DIN EN 1005-5:2007-05 (E)

Safety of machinery - Human physical performance - Part 5: Risk assessment for repetitive handling at high frequency

Contents

Page

Foreword 4

Introduction 5

1 Scope 6

2 Normative references 6

3 Terms and definitions 6

4 Abbreviations 7

5 Requirements 8
5.1 The application of standards relevant to this document 8
5.2 General aspects 8
5.3 Risk assessment 9
5.3.1 General 9
5.3.2 Hazard identification 11
5.3.3 Risk estimation and simple evaluation of machinery related repetitive handling at high frequency (Method 1) 12
5.3.4 Detailed risk evaluation of machinery related repetitive handling at high frequency: risk reduction and risk reduction option analysis (Method 2) 13

6 Verification 17

7 Information for use 18

Annex A (informative) Identification of technical action 19

A.1 General 19
A.2 Examples for identifying and counting technical actions 22
A.2.1 Example 1: Pick and place (Tables A.2 and A.3) 22
A.2.2 Example 2: Pick and place with transfer from one hand to the other and with visual inspection (Table A.4) 22
A.2.3 Example 3: Pick and place while transporting a load (Table A.5) 23
A.2.4 Example 4: Cyclical use of a tool with repeated and identical actions (Table A.6) 24
A.2.5 Example 5: Technical actions not carried out in every cycle (Table A.7) 24

Annex B (informative) Posture and types of movements 26

Annex C (informative) Force 31

C.1 General 31
C.1.1 Introduction 31
C.1.2 Procedure 1 - A biomechanical approach based on user group strength distributions 31
C.2 Procedure 2 - A psychophysical approach using the CR-10 Borg scale 33

Annex D (informative) Association between the OCRA index and the occurrence of Upper Limbs Work- related Musculo-Skeletal Disorders (UL-WMSDs): criteria for the classification of results and forecast models 34

D.1 General 34
D.2 OCRA Index values, exposure areas and consequent actions 37

Annex E (informative) Influence of recovery periods pattern and work time duration in determining the overall number of reference technical actions within a shift (RTA) and, consequently, the OCRA index 39

Annex F (informative) An application example of risk reduction in a mono-task analysis 41

F.1 Foreword 41
F.2 General: technical characteristics of the task 41
F.3 Hazard identification 43
F.4 Method 1 43
F.5 Method 2 43
F.5.1 Description of awkward postures and movements and evaluation of the corresponding Posture multiplier (PoM) 43
F.5.2 Repetitiveness multiplier (ReM) 46
F.5.3 Evaluation of average force level and the corresponding Force Multiplier (FoM) 46
F.5.4 Determination of the Recovery period multiplier (RcM) and the Duration multiplier (DuM) 47
F.5.5 Computation of reference technical actions per minute (RF) 48
F.5.6 Computation of the OCRA index 48
F.5.7 OCRA index calculation for mono task analysis when the repetitive task duration should be assessed 48
F.5.8 Solutions to reduce the risk level 50

Annex G (informative) Definition and quantification of additional risk factors 58

Annex H (informative) Risk assessment by Method 2 when designing "multitask" jobs 60

H.1 OCRA index calculation when two or more repetitive tasks should be assessed 60
H.2 An application example: assessing repetitive tasks at a machine 61
H.2.1 Description of characteristics of two tasks 61
H.2.2 Definition of the corresponding multipliers 62
H.2.3 Mono- task analysis separately for task A and B: computation of the overall number Actual Technical Actions (ATA) in task A (Table H.3) and task B (Table H.4) 62
H.2.4 Mono- task analysis: computation of the overall number of reference technical actions within a shift (RTA) in task A (Table H.5) and task B (Table H.6) 65
H.2.5 Mono- task analysis: computation of the OCRA index in task A (Table H.5) and task B (Table H.6) 65
H.3 Multi-tasks analysis 67
H.3.1 Computation of the overall number of Actual Technical Actions (ATA) in task A and task B (Table H.7) 67
H.3.2 Computation of the overall number of reference technical actions (RTA) in task A and task B (Table H.7) 68
H.3.3 Computation of the overall number of reference technical actions within a shift in task A and task B (Table H.7) 69
H.4 Conclusion 70

Bibliography 71