

Key Indicator Method for assessing and designing physical workloads with respect to Body Movement

KIM-BM

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-BM-E)



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Scope of the Key Indicator Method (KIM-BM)

- This type of physical workload concerns body movements to a place of work or in a work area, which will be assessed independently of applying increased forces.
- **Typical activities:** Transport of furniture without transport devices, transport of patients, climbing rotating cranes, transmitters, control inspections in channels, walking on construction sites and/or hydraulic construction areas, maintenance on lighting systems, maintenance on furnaces, maintenance in shafts/tanks/channels.

Distinction from other Key Indicator Methods

- If the sub-activity includes increased forces, the types of physical workload “Whole-Body Forces”, “Lifting, Holding and Carrying”, “Pushing and Pulling” and/or “Manual Handling Operations” must also be considered.
- If there are several different sub-activities per working day, they must be recorded and assessed separately (e.g. using KIM-BM-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

Key Indicator Method for assessing and designing physical workloads with respect to Body Movement (KIM-BM)

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 the sub-activity [up to ... minutes] per working day:	up to 1	> 1 - 5	> 5 - 10	> 10 - 20	> 20 - 30	> 30 - 45	> 45 - 60	> 60 - 100	> 100 - 150	> 150 - 210	> 210 - 270	> 270 - 360	> 360 - 480
Time rating points	1	1.5	2	2.5	3	3.5	4	5	6	7	8	9	10

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

A Body Movement without using equipment

Type	Description	Carried load									> 40 kg
		without / < 3 kg	3 ... 10 kg	> 10 ... 15 kg	> 15 ... 20 kg	> 20 ... 25 kg	> 25 ... 30 kg	> 30 ... 35 kg	> 35 ... 40 kg		
	Walking	Slowly	4	6	8	10	12	14	25	35	100 ¹⁾
		At a moderate pace (3 ... 5 km/h)	8	10	12	14	16	18	30	40	
		Quickly	12	14	16	18	20	22	35	50	
	Climbing	Angle of inclination < 5°	10	12	14	16	18	20	35	50	
		Angle of inclination 5 - 15°	12	14	16	18	20	22	35	50	
		Angle of inclination > 15°	24	26	28	30	32	34	40	50	
	Climbing stairs	Normal stairs	18	20	22	24	26	50	100 ¹⁾		
		Steep stairs (35 ... 50°)	24	26	28	30	50	100 ¹⁾			
		Very steep stairs (> 50°)	30	32	34	50	100 ¹⁾				
	Climbing ladders Angle of inclination 65 ... 75°	24	26	50	100 ¹⁾						
	Climbing Angle of inclination > 80° Vertical movement on step irons, vertical ladders, manhole ladders	30	32	50	100 ¹⁾						
	Crawling²⁾, walking with a severe stoop Predominantly horizontal movement in low-ceiling rooms, tunnels, maintenance platforms, channels	24	26	50	100 ¹⁾						

¹⁾ This combination of type of movement and transport of loads leads to an increased risk even with short exposure times.

²⁾ For this type of movement, the sub-activity must also be evaluated using the KIM-ABP Part C.


Location of the load centre for A	Carried load		
	3 up to 15 kg	> 15 ... 30 kg	> 30 kg
No load or load < 3 kg or load is close to the body in a carrying frame or backpack on the shoulders	0		
Load close to the body, held in the hands or carried on one shoulder	4	8	12
Load at a distance from the body, held in the hands ³⁾	8	12	16

Trunk posture for A	Carried load			
	0 up to 15 kg	> 15 ... 30 kg	> 30 kg	
Trunk clearly inclined forward and/or twisting and/or lateral inclination of the trunk identifiable	Occasionally	2	4	6
	Frequently to constantly ³⁾	4	6	8

³⁾ Please note: If unfavourable arm or trunk postures occur frequently to constantly, the sub-activity must also be evaluated using the KIM-LHC (for load ≥ 3 kg) or the KIM-ABP (no load or load < 3 kg).

Unfavourable working conditions for A (Specify only where applicable. Indicators not mentioned in the tables are to be taken into account accordingly. Rare deviations can be ignored.)	Rating points	
Restricted: narrow space for movement (e.g. fall protection by means of safety cage) / reduced stability due to movable or inclined standing surface / sand / gravel path	3	
Severely restricted: freedom of movement hindered / no technical climbing aids (natural conditions) / open country	5	
Critical: freedom of movement severely hindered due to confined spaces and danger points / restricted view / no resting platforms / mountaineering / respiratory protective equipment / muddy ground	15	
Climate: extreme climatic influences, such as heat, wind, snow (graded as rarely/occasionally and frequently/constantly)	4	8
Total of "Restricted", "Severely restricted" or "Critical" and "Climate" (if applicable)		

B Body Movement when driving by muscle power

Type	Description	Load weight to be moved including transport device ⁴⁾		
		up to 50 kg	> 50 ... 150 kg	> 150 kg
	Slowly < 10 km/h	3	6	9
	At a moderate pace 10 ... 15 km/h	6	10	14
	Quickly > 15 km/h	9	15	21


Driveway - unfavourable working conditions for B (Specify only where applicable. Indicators not mentioned in the tables are to be taken into account accordingly. Rare deviations can be ignored.)	Load weight to be moved including transport device ⁴⁾		
	up to 50 kg	> 50 ... 150 kg	> 150 kg
Driveway restricted: earth or roughly cobbled driveway, potholes, heavy soiling, temporary ascents	8	12	16
Climate: extreme climatic influences, such as heat, wind, snow	rarely/occasionally	frequently/constantly	
	4	8	
Total			

⁴⁾ If supported by electric operation, the rating points must be divided in half.

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 a type of physical workload during a working day with concurrent high load peaks.	4

3rd step: Evaluation and assessment

A:	Body movement without using equipment				
	Location of the load centre (only for A, otherwise 0)	+			
	Twisting and/or lateral inclination of the trunk (only for A, otherwise 0)	+			
	Unfavourable working conditions (only for A, otherwise 0)	+			
B:	Body movement when driving by muscle power	+			Results
	Driveway (only for B, otherwise 0)	+			In case of female employees x 1.3
	Work organisation / temporal distribution A and B	+			
Time rating points	X		Total of indicator rating points:	=	M
					x 1.3
					W

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) Probability of physical overload b) 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.	

⁷⁾ 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 with respect to Body Movement (KIM-BM)

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 of body movements to a place of work or in a work area for orientation purposes. When determining the time rating points as well as the rating points for the key indicators (type of movement, carried load, location of the load centre (only for A "Body Movement without using equipment"), work organisation / temporal distribution, working conditions and driveway (only for B "Body Movement when driving by muscle power")), 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 speed of movement and/or carried load, arise within a sub-activity, average values must be formed. If a number of sub-activities with different types of movement or 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 body movement, the KIM-BM-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.

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

The rating points for the type of movement are to be determined depending on the type of movement, separately for

- A "Body Movement without using equipment" or
- B "Body Movement when driving by muscle power".

For A "Body Movement without using equipment", the rating points for the carried load are determined on the basis of the corresponding table. In addition, the rating points for the location of the load centre, trunk posture and unfavourable working conditions are to be determined.

For B "Body Movement when driving by muscle power", the rating points for the carried load are to be determined on the basis of the corresponding table. In addition, the rating points for the driveway – unfavourable working conditions are to be determined.

The rating points for the work organisation / temporal distribution are determined according to the procedure described above.

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.

If women carry out this sub-activity, the risk score is to be multiplied by the factor 1.3. This takes into account that women have on average about 2/3 of the physical capacity of men.

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 advisable^{*)}.
- 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.

^{*)} based on *ArbMedVV* [German Ordinance on Occupational Health Care], as of June 2019