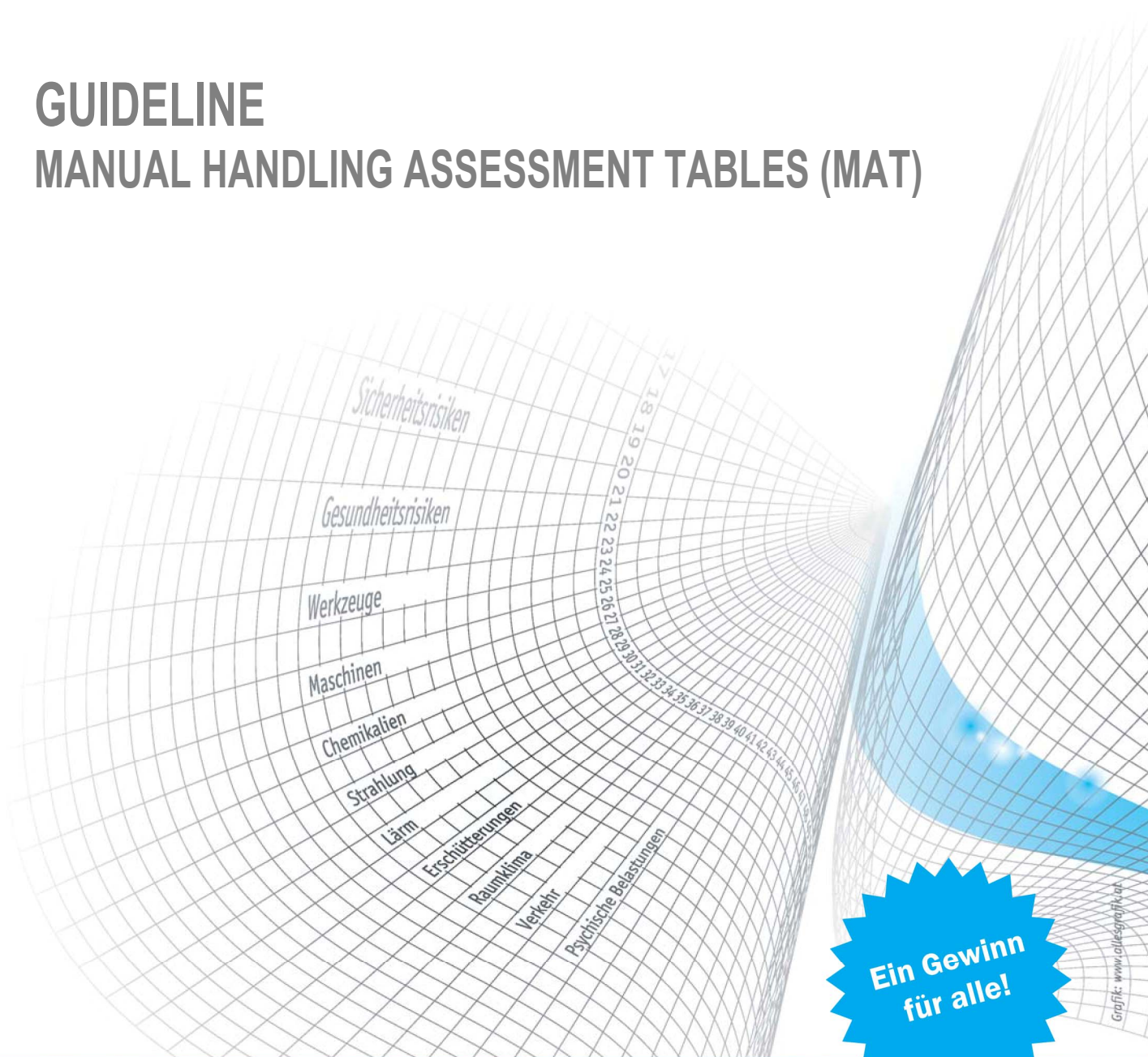


# MANUAL HANDLING OF LOADS LIFTING, HOLDING, CARRYING

## GUIDELINE MANUAL HANDLING ASSESSMENT TABLES (MAT)



SHORT RISK ASSESSMENT OF MANUAL HANDLING OF LOADS  
STIPULATED FOR TESTING SIMPLIFIED PRACTICES

Vienna, October 2009

## IMPRINT

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Not intended to be exhaustive.

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## INTRODUCTION

These manual handling assessment tables (MAT) were developed for the purpose of testing in practice within the framework of the Austrian strategy on occupational health and safety on the basis of three projects on manual handling of loads (by the Labour Inspectorates between 2000 and 2009) and the experience gathered in the course thereof.

The motivating force was the desires expressed by the users. Models like the Key Item Method 2001, EN 1005-2 and ISO 11228–1, always require a calculation, making quick evaluations difficult. This is why users desired tables which contains, on the one hand, all the information and thus facilitates a quick overview, and on the other hand, is not in conflict with the pertinent state of the art.

Furthermore, users wanted an assessment that produced results that are as unequivocal as possible: i.e. whichever load band is relevant (green, yellow or orange), there should always be clearly formulated requirements determining whether the particular activity is admissible. This would fulfil an important prerequisite for any future legislative implementation.

In the run-up to this short assessment, the manual handling of loads was systematically developed in the form of tables and diagrams with formulas derived there from not only for lifting, holding and carrying but also for pushing, pulling and manipulation. Nonetheless, the intended testing of the short assessment's practicability will focus firstly on the assessment of lifting, holding and carrying by means of tables.

Lifting (moving), holding and carrying is almost always carried out in a self-determined fashion in practice, i.e. the person manipulating the load can put it down at any "self-determined" point. Furthermore, the consideration of ergonomic working conditions does not have a very strong impact on the assessment. Moreover, the ergonomic working conditions proved not to be changeable in many cases.

Thus, assessment can be made more practicable by use of tables in that both the self-determined manipulation and the creation of good working conditions (for the types of working condition see table 6) are incorporated into the general requirements **in order to facilitate assessment exclusively on the basis of three parameters, namely the weight of the load, extent of the time (frequency, duration, distance) and type of body posture. Furthermore, in practice the type of body posture can be reduced to two classifications by corresponding arrangement of the table without any loss of clarity: good postures and bad postures (see table 3).**

It is planned that the above-mentioned tests are carried out within the framework of the Austrian strategy on occupational safety and health jointly with partner institutions. The short assessment as the starting product will be limited to the essentials with respect to its contents. On the basis of the practical experience gathered during the course of the tests it should be developed systematically into a guideline in which pushing, pulling and manipulation and diagrams and formulas can then also be integrated.

# MANUAL HANDLING ASSESSMENT TABLES (MAT)

**TABLE 1: LOAD-TIME-LIMITS (LTL-TABLE)**

Lifting, holding, carrying – self-determined* <sup>1</sup> – standing, kneeling, squatting, walking Assessment: Good postures – solid arrows; bad postures – dotted arrows					
Adults (> 18 years)		Assessment  Load-Time- Correlation:	Time (frequency, duration, distance)		
Men	Women		Frequency	Duration	Distance
Load* <sup>2</sup> [kg]			f [1/d]	t [min]	s [km]
↓Green band: Load - targets of design			> 2000	> 480	> 32
≤ 5	≤ 3		bis 2000	bis 480	bis 32
> 5 bis 10	> 3 bis 5		bis 1000	bis 240	bis 16
> 10 bis 20	> 5 bis 10		bis 500	bis 120	bis 8
> 20 bis 30 <sup>3</sup>	> 10 bis 15		bis 200	bis 60	bis 4
> 30 bis 40	> 15 bis 25		bis 100	bis 30	bis 2
↑Yellow band: Range of high load		<div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;">                     Solid arrows: Good postures Dotted arrows: Bad postures (see Table 2- 4)                 </div>	bis 40	bis 15	bis 1
> 40	> 25		bis 10	bis 5	bis 0,3
↑Yellow band: Range of highest load		Orange band: Limits of LTL-table exceeded			

- \*<sup>1</sup> Self-determined lowering of load is possible. That is self-determined change of activity or self-determined work breaks.
- \*<sup>2</sup> Cumulative mass of more than 10 t a day for men or 7.5 t a day for women should not be exceeded. An exceeding of the cumulative mass is permitted as an exception, but not regularly.
- \*<sup>3</sup> Target of design of loads (green range) for men is 25 kg and not 30 kg.

**TABLE 2: LOAD-TIME-CORRELATION OF LTL-TABLE**

The load-time-correlation applies for each load band in the LTL table. It is shown by arrows symbolically for a load band in the LTL table.

A load is referenced to four different times (time-rows) by arrows. The solid arrows characterise classification for good body posture. The dotted-line arrows characterise classification for bad body posture.

**Good and bad body postures are illustrated and described in table 3.**

Load [kg]	Load-Time-Correlation	TIME (frequency, duration, distance)
Load		Solid yellow arrow: Good posture Yellow range in Load-Time-Table
		Slid green arrow: Good posture Green range in Load-Time-Table
		Dotted yellow arrow: Bad posture Yellow range in Load-Time-Table
		Dotted green arrow: Bad posture Green range in Load-Time-Table

With these four evaluation steps within the green and yellow band and one in the orange band, which lies outside, tables 3 to 5 can be used to perform all relevant assessments of lifting, holding and carrying activities.

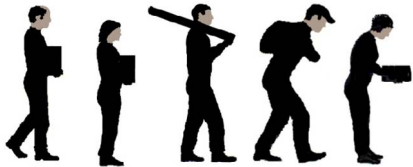

As an alternative for the time parameter, it is also possible to use the frequency of the operations (as a rule if  $t \leq 10$  s), the duration for the holding or carrying (as a rule if  $t > 10$  s) or the distance for the carrying. In case of doubt, the time parameter that produces the least favourable assessment should be taken.

Within the green and yellow high load bands, interpolation can be used to assess different loads as a whole with the corresponding time weighting. The yellow highest load band must always be assessed separately. The average load  $L_m$  for different activities in the green and yellow high load band can be calculated (interpolated) as follows:

$$L_m = (L_1 \cdot T_1 + L_2 \cdot T_2 + \dots + L_n \cdot T_n) / (T_1 + T_2 + \dots + T_n) \quad \text{with } L_1 \text{ to } L_n \text{ being the loads of individual activities.}$$

$T_1$  to  $T_n$  = the time parameters of the same type (f or t or s) for the respective activities.

**TABLE 3: POSTURES OF LTL-TABLE**

Postures	Image of postures	Description
<b>Good postures (Green)</b>		<ul style="list-style-type: none"> <li>• Upper body upright, not twisted or at the most only slightly bent forward or trunk only slightly twisted</li> <li>• Load is close or near to middle of body</li> </ul>
<b>Bad postures (Yellow)</b>		<ul style="list-style-type: none"> <li>• Low bending or far bending forward with simultaneous twisting of trunk</li> <li>• Load far from body or above shoulder height</li> <li>• Restricted stability of posture when standing</li> <li>• Crouching or kneeling</li> </ul>

Modified source: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, Germany

**TABLE 4: ASSESSMENT OF FINDINGS OF LTL-T**

	LTL-table: Load-Time-Correlation	Comment / Assessment
<b>Green</b>	Good posture: solid green arrow: Load-Time in line	Activity is permissible subject to three general requirements (table 5 nos. 1 to 3). Physical overload is unlikely.
	Bad posture: dotted green arrow: Load-Time two lines downward	
<b>Yellow</b>	Good posture: solid yellow arrow: Load-Time one line upward	Physical overload also possible for normal persons. Therefore: activity is permissible subject to five restrictive requirements (table 5 nos. 1 to 5).
	Bad posture: dotted yellow arrow: Load-Time one line downward	
<b>Orange</b>	Limits of the LTL-table exceeded	Physical overload is likely. Therefore: activity is permissible subject to seven restrictive requirements (Table 5 nos. 1 to 7).

**TABLE 5: REQUIREMENTS FOR MANUAL HANDLING**

Nr.	Band	Description
1	Orange	Consideration of the personal constitution and body strength of the employee (in accordance with art. 15 Directive 89/391/EWG)
2		If possible realisation of good working conditions (good or bad ergonomic conditions: see table 6).
3		General information and training about health and safety of manual handling, dangers of inappropriate handling, characteristics of the load and working environment.
4		<b>Program of measures</b> with the aim of reducing the burden of manual handling. Goals: realization of adherence to the green band according to the LTL-Table. Note: for men you have to use 25 kg instead of 30 kg, and a cumulative mass of 10 t per day for men and of 7.5 t per day for women. If this is not possible then activity in the yellow or orange band is only permitted subject to compliance with further requirements.
5		Adaptation of the general information and training for a specific annual training about: see number 3.
6		Appropriate planned change of activity or self-determined work breaks and consideration of work outs for compensation.
7		Measures to limit the activity to what is unavoidable under consideration of the technical progress.

The traffic light bands show which requirements must be adhered to in which assessment bands (green, yellow, or orange) (1 to 3: green band, 1 to 5: yellow band, 1 to 7: orange band).

**TABLE 6: WORKING CONDITIONS**

Working conditions	Description
<b>Good ergonomic conditions*<sup>1</sup></b> (Green)	E.g. sufficient space, no physical obstacles within the workspace, even level and solid flooring, sufficient lighting, good gripping conditions, two-sided symmetrical load handling
<b>Bad ergonomic conditions*<sup>2</sup></b> (Yellow)	Instability of centre of gravity of load or restriction of <ul style="list-style-type: none"> <li>• free moving space and space for movement by too low a height,</li> <li>• posture stability - impaired by uneven floor or soft ground,</li> <li>• working area - less than 1,5 m<sup>2</sup>.</li> </ul>

Modified source: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, Germany

\*<sup>1</sup> If possible, realisation of good ergonomic conditions (see table 5 number 2).

\*<sup>2</sup> Bad ergonomic conditions are no subject of risk assessment (see introduction).