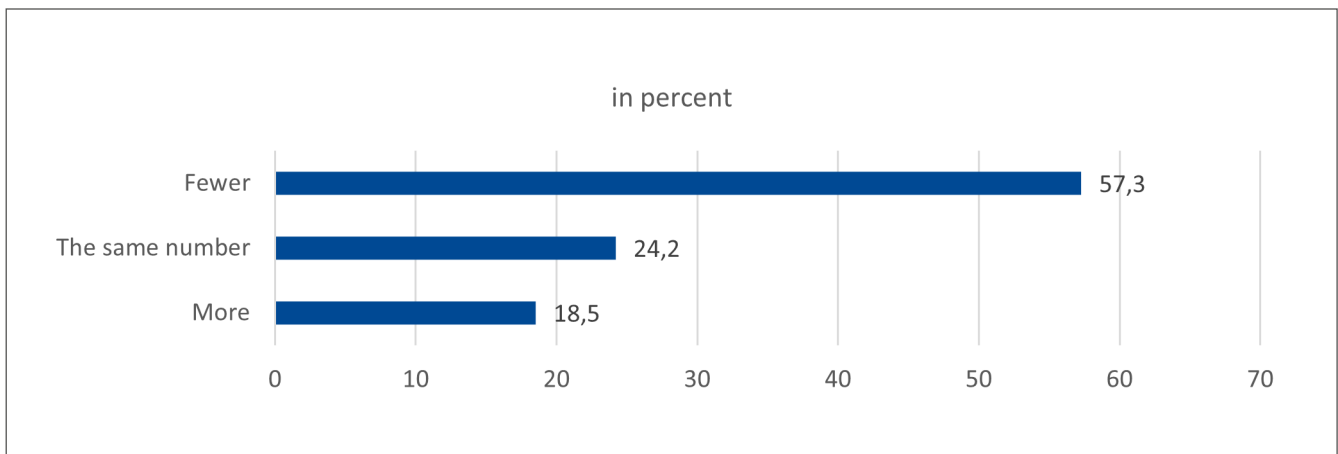
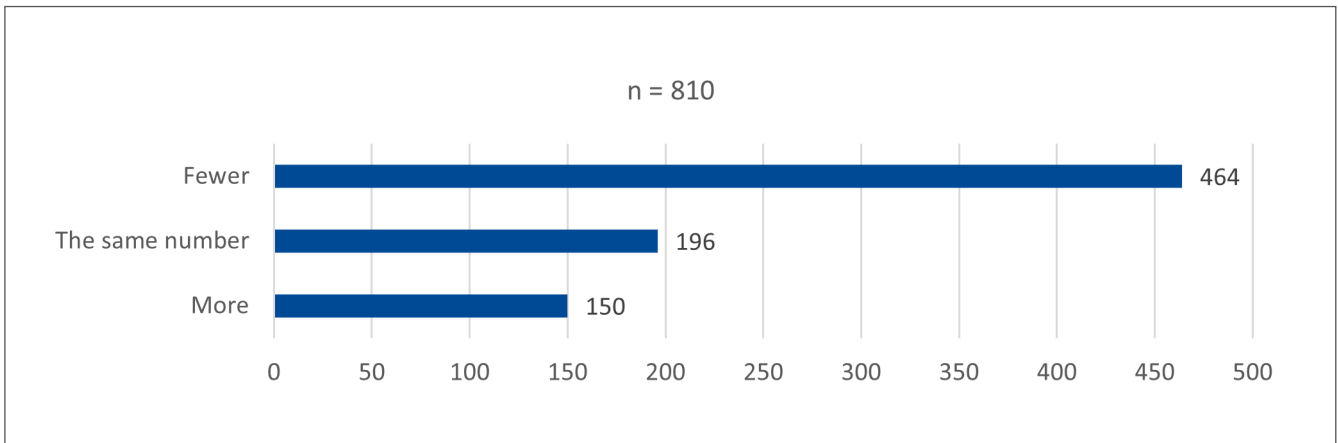
Question 5: In your opinion, defeating safeguards is:



When asked for their personal stance on the subject, the great majority of respondents (81.4%) replied that defeating safeguards should not be tolerated. Only 1.5% of respondents take the view that defeating is tolerable provided the perpetrator is sufficiently familiar with the machine. 12.2% of those surveyed consider defeating safeguards tolerable at least under exceptional circumstances. The remaining respondents provided free-text answers. For the most part, these respondents state exceptional circumstances under which they consider the defeating of a safeguard to be tolerable – for example in combination with alternative organizational and/or technical measures which are to be determined with performance of a risk assessment. Almost all of the responses stating that the defeating of a safeguard can be tolerated are from respondents whose area of work is not explicitly related to occupational safety (see 2.1).

3.2 Trend in the incidence of defeating

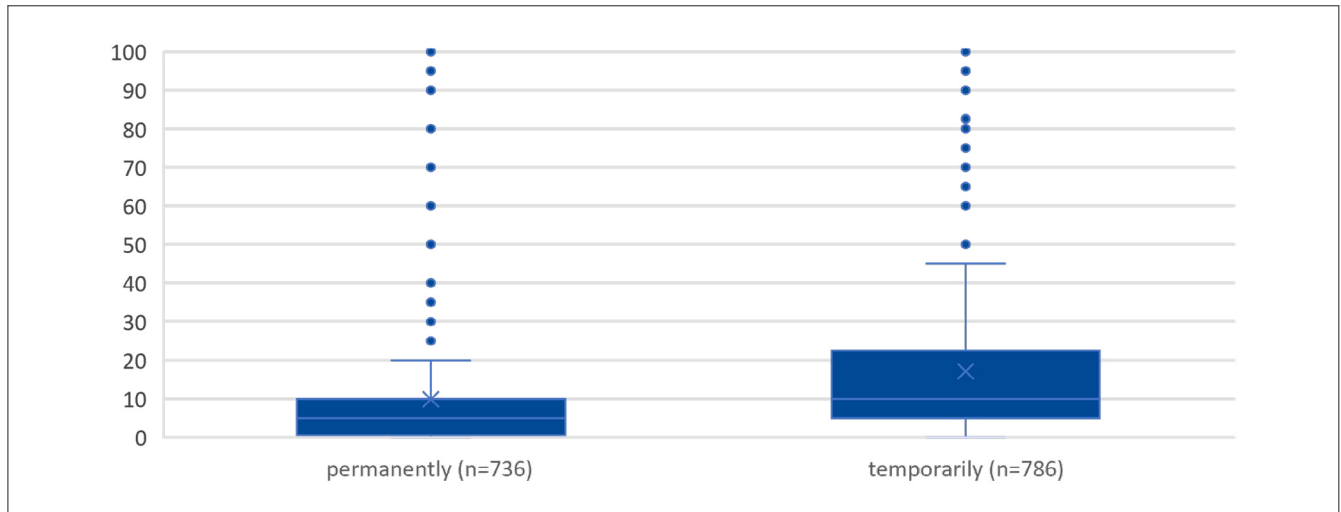
Question 6: In your opinion, are more machines being defeated today than ten years ago, or fewer?



The trend in the incidence of the defeating of safeguards over the last decade is viewed predominantly optimistically by the respondents: 57.3% believe the incidence to have declined over this period, whereas only 18.5% have observed an increase. 24.2% of respondents have observed no change over the past decade.

3.3 Frequency of defeating (machinery)

Question 7: In your experience, on what percentage of machines are safeguards defeated in the companies you supervise?

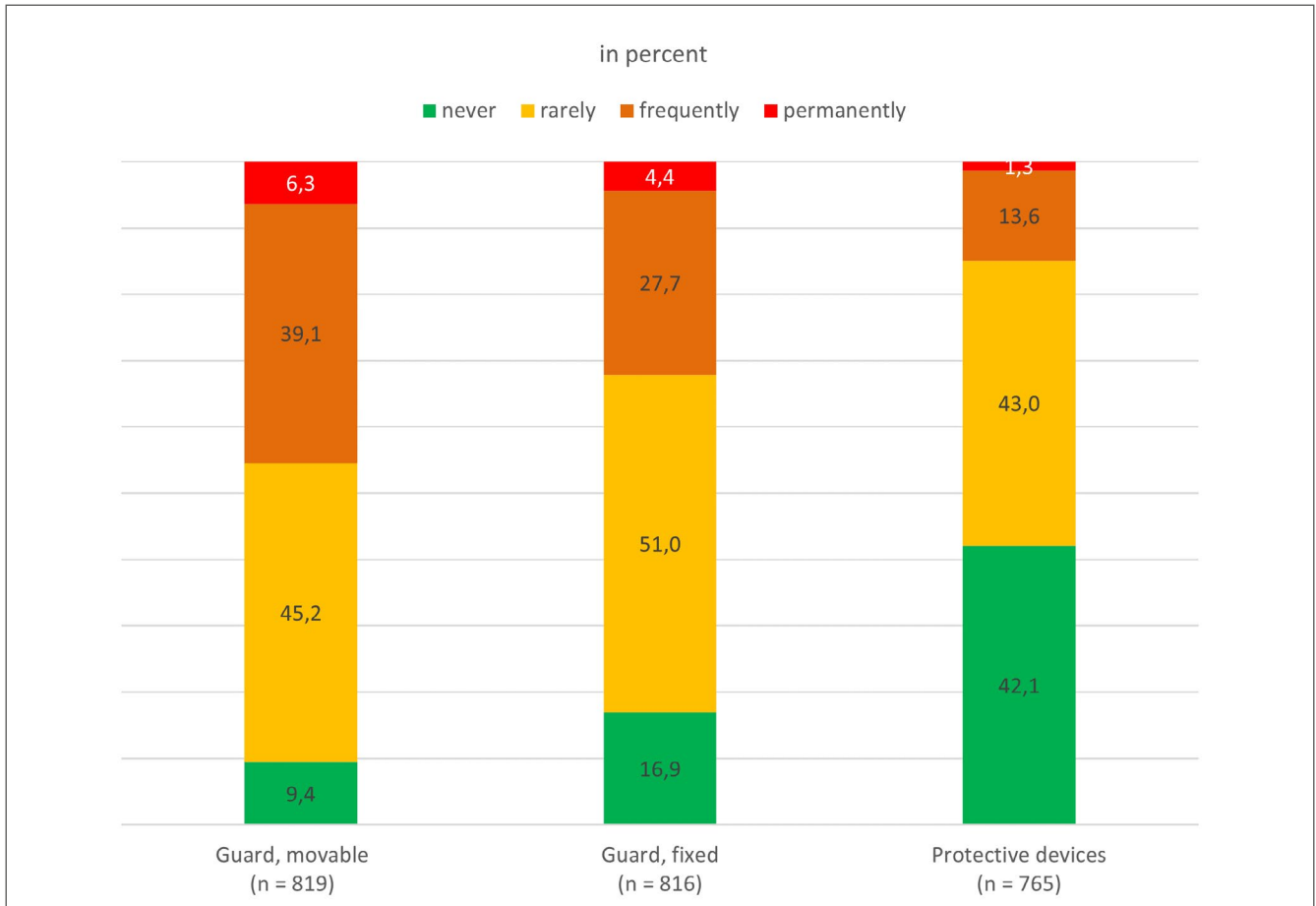


To assess the current incidence of defeating, survey participants were asked to state the percentage of machines in their companies on which safeguards are permanently and temporarily defeated. As the box plot shows, responses concerning the proportion of machines subject to defeating vary widely. According to the respondents, on 27.2% of machines safeguards are defeated temporarily or permanently (sum of the mean values). On 17.2% of the machines, safeguards are defeated temporarily, i.e. solely for the performance of certain tasks; the original state is subsequently restored. On 10% of the machines, defeating is permanent, regardless of whether it is necessary for the activity being performed. Such machinery presents a particularly high risk potential, as it also endangers persons who are not aware that its safeguards have been defeated.

The estimated frequency of defeating varies widely from sector to sector. According to the survey participants, the proportion of machines that are defeated is particularly high in wood and metal-processing companies (BGHM), where on 39.6% of machines safeguards are estimated to be defeated permanently or temporarily. The corresponding proportion of machines is 22.4% in companies in the chemical industry (BG RCI) and 23.6% in companies in the energy, textile, electrical and media products sectors (BG ETEM). For the remaining sectors, the number of survey participants (<100) is not sufficiently representative to permit conclusions for the sector as a whole.

3.4 Frequency of defeating (safeguards)

Question 8: In your experience, what safeguards are defeated, and how often?



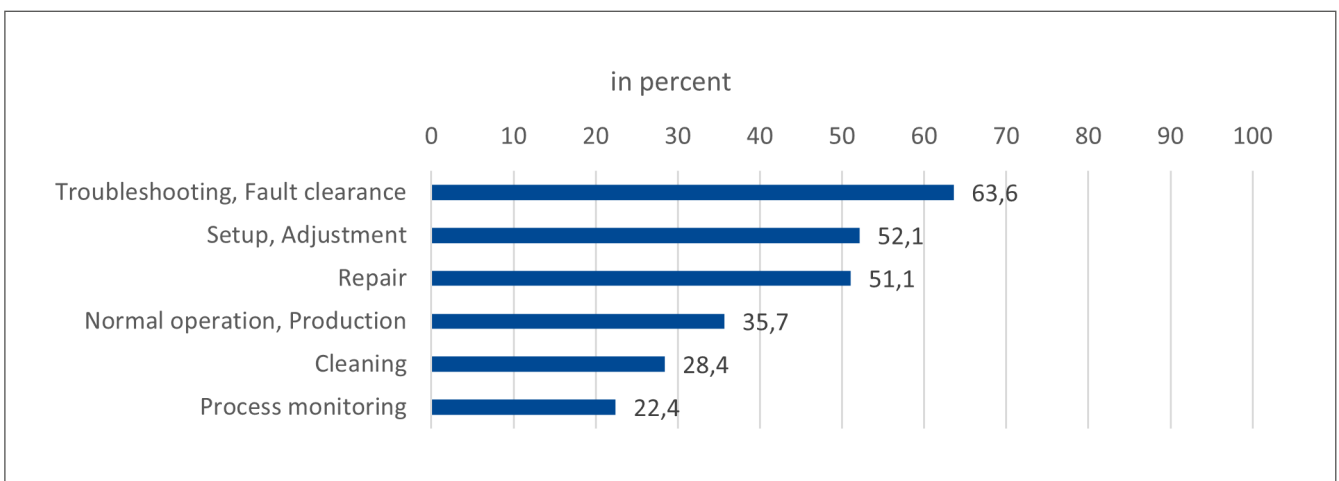
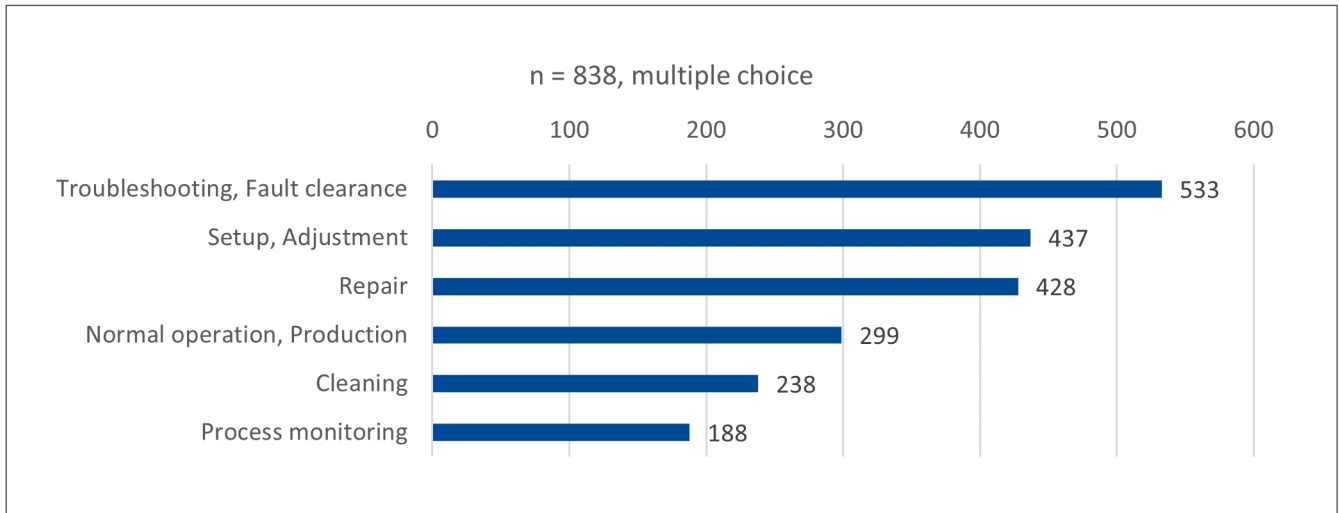
To identify what safeguards are defeated particularly frequently, safeguards were classified broadly according to type:

- Guard, movable (e.g. interlocked guard),
- Guard, fixed (e.g. protective fence, shrouding of a machine),
- Protective devices (e.g. light barrier, two-hand control, pressure-sensitive mat).

The possible answers for the frequency of defeating were never, rarely, frequently and permanently. The answers show that movable guards are defeated particularly frequently: 45.4% of respondents state that such safeguards are frequently or permanently defeated (frequently: 39.1%, permanently: 6.3%). Protective devices are those least frequently defeated; they are generally perceived as being less of a hindrance during work. Only 14.9% of respondents assume that protective devices are defeated frequently or permanently (frequently: 13.6%, permanently: 1.3%). 32.1% of respondents state that fixed guards are defeated frequently or permanently (frequently: 27.7%, permanently: 4.4%).

3.5 Work tasks

Question 9: In your experience, for what work tasks are safeguards most frequently defeated?

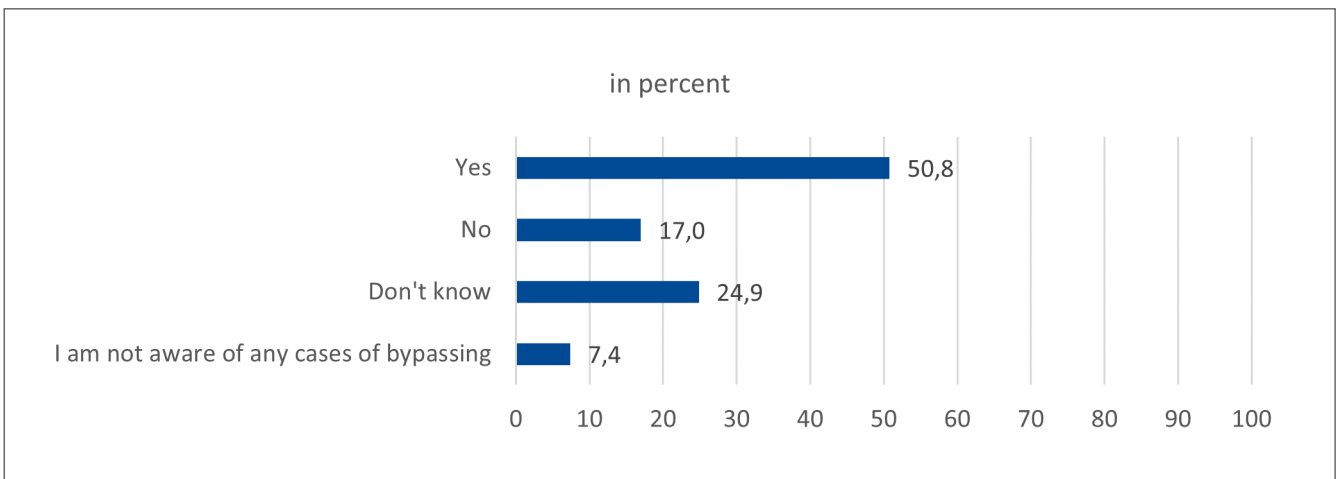
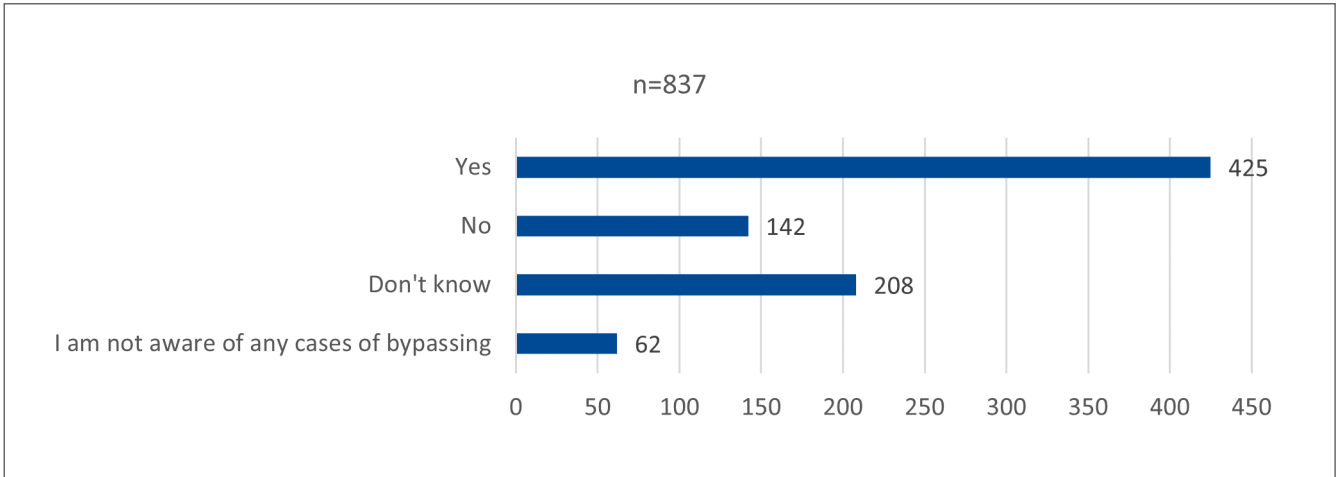


The usual situation in which safeguards are defeated is where they slow down or impede certain tasks or prevent them from being completed altogether. As the survey shows, this is particularly often the case during troubleshooting and fault clearance (63.3%). Just over half of those surveyed also cite setup and adjustment (52.1%) and repair (51.1%) of machinery as activities for which safeguards are most frequently defeated. As a rule, each of these activities requires machine movements to be observable and performed precisely, for example to enable the causes of faults to be detected, tools adjusted and parts of the machine inspected. Should the machine manufacturer not provide safe operating modes for these purposes, or the available operating modes be inadequate for performance of the activity, the operating personnel have an incentive to defeat the safeguard.

4 Awareness from experience

4.1 Tolerance by superiors

Question 10: If, in your experience, a safeguard has already been defeated in your company/the companies you supervise: was a superior aware of it?



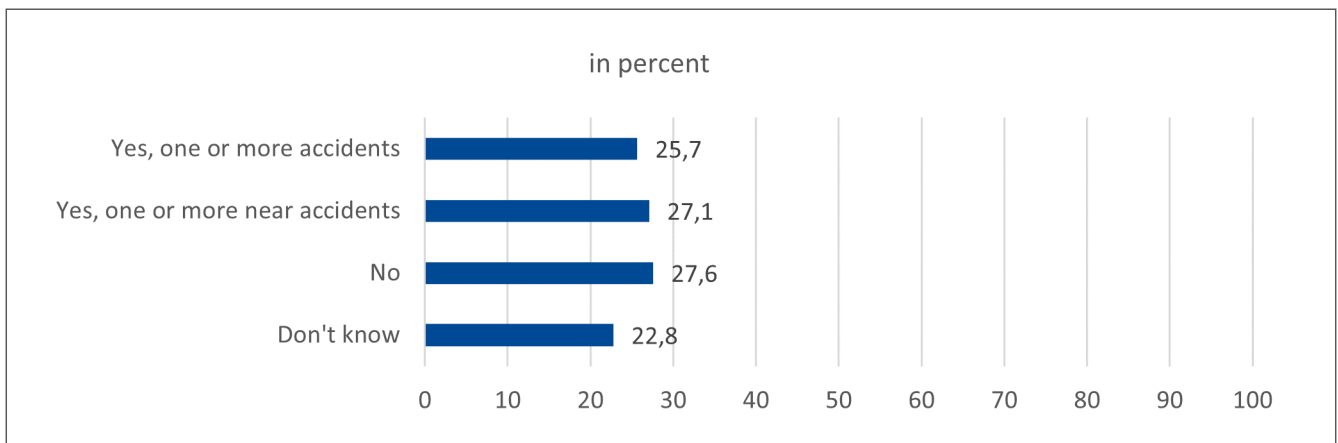
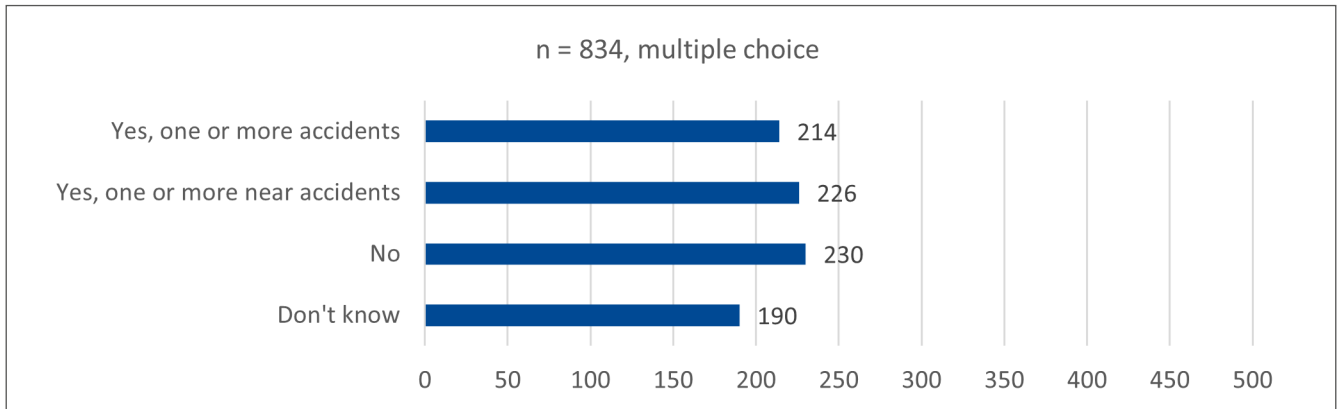
Managers are responsible for the safety of employees under their authority. Besides making safe behaviour in the workplace possible in the first instance and taking measures to promote it, this also includes identifying unsafe behaviour by means of regular checks, and preventing it. Finally, it entails being thorough in preventing safeguards from being defeated. In practice, however, it is found that where a conflict exists with the desired production target, safety and productivity may prove to be incompatible, and productivity is often prioritized.

To determine the prevalence of such negligent behaviour among managers, those surveyed were asked whether, to their knowledge, a case had already arisen in their company in which a superior was aware of a safeguard having been defeated. Over half of the respondents (50.7%) state that defeating has already occurred in their company with a superior's knowledge. Only 16.9% of respondents are able to answer the question with an unequivocal "no".

Section 6.1 explains whether and how this behaviour on the part of superiors affects the incidence of defeating in the company.

4.2 Incidence and severity of accidents

Question 11: Has an accident or near accident ever occurred in your company/the companies you supervise as a result of a safeguard being defeated?

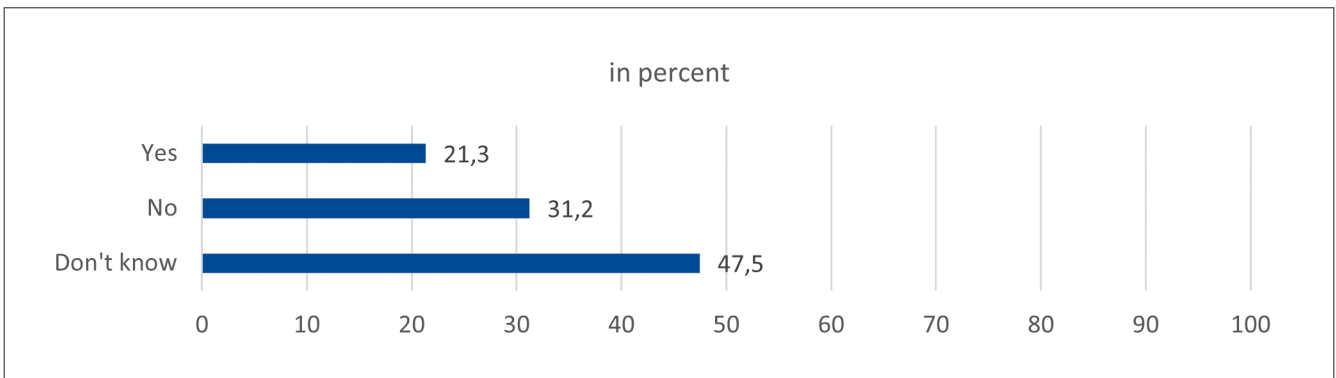
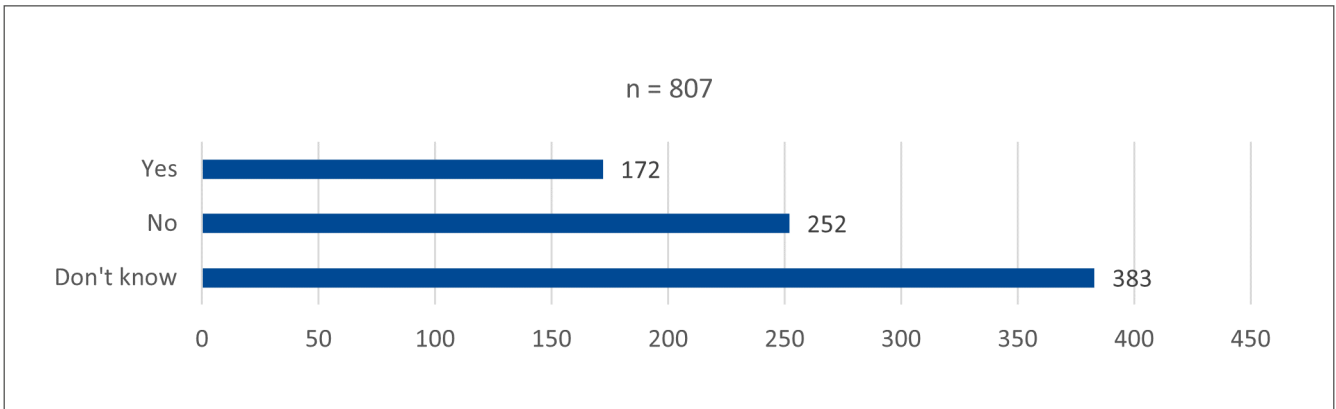


Whereas accidents are always accompanied by harm to health and often by financial loss, near accidents usually have no consequences and generally attract correspondingly little attention. However, near accidents offer a means of identifying as-yet undetected hazards before a harmful incident occurs. Rigorous reporting and analysis of near accidents and elimination of their causes, as is consistent with a positive error culture, is therefore an effective means of preventing occupational accidents in the long term.

As part of the survey, respondents were questioned concerning their experience with accidents and near accidents caused by defeating. 25.7% of those surveyed state that an accident caused by defeating has already occurred in their companies. 27.1% of those surveyed state that defeating a safeguard has already resulted in at least a near accident. Overall, half of those surveyed state that in their company or the companies they supervise, their work has already involved accidents or near accidents caused by defeating.

4.3 Defeating by the manufacturer

Question 12: Has a manufacturing company already engaged in defeating during commissioning or servicing work in your company/the companies you supervise?



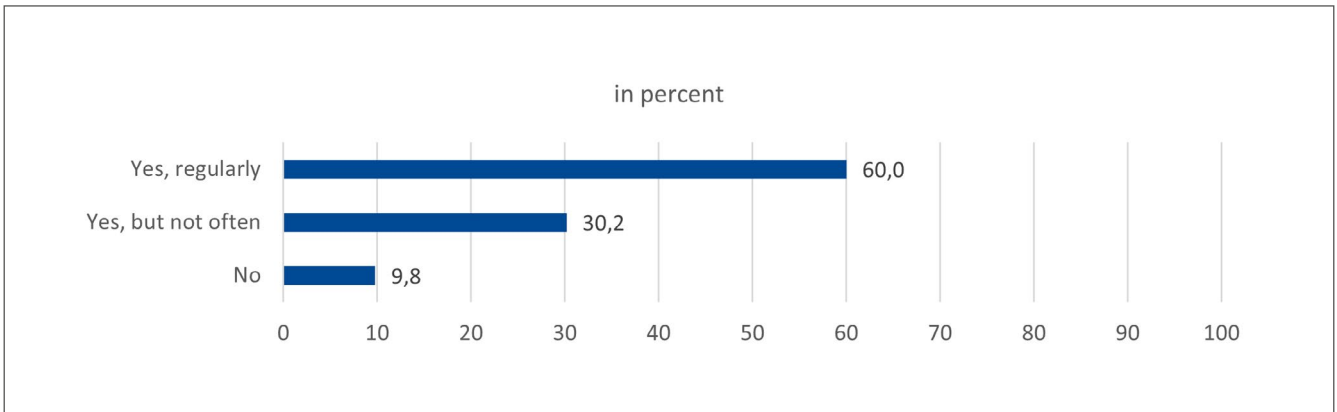
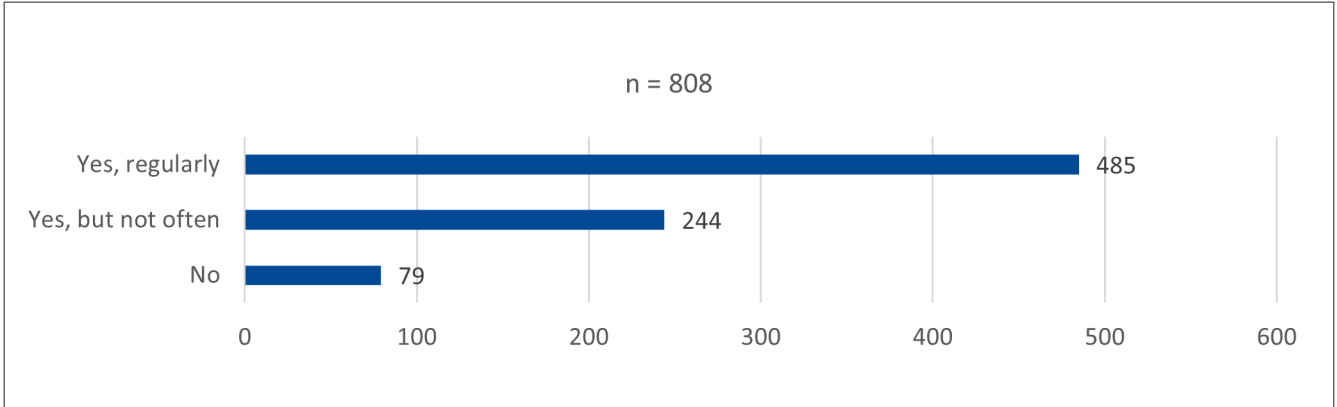
Manufacturers are not only responsible for providing the operator with safe machines: they also set an example, in both a positive and negative sense, for general use of their machinery. If safeguards are disabled during installation and test operation, the operator's employees may interpret this as encouragement to act in the same way in similar situations.

In the survey, over one in five respondents (21.3%) state that they have already experienced manufacturers' employees defeating safeguards in the course of their work within the respondents' companies. Fewer than one in three (31.1%) are able to state unequivocally that they have not experienced this.

A free-text field provided the opportunity to state situations in which a manufacturer had been observed to defeat a safeguard. In this context, the activities most frequently stated are initial installation, test operation and initial commissioning. In several cases, those surveyed also reported that the manufacturer's fitters gave instructions on defeating, or that the machine was actually delivered with substitute actuators.

4.4 Consideration in training and instruction

Question 13: Is the subject of defeating addressed in internal company training and/or instruction?

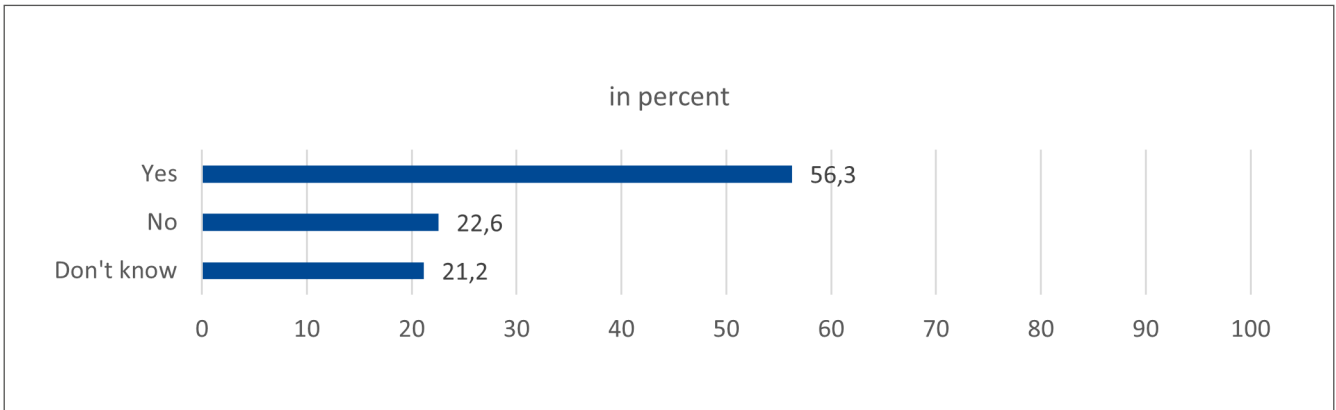
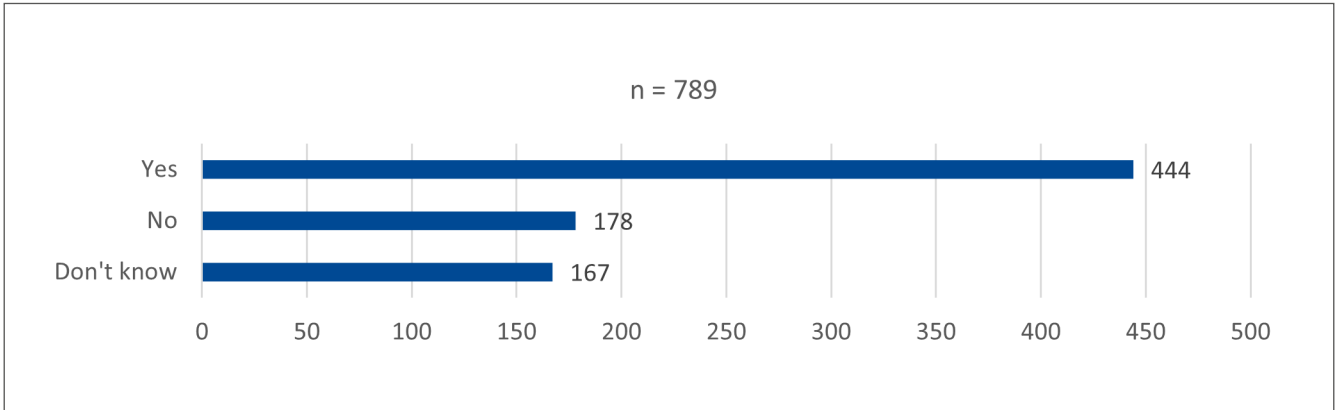


As the survey participants' answers regarding the frequency of defeating reveal, defeating safeguards is commonplace in many companies. This makes it all the more important to include the topic in training and instruction.

59.9% of respondents do at least state that the topic is regularly raised during training and instruction. Conversely, 30.2% report that the topic is rarely addressed in training and instruction. In 9.8% of companies, the issue is not addressed at all.

4.5 Consideration at procurement

Question 14: Does your company/do the companies you supervise take defeating into account when purchasing new machinery?



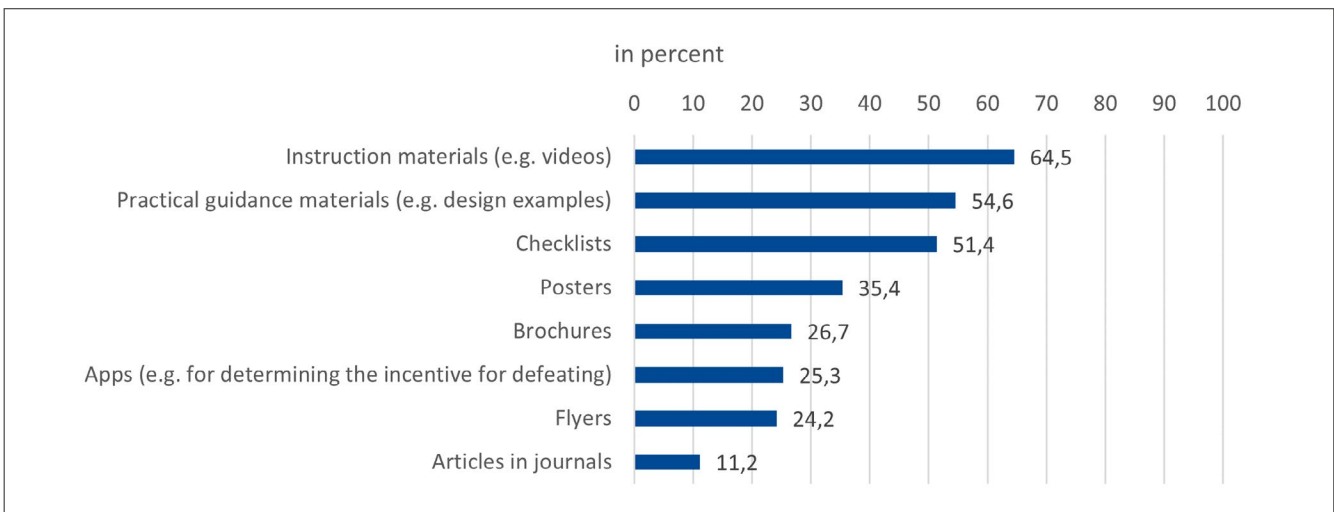
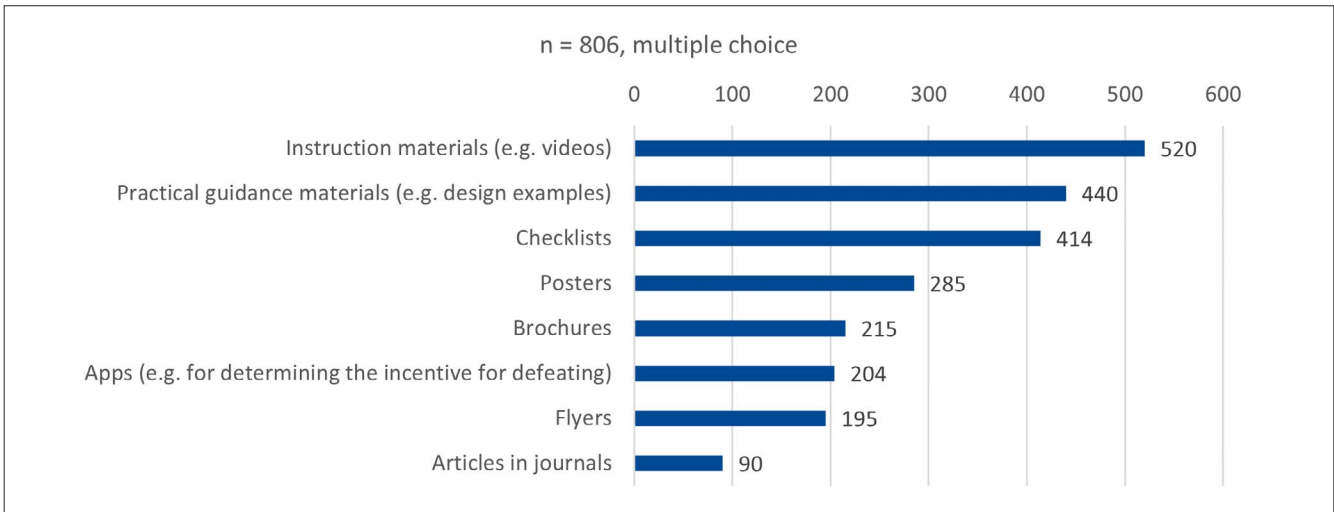
The susceptibility of a safeguard to be defeated can be reduced most effectively at the procurement stage of the machine. It is therefore extremely important for this issue to be considered as part of the procurement process, in order to prevent defeating and the resulting accidents.

56.3% of the participants in the survey state that the issue is addressed in their company or the companies they supervise. In 22.6% of companies, however, this is evidently not the case.

5 Opinion

5.1 Support provided by the German Social Accident Insurance Institutions

Question 15: What support on the subject of defeating would you like to see from your accident insurance institution?



The topic of defeating is repeatedly taken up by the accident insurance institutions in publications. A cross-institution working group addresses the issue.

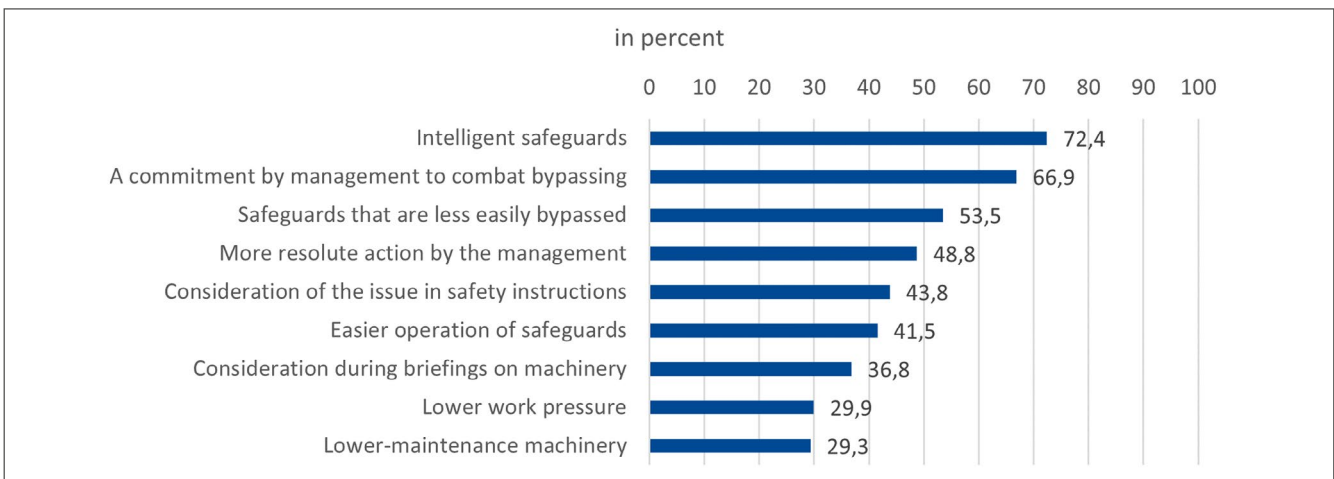
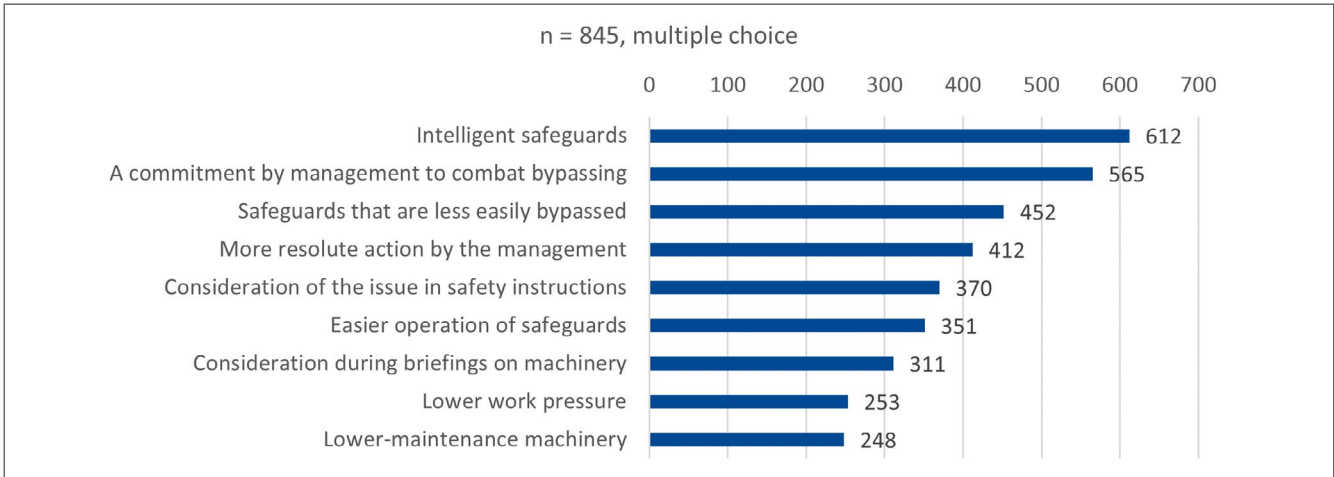
The survey participants were asked which forms of support they considered particularly valuable with regard to this issue. Practical support such as instruction materials (64.5%), practical guidance materials (54.6%) and checklists (51.4%) are those most frequently stated. "Soft" forms of support such as posters (35.4%), brochures (26.7%) or flyers (24.2%) were considered less valuable.

The following resources are also mentioned in the free-text responses as being desirable:

- Instructions for performance of the risk assessment in accordance with TRBS 1112 for determining permitted exceptions and identifying necessary alternative measures,
- On-site training,
- Webinars,
- VR simulation.

5.2 Measures to prevent defeating

Question 16: In your opinion, what measures contribute in particular to the prevention of defeating?



Preventing safeguards being defeated is the responsibility of both the manufacturer and the operator. While for manufacturers, technical measures predominate, organizational and personal measures and the company's general safety climate are the primary means by which the operator is able to prevent the defeating of safeguards.

The survey participants were asked what measures, in their opinion and in consideration of their experience, they believe contribute in particular to prevent defeating. Their responses show that they regard measures on the part of manufacturers and operators as complementary and having equal value. Intelligent safeguards (72.4%) rank first among the measures stated. These include intelligent camera systems capable of distinguishing between human beings and machinery, and control systems that detect when a safeguard has been defeated.

Second to intelligent safeguards among measures to be taken by manufacturers are safeguards that are less conducive to defeating (53.5%), for example measures for this purpose on switches for safety guards, and ergonomic safeguards that are easier to operate (41.5%). Reducing the reasons for defeating (see Section 3.5: Troubleshooting, fault clearance and repair) by the use of machinery with a lower maintenance overhead is also acknowledged as an effective measure specifically for preventing defeating (29.3%).

The most highly ranked measure to be taken by operators is a clear commitment by management to preventing defeating (66.9%). The correlation of the responses concerning superiors' tolerance of defeating with other results of the survey (see Section 6.1) clearly indicates that the attitude of management or the person tasked with assuming management tasks has an immense influence on the incidence of defeating. At the same time, respondents would like management to take tougher action in response to defeating incidents (48.8%) and address the topic more regularly in safety instruction (43.8%) in general and machine briefings (36.8%) in particular. Underestimation of risks and ignorance of hazards are a major factor, in fact, among reasons for unsafe behaviour. This can be rectified only by measures for increasing safety awareness, such as dedicated instruction, training in safety, and in general by a company atmosphere that promotes safety.

The free-text responses also addressed technical and organizational aspects in equal measure. With regard to measures taken by manufacturers, the list is topped by those for reducing the reasons for defeating, in the form of trouble-free or inherently safe processes and an ergonomic protection concept for the machine. Several respondents call for better communication between manufacturers and operators during the procurement process. Some respondents would like to see tougher action, and a stronger legal basis for it, on the part of the labour inspectorate and accident insurance institutions.

6 Correlation

6.1 Influence of management behaviour

As shown by the survey, defeating safeguards is tolerated by managers, at least under certain circumstances, in more than half of the companies. Only somewhat fewer than one in six of those surveyed state unequivocally that defeating is not tolerated by superiors. The correlation between these responses and those concerning the incidence of defeating is indicative of the huge influence of managers' prevention behaviour upon employee safety. In companies in which defeating a safeguard is tolerated (at least under certain circumstances), the proportion of machines on which safeguards are defeated temporarily or permanently is, at 33%, almost half as high again as in companies in which defeating is not tolerated (22.9%). At 10.9%, the proportion of machines with permanently defeated safeguards in the first group of companies is almost twice that in the second (for comparison: 5.7%).

The drastic increase in the incidence of defeating also has an impact upon the accident rate. At 36.8%, the actual accident rate in companies in which defeating is tolerated is twice that in companies where it is not (for comparison: 17.9%).

The issue is also considered far less frequently in training courses and instruction, and during procurement.

6.2 Influence of company size

A significant correlation is also evident between the size of the company and the incidence of defeating. This becomes particularly apparent when small and micro-enterprises (1 to 49 employees) are compared with large companies (over 250 employees). In the former, the topic is given significantly less consideration during the procurement of machinery (small and micro-enterprises: 34.0%; large companies: 65.2%).

Defeating is also much more likely to be tolerated by managers in small and micro-enterprises than in larger companies. For example, 59.1% of respondents from small and micro-enterprises confirmed that a manager was aware of defeating (large companies: 45%).

This is also reflected in the general attitude towards defeating. Without exception, all respondents who, according to the survey, consider defeating of safeguards completely acceptable or at least tolerable under exceptional circumstances (18.6%) were from small and micro-enterprises.

Ultimately, this yields a significantly higher proportion of machines being defeated permanently or temporarily in small and micro-enterprises compared to in large companies (37.1% vs. 23.1%).

7 Further information

Further information and practical guidance materials for manufacturers and operators of machinery and publications on the subject by the German Social Accident Insurance Institutions can be found at www.stop-defeating.org and www.dguv.de/ifa/stopp-manipulation/index-2.jsp.

Legal information

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