

Key Indicator Method for assessing and designing physical workloads with respect to manual Pushing and Pulling of loads KIM-PP

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-PP-E)



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Scope of the Key Indicator Method (KIM-PP)

- This Key Indicator Method serves to record and assess physical workloads resulting from moving transport devices, overhead conveyors or overhead cranes by muscle power.
- Transport devices can include one-wheel barrows, single-axle barrows, trolleys or carriages with 3 to 6 wheels which are moved freely on the floor in all directions by muscle power only. Overhead conveyors are monorail systems with which the load is moved on transport devices in one direction. Overhead cranes are single-girder overhead cranes covering areas in which the load can be moved in all directions.
- If no additional forces are required for material processing, this Key Indicator Method can also be used for manually moved work equipment (e.g. colour-marking barrows, measuring rollers).

Distinction from other Key Indicator Methods

- If the load is moved without using equipment (e.g. rolling rotationally symmetric objects or dragging across the floor), the Key Indicator Method "Whole-Body Forces" (KIM-BF) must be considered.
- If the load is moved using transport devices which are equipped with mechanical drives (e.g. pedestrian-operated trucks, stair climbing carts), the Key Indicator Methods "Body Movement" (KIM-BM) and "Whole-Body Forces" (KIM-BF) can be taken into consideration in addition.
- When moving lifting aids without substantial movements (e.g. pillar crane, suction lifter), the Key Indicator Method "Whole-Body Forces" (KIM-BF) must be taken into consideration.
- If there are several different sub-activities including pushing and pulling per working day, they must be recorded and assessed separately (e.g. using KIM-PP-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 with respect to manual Pushing and Pulling of loads (KIM-PP)









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

1st step: Determination of time rating points (distance, duration of the PP)



Distance ¹⁾ up to ...m ²⁾	40	200	400	800	1200	1800	2500	4200	6300	8400	11000	15000	20000
Duration ¹⁾ up to ...min ²⁾	≤ 1	≤ 5	≤ 10	≤ 20	≤ 30	≤ 45	≤ 60	≤ 100	≤ 150	≤ 210	≤ 270	≤ 360	≤ 480
Time rating points	1	1.5	2	2.5	3	3.5	4	5	6	7	8	9	10

¹⁾ An approximate walking speed of 0.7 m/s (2.5 km/h) when pushing and pulling loads is assumed. ²⁾ Per sub-activity and working day.

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

Load weight to be moved including transport device [kg]	Transport device								Overhead conveyors	Overhead cranes
	Carriages									
	Barrows ^{3) 4)}			only swivel castors	with fixed castors or lockable swivel castors	pedestrian-controlled				
										
up to 50	3	2	2.5	2.5	3	1	1	1	1	2
> 50 up to 100	5	3	4	3	4	1	1	1	1	2.5
> 100 up to 200	10	6	7	4	6	2	1.5	1.5	1.5	3.5
> 200 up to 300	50	12	50	5	8	3	2	2	2	4.5
> 300 up to 400	100	100	100	7	12	4	3	2.5	2.5	6
> 400 up to 600				12	50	6	5	4	4	10
> 600 up to 800				50	10	8	7	15		
> 800 up to 1000				15	12	10	50			
> 1000 up to 1300				50	50	50	20	100		
> 1300	100	100	100	50						




³⁾ In addition to the propelling force, the load rating points also consider lifting, tilting, balancing and lowering forces. ⁴⁾ Barrows with support wheels, stair climbing carts and other special designs cannot be differentiated using the KIM-PP. ⁵⁾ E.g. waste containers in outdoor areas with simple wheel bearings, which might be exposed to the weather. Grey fields: These load weights can no longer be moved reliably.

Driveway conditions	Rating points		
			Carriages
Driveway completely level, smooth, solid, dry, without inclinations	0	0	0
Driveway mostly smooth and level, with small damaged spots/faults, without inclinations	0	0	1
Mixture of cobbles, concrete, asphalt, slight inclinations ⁶⁾ , dropped kerb	0	1	2
Mixture of roughly cobbled, hard sand, slight inclinations ⁶⁾ , small edges/sills	1	2	3
Earth or roughly cobbled driveway, potholes, heavy soiling, slight inclinations, landings, sills	3	5	6
Additional points in case of significant inclinations or stairs	Inclinations of 2 up to 4° (4 up to 8%)	5	Rating points + additional points Total
	Inclinations of 5 up to 10° (9 up to 18%)	10	
	Stairs ⁷⁾ , inclinations > 10° (18%)	25	

⁶⁾ Slight inclination: up to 2° (4%) ⁷⁾ only for using stair climbing carts

Unfavourable working conditions (specify only where applicable)	Intermediate rating points IRP	Total IRP (max. 4)
Regularly significantly increased starting forces, because transport devices sink into the ground or get wedged	3	
Frequent stops with braking / without braking	3 / 1	
Many changes of direction or curves, frequent manoeuvring	3	
Load must be positioned precisely and stopped, driveway must be adhered to precisely	1	
Increased movement speed (approx. 1.0 up to 1.3 m/s)	2	
None: there are no unfavourable working conditions	0	

Unfavourable properties of the transport device/overhead conveyor/overhead crane	Intermediate rating points IRP	Total IRP (max. 4)
No suitable handles or construction parts for applying force	2	
No brake when driving on inclinations > 2° (> 3%)	3	
Unadjusted castors (e.g. too small on soft or uneven floor)	2	
Defective castors (worn-out, rubbing, stiff, air pressure too low)	2	
None: there are no unfavourable properties of the transport devices	0	

Body posture / body movement ⁸⁾	Rating points
 <ul style="list-style-type: none"> Trunk upright or slightly inclined forward, no twisting Force application height can be selected freely No hindrance for the legs 	3
 <ul style="list-style-type: none"> Body inclined towards the direction of movement or slight twisting when pulling the load on one side Fixed force application height ranging from 0.9 – 1.2 m No or only slight hindrance for the legs Predominantly pulling 	5
 <ul style="list-style-type: none"> Awkward body postures caused by <ul style="list-style-type: none"> Fixed force application height < 0.9 or > 1.2 m Lateral force application on one side Significantly obstructed view Significant hindrance for the legs Frequent/constant twisting and/or lateral inclination of the trunk identifiable <p>Direction of force →</p>	8


⁸⁾ The typical body posture is to be taken into account. If the trunk is inclined to a greater extent when starting, braking and manoeuvring, this is taken into account under unfavourable working conditions.

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

	Load weight / transport device				
	Driveway conditions +				
	Unfavourable working conditions (Σ IRP) +				
	Properties of transport device (Σ IRP) +				
	Body posture +				
	Work organisation / temporal distribution +				
Time rating points	x	Total of indicator rating points:	=	x 1.3	=
					Result
		Pushing and Pulling in pairs:		x 0.7	

In case of female employees:

The risk score calculated and the table below can be used as the basis for a rough evaluation:					
Risk	Risk range	Intensity of load*	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 manual Pushing and Pulling of loads

KIM-PP

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 assessment of the probability of physical overload. Possible consequences for health as well as the resulting need for action may be derived from that.

Please note:

This method serves to assess the working conditions with respect to pushing and pulling loads on transport devices/overhead conveyors/single-girder overhead cranes for orientation purposes. When determining the time rating points as well as assigning the rating points for the key indicators (type of the transport device/load weight, driveway conditions, working conditions, properties and condition of the transport device and body posture), 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:

If there are several different sub-activities including pushing and pulling per working day, they must be recorded and assessed separately where applicable. The probability of physical overload can only be assessed if all physical workloads occurring during a working day are assessed. They can be assessed using KIM-PP-E, for example. In case of overlaps with other types of physical workload, it is to be examined whether other KIMs must also be used as an alternative (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 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.

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 basis is the whole distance or total duration in the sub-activity per working day, which is covered using the transport device, both loaded and empty.

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

The rating points for the type of the transport device/load weight, driveway conditions, working conditions, properties and condition of the transport device and body posture are determined according to the indicators and scales described in the respective tables.

3rd step: Evaluation and assessment

Each sub-activity is evaluated on the basis of a sub-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 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