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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 11228-3

Ergonomics — Manual handling — Part 3: Repetitive movements and exertions of the upper limbs

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 3, *Anthropometry and biomechanics*.

This second edition cancels and replaces the first edition (ISO 11228-3:2007), which has been technically revised.

The main changes are as follows:

- a quick assessment method is presented in the normative part of standard including a normative annex;
- different methods are presented in a table in an informative annex with guidance and additional to the user for application;
- Inclusion and validation criteria of the different methods is included in an informative annex.

A list of all parts in the ISO 11228 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Repetitive movements and exertions of the upper limbs (repetitive work) can cause pain and fatigue, which could lead to musculoskeletal disorders, reduced productivity, and deteriorated posture and movement coordination. The latter can increase the risk of errors and may result in hazardous situations and reduced quality. Repetitive work, and its consequences, can be prevented through the use of ergonomic design and organization of work.

Risk factors in repetitive work include the frequency of actions, exposure duration, postures and movement of body segments, forces associated with the work, work organization, job control, demands on work output (e.g. quality, task precision) and level of training/skill. Additional factors can include environmental factors, such as climate, noise, vibration and illumination.

The recommendations provided by this part of ISO 11228 are based on current scientific evidence concerning the physiology and epidemiology of manual work. The knowledge is, however, limited, and the suggested guidelines are subject to change as evidence emerges. The revision of the standard represents a departure from the original version of the standard published in 2007. The changes include the introduction of a quick assessment method, in the normative section of the standard, the elimination of the detailed instructions on how to use OCRA, streamlining of the Annexes and the presentation of several different risk assessment tools along with inclusion, validation and application criteria to make the use of the standard easier. The revision writing committee defined a set of criteria regarding the selection and validation status of the tools and methods presented and confined the tools presented to [Annex C](#).

Ergonomics — Manual handling —

Part 3: Repetitive movements and exertions of the upper limbs

1 Scope

This part of ISO 11228 establishes ergonomic recommendations for repetitive work tasks involving repetitive movements and exertions of the upper extremity. It provides guidance on the identification and assessment of risk factors commonly associated with repetitive movements and exertions of the upper limbs, thereby allowing evaluation of the related health risks to the working population. The recommendations apply to the adult working population and are intended to give reasonable protection for nearly all healthy adults. Those recommendations concerning health risks and control measures are mainly based on research involving in North American and European populations and how work methods affect musculoskeletal loading, discomfort/pain and endurance/fatigue. These recommendations can be used for guidance purposes. Countries may generate their own recommendations based on studies on native populations. For the evaluation of working postures, refer to ISO 11226.

It should be noted that this standard does not have a mass threshold or limit. However, if the masses handled are 3 kg or more, the user is directed to also consult ISO 11228-1 Ergonomics – Manual handling – Part 1: *Lifting, lowering and carrying*.

This part of ISO 11228 is intended to provide information for all those involved in the design or redesign of work, jobs and products (e.g. machinery).

This document does not address the manual handling of objects while using lift-assistive devices such as exoskeletons and does not address the needs of pregnant women or persons with disabilities.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6385, *Ergonomics principles in the design of work systems*

ISO 11226, *Ergonomics — Evaluation of static working postures*

ISO 11228-1, *Ergonomics — Manual handling — Part 1: Lifting, lowering and carrying*

ISO 11228-2, *Ergonomics — Manual handling — Part 2: Pushing and pulling*

ISO 14738, *Safety of machinery — Anthropometric requirements for the design of workstations at machinery*

ISO 15534 (all parts), — *Ergonomic design for the safety of machinery*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6385, ISO 11228-1, ISO 11228-2, ISO 11226 and the following apply.

NOTE In the definitions involving frequency, a unit of time is mentioned because more than one method is involved, each using a different unit, e.g. seconds in some tools or minutes in others.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

repetitive manual task

task executed by the upper limbs of a worker characterized by repeated relatively short work cycle times (up to several minutes) or a task during which the same or very similar -working actions and movements are repeated for more than 30 % of the task time

Note 1 to entry: different tools may define different duration and other operative factors in assessing repetitive manual tasks

Note 2 to entry: Manual handling consists of a variety of actions and can require the use of force to manoeuvre, manipulate, move or restrain an object

3.2

key enter

type of hazard identification in the form of a specific question in the Quick Assessment tool for the purpose of deciding whether further risk evaluation is required

Note 1 to entry: for the purpose of this document the possible hazard could lead to biomechanical overload of the upper limbs

3.3

quick assessment

simple risk evaluation method used to quickly assess the presence of acceptable or critical conditions that may cause, aggravate, accelerate or exacerbate musculoskeletal injuries

3.4

work cycle

sequence of working actions that are repeated the same or very similar way to complete a specified work task

Note 1 to entry: work cycles are usually defined by industrial engineers when the same sequence of actions must be repeated on a regular basis in an organized workstation

3.5

cycle time

total time it takes to complete a single work cycle, in appropriate time units (seconds, minutes)

Note 1 to entry: cycle time begins from the moment when one operator begins a work cycle to the moment that the same work cycle is repeated

3.6

action or technical action

elementary manual movements or exertions required to complete the operations within the cycle

EXAMPLE Holding, turning, pushing, cutting.

3.7

repetitiveness

characteristic of a task when a person is continuously repeating the same work cycle, actions and movements

3.8

frequency of actions

number of actions per unit of time

3.9

force

intensity of a physical effort required of the operator to execute the task

3.10

postures and movements

positions and movements of body segment(s) or joint(s) required to execute the task

3.11

efforts/exertions

movements of body segments to exert force, meaning the same as postures and movements above

3.12

recovery time

period, typically of rest, which allows restoration of musculoskeletal function or recovery from fatigue and may be expressed in seconds or minutes

Note 1 to entry: may be expressed in seconds or minutes

3.13

additional risk factor

object and environmental factors for which there is evidence of causal or aggravating relationship with work-related musculoskeletal disorders of the upper limb

EXAMPLE Vibration, local pressure, cold environment or cold surfaces, psychosocial factors.

3.14

Work-related Musculoskeletal Disorder (WMSD)

injuries and illnesses of the locomotor apparatus (i.e., tendons, ligaments, joints, cartilage, nerves, vessels and supporting structures that are involved in locomotion) that may be caused by, aggravated, accelerated, or exacerbated by interaction with known or unknown risk factors in the workplace, and they may impair work capacity

3.15

hazard

existence of a condition that can result in injury or illness to a worker

[SOURCE: ISO 12100: 2010]

3.16

hazard identification

potential source of harm

3.17

risk

hazard plus the potential exposure to it

4 Recommendations

4.1 Avoiding repetitive manual tasks

Repetitive manual tasks should be avoided wherever possible. The employer should take appropriate organizational measures or should use the appropriate means, in particular mechanical equipment, in order to avoid the need for repetitive manual tasks by workers. Where it cannot be avoided, the employer should take appropriate organizational measures, use the appropriate means or provide the workers with the means to reduce the risk involved in repetitive manual tasks.

Avoiding or reducing repetitive manual tasks can be achieved through mechanization/automation, work enlargement, properly designed job rotation and/ within the framework of a participative ergonomics approach.

In the case of repetitive movements and exertions of the upper limbs, many tasks can be modified through the use of robotics or automated production systems. See [Annex E](#) for details.

NOTE A “participative ergonomics approach” signifies the practical involvement of workers, supported by suitable communication, in planning and managing a significant amount of their work activities, with sufficient knowledge and ability to influence both processes and outcomes in order to achieve desirable goals.

4.2 Risk assessment

4.2.1 General

When a repetitive handling task is present, the degree of risk must be assessed, and then reduced. The recommended steps are outlined in [Figure 1](#):

- entering the risk assessment by “Key Enter” (see [Annex B.3](#) for information on the “Key Enter”), or performing a qualitative hazard identification;
- assessing the risk using the Quick Assessment (see [Annex B](#)) and performing a risk evaluation using simple or detailed methods and finally, reducing the risk.

The procedure shown in [Figure 1](#) should be used when carrying out a risk assessment of jobs involving repetitive movements and exertions of the upper limbs.

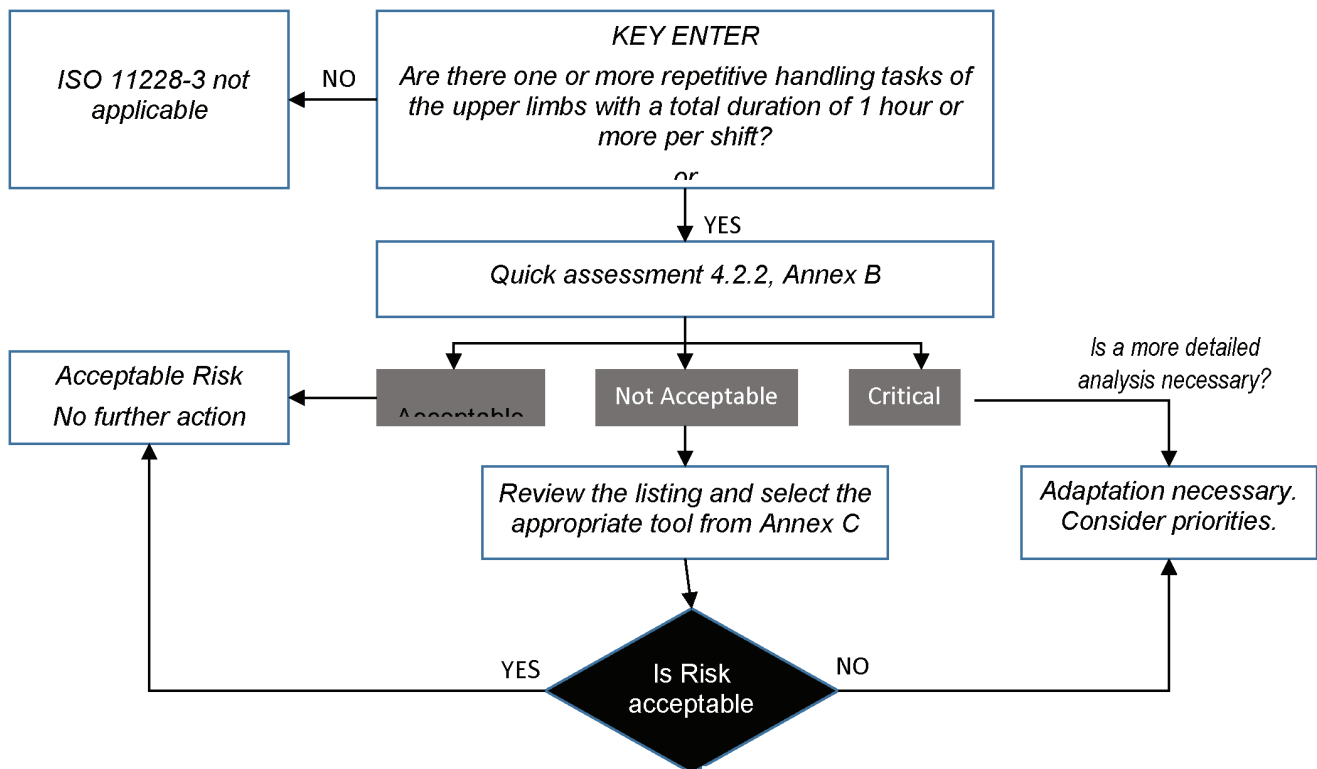


Figure 1 — Risk assessment procedure Key Enter and qualitative hazard identification

The first step of the risk assessment procedure is to establish if a repetitive manual task shall be further evaluated by means of a specific Key Enter.

To this end the following specific Key Enter is adopted:

Are there one or more repetitive handling tasks of the upper limbs with a total duration of one (1) hour or more per shift?

If the answer is YES then proceed with risk assessment; otherwise ignore this part of ISO 11228.

4.2.2 Quick Assessment

A risk assessment (Quick Assessment) shall be performed when one (or more) repetitive task(s) involving the upper limbs is performed for one (1) hour or more in the shift or when a qualitative hazard identification identifies hazards which may expose individuals to a risk of injury (See Annex [A.1](#)).

The Quick Assessment is provided in [Annex B](#) (normative) and involves quickly evaluating the extent of the risk by asking simple qualitative and quantitative questions. The Quick Assessment identifies one of three possible risk conditions:

- a) Acceptable: no further actions are required;
- b) Critical: the work or process must be immediately redesigned based upon a risk assessment;
- c) Neither Acceptable nor Critical: a more detailed analysis is required, and a proper risk assessment needs to be carried out using more specific analytical tools for simple or detailed risk evaluation.

When conditions are found to be “acceptable” or “critical”, it is not always necessary to conduct a more in-depth analysis of the exposure level, especially in the case of critical conditions, since risk reduction should be considered at that point..

In [Annex B](#), a specific part of Table B.1 lists the conditions that must all be present simultaneously to classify a repetitive manual handling task as “acceptable”. A repetitive task which is assessed as being “acceptable” using the Quick Assessment, can also be considered to have been classified as acceptable using the detailed methods indicated in this document. On the other side, another specific part of Table B.1 lists situations which, if any one of them is present, represent a critical condition. When a repetitive manual task is found to be “critical” due to the presence of any one of these situations, the recommendation is to opt for an immediate and substantial corrective action (i.e., risk reduction). Further analyses can help to quantify the risk and guide corrective measures. More in-depth investigations should be undertaken to monitor the potential effectiveness of the corrective measures.

4.2.3 Detailed risk assessment

The next step after the Quick Assessment (depending on the identified condition of the risk) is to perform a more detailed risk assessment. This is particularly helpful in industrial manufacturing sectors or in selected, non-industrial sectors (i.e logistic, food preparation, industrial cleaning, etc.). Other reasons for completing a more detailed risk assessment could be if the risk estimated is still uncertain or where tasks and jobs are being redesigned. A more detailed risk assessment is required especially when jobs are composed of two or more repetitive tasks (multitask job): in such cases, appropriate procedures for the analysis are presented in [Annex D](#). A more detailed risk assessment will also allow a better determination of the remedial measures to be taken. The methods listed in [Annex C](#) and [table C.1](#) have been identified as providing more detailed risk assessments. and they have met to varying degrees, the validation criteria given in [Annex A](#).

4.2.4 Risk assessment validation criteria

For the purposes of this standard the criteria for selection of the tools presented is provided in [Annex A](#). Validation criteria have also been defined for those tools identified as Risk Assessment tools.

For each method given in [Table C.2](#) an indication of the criteria met is provided.

4.3 Risk reduction

A proper risk assessment is the basis for appropriate choices in risk reduction. Risk reduction can be achieved by combining, in different ways, improvements in different risk factors and should consider the following:

- a) the avoidance and limitation of repetitive handling, especially for long daily durations without proper recovery time or at high frequencies,
- b) proper design of the task, workplaces and work organization, also using existing International Standards and introducing adequate task variation,

- c) proper design of the objects, tools and materials handled,
- d) proper design of the work environment,
- e) individual workers' capacities and level of skill for the specific task.

See [Annex E](#) for more detailed information about risk reduction options.

Annex A

(informative)

Risk assessment — Risk factors, general framework and criteria for the selection of tools

A.1 Background on work related risk factors

A.1.1 General

Many hazards or work-related risk factors are associated with an increased probability (risk) of Upper Limbs Work related Musculo-Skeletal Disorders (UL WMSDs). Some of them have been defined as main contributing factors (Repetition, Force, Awkward Postures and Movements, Lack of Recovery periods, Duration) whilst for other hazards there is some evidence that they could contribute to increasing the overall level of risk for UL WMSDs.

In this [section A.1](#) the main hazards (and risk factors) are briefly reported for the scope of a preliminary qualitative hazard identification (see [4.2.2](#)). However, as reported in the following [section A.2](#), the complex of risk factors should be evaluated in an integrated way for estimating the overall level of risk of contracting UL WMSDs.

A.1.2 Repetition

Frequent repetitive movements give rise to a risk of injury that can vary depending on the context of the movement pattern and the individual. As the frequency of actions and movements increases and/or the cycle time decreases, the risk of injury increases. Extremely repetitive movements should be avoided within a task or job.

A.1.3 Posture and movement

Work tasks and operations should provide variations to the working posture: both whole-body postures and movement of specific limbs. In the work tasks, extreme ranges of joint movement and prolonged static postures should be avoided.

A.1.4 Force

Forceful exertions can be harmful. Tasks should involve smooth force exertions, with the avoidance of sudden or jerky movements or any condition that can present an unanticipated significant increase in force to the worker. Handling precision (accurate picking and placement), and the type and nature of the grip can introduce additional muscular activation.

A.1.5 Duration and insufficient recovery

Insufficient time for the body to recover between repetitive movements (i.e., lack of recovery time) increases the risk of injury. Duration can be broken down into different levels, i.e., work shift duration, job duration, task duration. The opportunity for recovery or rest may fall within each of these work periods.

A.1.6 Object characteristics

Inappropriately designed objects could have characteristics that can cause harm (e.g., contact forces, shape, dimensions, coupling, object temperature). Inappropriately placed handholds may lead to awkward hand/arm postures. Non-cushioned handholds and flat objects laying on a hard surface increase the difficulty of grasping the object and augment force requirements. The size and shape of the object being handled and the

coupling between it and the operator's hands will determine the grip type and the force that the operator must exert.

A.1.7 Vibration and impact forces

Exposure to hand/arm vibration, shocks or impacts can lead to a desensitizing of the hand and increase the force necessary for gripping an object or tool. Prolonged exposure to these types of risk factors has also been linked to vascular and neurological disorders of the upper limbs.

A.1.8 Environmental conditions (climate, noise, etc.)

Hot and, most of all, cold environments and high levels of noise can impose additional hazards. Wet or contaminated surfaces are likely to inhibit the ability to exert forces and increase the risk of injury. The designer of products shall consider environmental conditions only within the limits of the foreseeable use of the product.

A.1.9 Work organization

Work organization (e.g., task duration, job duration, recovery time, shift patterns and the type of man-machine interaction) has an important part to play in the exposure to musculoskeletal risk factors. This should be structured to facilitate rest periods and avoid the use of similar muscle groups over the duration of the work shift. Job rotation, job diversification and job enlargement are all methods of structuring the work to facilitate variation and recovery within the work period.

A.1.10 Psychosocial factors (e.g., job complexity, job demands, job content)

Psychological response to work and workplace conditions has an important influence on general health and, in particular, musculoskeletal health. These factors include the design, organization and management of work, the specific impact of workplace risk factors, such as work content, and the overall social environment (i.e., the context of work). Many of the effects of these psychosocial factors occur via stress-related processes, which can have a direct effect on biochemical and physiological responses.

Important aspects of work design include the amount of control an individual has over his/her work, the level of work demands, the variety of tasks he/she is required to perform, and the level of support provided by managers, supervisors and/or co-workers. Undesirable psychosocial aspects of a job contributing to a risk of musculoskeletal disorders include the following:

- a) workers have little or no control over their work and work methods or organization;
- b) tasks require high levels of attention and concentration;
- c) workers are unable to make full use of their skills;
- d) workers have little or no involvement in decision making;
- e) workers are expected to carry out repetitive, monotonous tasks exclusively;
- f) work is machine- or system-paced;
- g) work demands are perceived as excessive;
- h) payment systems encourage working too quickly or without breaks;
- i) work systems limit opportunities for social interaction;
- j) high levels of effort are not balanced by sufficient reward (resources, remuneration, self-esteem, status, etc.).

A.1.11 Individuals

Individual skills, training, age, gender, health problems and pregnancy are personal characteristics that can influence performance and should be considered in the risk assessment. Skill and experience are likely to

benefit the individual when performing the task and reduce the risk of injury. Training can increase the level of skill.

A.2 General framework for Risk Assessment

The general framework for risk assessment is covered by EN-ISO 12100. In relation to WMSD and ergonomics it is important to consider the general model of description and assessment of tasks as mentioned in EN ISO 614. When the need for manual repetitive tasks cannot be avoided in a given situation different measures have to be taken by employers. Designers have the opportunity in the beginning of their product design phase to diminish risks for workers and consumers/users.

According to the Consensus Document listed under Reference [1], which was prepared and published by the IEA¹⁾ Technical Committee on Musculoskeletal Disorders, with the endorsement of ICOH, four main risk factors should be analysed: repetitiveness, forces, awkward postures and movements, and lack of proper recovery periods. Such factors should be assessed as functions of time (mainly considering their respective durations). In addition to these factors, others, grouped under the term “additional risk factors”, should be considered; these are mechanical factors (e.g. vibrations, localized mechanical compressions), environmental factors (e.g. exposure to cold) and organizational factors (e.g. pace determined by machinery), and for most of them there is evidence of association with UL-WMSD.

Each identified risk factor should be properly described and classified. This allows, on the one hand, identification of possible requirements and preliminary preventive interventions for each factor and, on the other hand the consideration of all the factors contributing to the overall “exposure” within a general and mutually integrated framework. From this viewpoint “numerical” or “categorical” classifications of results may be useful to make management of results easier, even if it is important to avoid the feeling of an excessive objectiveness of methods whose classification criteria can still be empirical.

A.3 Tool Selection Basic and Risk Assessment Validation Criteria

A.3.1 Introduction

The purpose of this [section A.3](#) is to provide the basis for inclusion of risk assessment tools for ISO 11228-3 and the assessment of its validity. This is based by applying inclusion criteria and assessment criteria for validity based on consensus of the experts involved. These criteria are expressed for the specific purposes of this standard. For each inclusion criteria, the experts have assessed their compliance on three levels: fully compliant, partly compliant and not compliant. The assessment is based on the information available at the time among the experts and information provided by the national standardization bodies up to the enquiry stage (DIS) and represent the best judgments of the standards writing committee. They should be regarded as a work in progress given new research and subject to regular updates.

The classification should be subject to recurrent revision to take account to new research.

The Basic Criteria listed below were used to select all of the tools for inclusion in this standard. Tools meeting these criteria, for the purposes of this standard, can be described as job assessment/design tools. Depending upon the tool, they may assess strength, fatigue, exposure, or other risk factors for a job.

The Risk Assessment Criteria indicates which of the tools have shown a relationship between the output metric of the tool and illness/injury outcomes.

A.3.2 Basic Inclusion Criteria

The tool is relevant for the assessment, design¹⁾ or re-design or surveillance of new or existing jobs, tasks or workstations of repetitive manual tasks of the upper limbs in relation to upper-limb work-related musculoskeletal disorders (UL-WMSDs) in a general adult working population.

1) International Ergonomics Association

The tool considers, directly or indirectly, the relevant risk factors for UL-WMSDs including force, posture, repetition, frequency, recovery periods, movements, duration or derivatives thereof (e.g., duty cycle.) p.²⁾

The tool applies to two or more body parts of the upper limbs, i.e., fingers, hands, wrists, arms, elbows and shoulders.

The basis of the tool is described in peer-reviewed scientific literature¹.

The possible application of the tool is not restricted to a single type of work task or occupation.

The time to perform an assessment using the tool for a skilled user of a single task is acceptable in relation to task complexity (i.e., 4 hours or less).

The tool can be used by ergonomists and similar experts or non-ergonomists experts such as managers and safety representatives.

The tool does not require costly or complex measurement instruments or equipment².

While not a criterion for inclusion, it will be noted if the tool includes an explicit procedure for the analysis of multiple task jobs or rotations between repetitive manual tasks of the upper limbs.

Should to the largest extent be based on findings from peer-reviewed scientific literature.

Force gauges such as hand-held dynamometers and similar instruments are not considered as costly measurement instruments, but force plates and accelerometers and inertial measurement units are examples of such. Smartphone and Smartphone applications are not considered as costly measurement instruments.

A.3.3 Risk Assessment Classification Criteria

The tool has demonstrated **predictive validity** in at least one epidemiological study (i.e., longitudinal, prospective or retrospective, or large³ cross-sectional study where health outcomes are well-defined and including a control group). The predictive validity refers to the relation between the tool output metric(s) and UL-WMSDs in an adult working population and reported in peer-reviewed scientific literature².

The tool has demonstrated **concurrent validity** in that its output metrics has a high level of agreement to a previously validated measure or tool that has predictive validity. Concurrent validation may involve previously compiled data sets, sensor data, etc. from other studies of UL-WMSDs in an adult working population and reported in peer-reviewed scientific literature². The agreement needs to indicate a clear exposure-repose relationship of at least low, medium and high exposure level. In assessing concurrent validity, various measures, as reported, included Spearman's rho correlation index, the Cohen's kappa coefficient of agreement and odds ratios were assessed to determine the level of agreement between assessment method risk categories. It must be noted by the user that while correlations of the metrics between validated tools and compared tools may be high, the classification of the metric ranges into risk categories (e.g., green-yellow-red/low-medium-high) may be much more problematic for various reasons.

Depending upon the tool and the application, risk assessment tools may be used in conjunction with other tools.

Conference paper or similar in major conferences is generally regarded as peer-reviewed scientific literature in this context.

Should involve a sufficiently large, justified and/or statistically determined sample size involved in several different tasks and workplaces.

[Table C.1](#) in [Annex C](#) presents the Basic Inclusion and Risk Assessment Classification criteria for the tools selected for this standard.

The user should note that the tools were selected and classified according to the criteria based upon the latest published information available at the time and the judgements and input of the standard writing committee and stakeholders.

2) Per Consensus Document which was prepared and published by the IEA Technical Committee on *Musculoskeletal Disorders*, with the endorsement of ICOH^[26]