

Key Indicator Method for assessing and designing physical workloads during Manual Handling Operations

KIM-MHO

Overview of Key Indicator Methods:

Key Indicator Method for assessing and designing physical workloads ...

- with respect to manual Lifting, Holding and Carrying of loads (KIM-LHC)
- with respect to manual Pushing and Pulling of loads (KIM-PP)
- **during Manual Handling Operations (KIM-MHO)**
- with respect to Whole-Body Forces (KIM-BF)
- with respect to Awkward Body Postures (KIM-ABP)
- with respect to Body Movement (KIM-BM)

as well as the respective **Extended** versions in a spreadsheet program (e.g. KIM-MHO-E)



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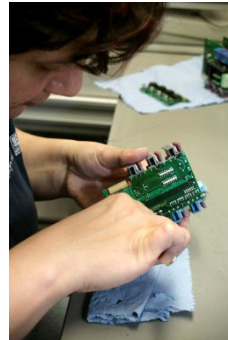


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Scope of the Key Indicator Method (KIM-MHO)

- This type of physical workload concerns uniform, repetitive motion and force exerted by the upper extremities using instruments, small tools or hand-guided machines if necessary, usually in a stationary sitting or standing position. The work task is to process (modify) the working object or move (handle) small objects with a weight of up to approx. 3 kg in most cases.
- **Typical activities:** Assembly activities (e.g. assembly of electrical appliances), soldering, sewing, sorting, cutting, cashiering, manually controlling, pipetting, work at a microscope, making music (e.g. playing the piano, violin), joining, turning, shifting, pressing, lifting, holding, relocating, wrapping

Distinction from other Key Indicator Methods

- If the sub-activity includes moving loads ≥ 3 kg, the types of physical workload “Lifting, Holding and Carrying” and/or “Pushing and Pulling” must also be considered.
- If the sub-activity includes exerting high forces frequently, e.g. when using tools, fittings and devices, the type of physical workload “Whole-Body Forces” must also be taken into consideration.
- If there are several different sub-activities per working day, they must be recorded and assessed separately (e.g. using KIM-MHO-E). The probability of physical overload can only be assessed if all physical workloads occurring during a working day are assessed.

Form including brief instructions


KIM for assessing and designing physical workloads during Manual Handling Operations (KIM-MHO)

Workplace/sub-activity:			
Duration of the working day:		Evaluator:	
Duration of the sub-activity:		Date:	

1st step: Determination of time rating points




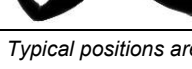
Total duration of this sub-activity per working day [up to ... hours]	up to 1	2	3	4	5	6	7	8	9	10
Time rating points:	1	2	3	4	5	6	7	8	9	10

2nd step: Determination of the rating points for other indicators

Type of force exertion in the finger/hand area within a "standard minute" Level Description, typical examples		Holding ¹⁾			Moving						
		average holding time [sec. per minute]			average movement frequencies [number per minute]						
		31-60	16-30	≤ 15	< 5	5-15	16-30	31-60	61-90 ³⁾		
		Rating points			Rating points						
	low	Very low / low forces (up to 15% F _{maxM}) e.g. button actuation / shifting / ordering / material guidance / insertion of small parts		5.5	3	1.5	0.5	1	2.5	5	7
		Moderate forces (up to 30% F _{maxM}) e.g. gripping / joining small work pieces by hand or with small tools		9	4.5	2.5	0.5	2	4	7.5	11
		High forces (up to 50% F _{maxM}) e.g. turning / winding / packaging / grasping / holding or joining parts / pressing in / cutting / working with small powered hand tools		14	7	3.5	1	3	6	12	18
		Very high forces (up to 80% F _{maxM}) e.g. cutting involving major element of force / working with small staple guns / moving or holding parts or tools		22	11	5.5	1.5	5	10	19	
		Peak forces²⁾ (more than 80% F _{maxM}) e.g. tightening, loosening bolts / separating / pressing in		100		35	8	30	100		
		Powerful hitting²⁾ with ball of the thumb, palm of the hand or fist					8	30			
The work cycle must be observed and the rating points for the force categories marked. Added (left and right hands separately), these produce the force rating point. To calculate the total score (step 3), the higher value must be used.					Rating points of force exertion:			Left hand	Right hand		

- ¹⁾ The amount of time of holding work is only considered as such in the assessment if one arm is held continuously statically for at least 4 seconds!
- ²⁾ Please note: If one of these categories was chosen, it is recommended to evaluate this sub-activity also using the KIM-BF! These forces might not be exerted at all or might no longer be exerted reliably. This applies to women in particular.
- ³⁾ In case of even higher frequencies, the resulting risk score must be extrapolated linearly or the E version (KIM-MHO-E) must be applied.





Force transfer / gripping conditions	Rating
Optimum force transfer/application / working objects are easy to grip (e.g. bar-shaped, gripping grooves) / good ergonomic gripping design (grips, buttons, tools)	0
Restricted force transfer/application / greater holding forces required / no shaped grips	2
Force transfer/application considerably hindered / working objects hardly possible to grip (slippery, soft, sharp edges) / no or only unsuitable grips	4

Hand/arm position and movement ⁴⁾	Rating points
 Good: position or movements of joints in the middle (relaxed) range, only rare deviations / no continuous static arm posture / hand-arm rest possible as required	0
 Restricted: occasional positions or movements of the joints at the limit of the movement ranges / occasional long continuous static arm posture	1
 Unfavourable: frequent positions or movements of the joints at the limit of the movement ranges / frequent long continuous static arm posture	2
 Poor: constant positions or movements of the joints at the limit of the movement ranges / constant long continuous static arm posture	3

⁴⁾ Typical positions are to be considered. Rare deviations can be ignored.

Unfavourable working conditions (specify only where applicable)	Rating points
Good: there are no unfavourable working conditions, i.e. reliable recognition of detail / no dazzle / good climatic conditions	0
Restricted: occasionally impaired detail recognition due to dazzle or excessively small details difficult conditions such as draught, cold, moisture and/or disturbed concentration due to noise	1
Unfavourable: frequently impaired detail recognition due to dazzle or excessively small details frequently difficult conditions such as draught, cold, moisture and/or disturbed concentration due to noise	2

Indicators not mentioned in the table are to be taken into account accordingly.

Body posture/movement ^{5) 6)}		Rating points
	<ul style="list-style-type: none"> - Alternation between sitting and standing, alternation between standing and walking, dynamic sitting possible - Trunk inclined forward only very slightly - No twisting and/or lateral inclination of the trunk identifiable - Head posture: variable, head not inclined backward and/or severely inclined forward or constantly moving - No gripping above shoulder height / no gripping at a distance from the body 	0
	<ul style="list-style-type: none"> - Predominantly sitting or standing with occasional walking - Trunk with slight inclination of the body towards the work area - Occasional twisting and/or lateral inclination of the trunk identifiable - Occasional deviations from good "neutral" head posture/movement - Occasional gripping above shoulder height / occasional gripping at a distance from the body 	2
	<ul style="list-style-type: none"> - Exclusively standing or sitting without walking - Trunk clearly inclined forward and/or frequent twisting and/or lateral inclination of the trunk identifiable - Frequent deviations from good "neutral" head posture/movement - Head posture hunched forward for detail recognition / restricted freedom of movement - Frequent gripping above shoulder height / frequent gripping at a distance from the body 	4
	<ul style="list-style-type: none"> - Trunk severely inclined forward / frequent or long-lasting bending - Work being carried out in a kneeling, squatting, lying position - Constant twisting and/or lateral inclination of the trunk identifiable - Body posture strictly fixed / visual check of action through magnifying glasses or microscopes - Constant deviations from good "neutral" head posture/movement - Constant gripping above shoulder height / constant gripping at a distance from the body 	6 ⁷⁾

⁵⁾ Typical body postures are to be taken into account. Rare deviations can be ignored.


⁶⁾ If the manual handling operations are not carried out in a stationary sitting, standing, kneeling, squatting, lying position, but in motion (walking, crawling), it is recommended to evaluate the sub-activity also using the KIM-BM.

⁷⁾ Please note: If this category was chosen, it is recommended to evaluate this sub-activity also using the KIM-ABP!

Work organisation / temporal distribution	Rating points
Good: frequent variation of the physical workload situation due to other activities (including other types of physical workload) / without a tight sequence of higher physical workloads within one type of physical workload during a single working day.	0
Restricted: rare variation of the physical workload situation due to other activities (including other types of physical workload) / occasional tight sequence of higher physical workloads within one type of physical workload during a single working day.	2
Unfavourable: no/hardly any variation of the physical workload situation due to other activities (including other types of physical workload) / frequent tight sequence of higher physical workloads within one type of physical workload during a single working day with concurrent high load peaks.	4

3rd step: Evaluation and assessment

Type of force exertion in the finger/hand area	
Force transfer / gripping conditions +	
Hand/arm position and movement +	
Unfavourable working conditions +	
Body posture +	
Work organisation / temporal distribution +	
Time rating points X	
Total of indicator rating points:	
=	Result

The risk score calculated and the table below can be used as the basis for a rough evaluation:					
Risk	Risk range	Intensity of load ⁷⁾	a) b)	Probability of physical overload Possible health consequences	Measures
	1	< 20 points	low	a) Physical overload is unlikely. b) No health risk is to be expected.	None
	2	20 - < 50 points	slightly increased	a) Physical overload is possible for less resilient persons. b) Fatigue, low-grade adaptation problems which can be compensated for during leisure time	For less resilient persons, workplace redesign and other prevention measures may be helpful.
	3	50 - < 100 points	substantially increased	a) Physical overload is also possible for normally resilient persons. b) Disorders (pain), possibly including dysfunctions, reversible in most cases, without morphological manifestation	Workplace redesign and other prevention measures should be considered.
	4	≥ 100 points	high	a) Physical overload is likely. b) More pronounced disorders and/or dysfunctions, structural damage with pathological significance	Workplace redesign measures are necessary. Other prevention measures should be considered.

* The boundaries between the risk ranges are fluid because of the individual working techniques and performance conditions. The classification may therefore only be regarded as an orientation aid. Basically, it must be assumed that the probability of physical overload will increase as the risk scores rise.

Guideline for the Key Indicator Method for assessing and designing physical workloads during Manual Handling Operations

KIM-MHO

Objective of the Key Indicator Method:

The objective of the KIMs is to document the main physical workload indicators as easily as possible, make correlations clear to the user and allow for a rough evaluation of the probability of physical overload. Possible consequences for health as well as the need for action resulting from that may be derived from this.

Please note:

This method serves to assess the working conditions during manual handling operations for orientation purposes. When determining the time rating points as well as the rating points for the key indicators (determination of the rating points for the type of force exertion in the finger/hand area, force transfer / gripping conditions, hand/arm position and movement, unfavourable working conditions, body posture as well as work organisation / temporal distribution), sound knowledge of the sub-activity being assessed is nevertheless an absolute prerequisite. Without such knowledge, it is not permitted to conduct an assessment. Rough estimates or assumptions lead to false results.

Procedure:

Basically, assessment is carried out for sub-activities. If minor deviations, e.g. with respect to the type of force exertion, gripping conditions and/or body postures, arise within a sub-activity, average values must be formed. If a number of sub-activities with substantially different conditions are carried out within a working day or extremely varying conditions occur within a sub-activity, they must be estimated and documented separately. The probability of physical overload can only be assessed if all physical workloads occurring during a working day are assessed. For a summarised assessment of substantially different physical workloads caused by manual handling operations, the KIM-MHO-E, for example, can be used. In case of overlaps with other types of physical workload, it is to be examined whether other KIMs must also be used (in this respect, see https://www.baua.de/EN/Topics/Work-design/Physical-workload/Key-indicator-method/Key-indicator-method_node.html).

The assessment requires 3 (or possibly 4) steps to be carried out:

1. Determination of time rating points
2. Determination of the rating points for key indicators and
3. Evaluation/assessment. As a result, it may be
4. necessary to carry out a step which includes the derivation and implementation of workplace redesign measures and precautions.

It is generally allowed to form useful intermediate steps (interpolation) when determining the rating points.

Time rating points < 1 may not be assigned, as the time rating point is always at least 1!

Carrying out the documentation and evaluation/assessment:

1st step: Determination of time rating points

The time rating points are determined on the basis of the table. The total duration of the sub-activity to be assessed is to be considered. Tooling times, distribution times and other tasks are not considered. The total duration of the sub-activity per working day is calculated on the basis of the duration and frequency of the analysed work cycles per working day.

2nd step: Determination of the rating points for other indicators

- The rating points for the type of force exertion are determined on the basis of the table, both separately for “holding” and “moving” and for left and right hands.
- The rating points for force transfer / gripping conditions, hand/arm position and movement, unfavourable working conditions, body posture as well as work organisation / temporal distribution are determined according to the procedure described above.
- A distance between the chest and middle of the hand of more than 17 cm (5% percentile, European value) is considered to be gripping at a distance from the body.

3rd step: Evaluation and assessment

Each sub-activity is evaluated on the basis of an activity-related risk score (calculated by adding the rating points for the key indicators and multiplying this by the time rating points). This risk score can be assigned to a risk range relating to this sub-activity and, based on this, the probability of physical overload and possible consequences for health as well as the need for action resulting from that can be derived.

4th step: Workplace redesign and preventive occupational medical care

In addition to the prevention measures derived on the basis of the risk assessment, the following applies:

- From risk range 3 “substantially increased”, workplace redesign measures as well as further collective and individual prevention measures are usually necessary. In Germany, preventative occupational medical care in accordance with *ArbMedVV* [German Ordinance on Occupational Health Care] is to be offered *).
- Workplace redesign and prevention measures for groups of particularly vulnerable employees (e.g. young people or people with altered performance) must be considered irrespective of the intensity of load and on a case-by-case basis where appropriate, e.g. if employees demand preventive occupational medical care.
- By examining the highest risk scores of the key indicators, the causes of increased physical workloads can be identified and changes initiated. The need for a redesign should also be considered if individual indicators reach the maximum rating points. Where appropriate, indications to restrictions of the feasibility with respect to the rating points for individual indicators must be considered.

*) *ArbMedVV* [German Ordinance on Occupational Health Care] as of June 2019