

DIN EN 500-4:2011-06 (E)

Mobile road construction machinery - Safety - Part 4: Specific requirements for compaction machines

Contents		Page
Foreword		6
Introduction		8
1	Scope	8
2	Normative references	8
3	Terms and definitions	9
4	List of significant hazards	11
5	Safety requirements and/or protective measures	11
5.1	Lighting, signalling and marking lights and reflex-reflector devices	11
5.2	Operation and handling	11
5.2.1	Retrieval transportation and towing	11
5.2.2	Pedestrian-controlled rollers	11
5.3	Operator's station	13
5.4	Operator's seat	13
5.5	Controls and indicators	13
5.5.1	General	13
5.5.2	Travel control of pedestrian-controlled machines with handle bar	13
5.5.3	Controls for towed machines	13
5.5.4	Remote control of pedestrian-controlled rollers	13
5.6	Starting	14
5.7	Stopping	14
5.7.1	General	14
5.7.2	Stopping device	14
5.7.3	Braking systems	14
5.8	Access system to operator's station and to maintenance points	15
5.9	Roll-over protective structure (ROPS)	15
5.10	Noise and vibration	16
5.10.1	Noise measurement of vibratory plates and vibratory rammers	16
5.10.2	Noise measurement of rollers	16
5.10.3	Vibration measurement of hand-guided machines	16
6	Verification of safety requirements and/or protective measures	17
7	Information for the user	17
7.1	Warning signals and devices	17
7.2	Instruction handbook	17
7.3	Marking	18
Annex A (normative) Remote infrared controls for rollers with attending operator		19
A.1	General	19
A.2	Scope	19
A.3	Terms and definitions	19
A.4	Safety requirements and measures	19
A.5	Components and equipment	21

Annex B (normative) Noise-test-code for vibratory plates and vibratory rammers	23
B.1 Scope	23
B.2 Determination of the A-weighted sound power level	23
B.2.1 General	23
B.2.2 Measurement surface	24
B.2.3 Test procedure	28
B.2.4 Repetition of the test and calculation of the sound power level	28
B.3 Determination of the A-weighted emission sound pressure level at the operator's position	29
B.3.1 General	29
B.3.2 Operator's position	29
B.3.3 Test procedure	29
B.3.4 Repetition of the test and calculation of the emission sound pressure level	29
B.3.5 Determination of emission sound pressure spectra	29
B.3.6 Sound pressure level as a function of time	29
B.4 Installation and mounting conditions	30
B.4.1 General	30
B.4.2 Design of the test surface	30
B.4.3 Design of the test site	31
B.5 Operating conditions	33
B.6 Uncertainty	33
B.7 Information to be recorded	33
B.8 Information to be reported	34
B.9 Declaration and verification of noise emission values	35
Annex C (normative) Measurement of the hand-arm vibration of hand-guided vibratory ground compaction machines	36
C.1 General	36
C.2 Terminology	36
C.3 Quantities to be measured	36
C.3.1 R.m.s. value of the weighted acceleration	36
C.3.2 Frequency analysis	36
C.3.3 Time records	37
C.3.4 Other quantities to be measured	37
C.4 Measuring equipment	37
C.4.1 Requirements for the acceleration transducers	37
C.4.2 Fastening of the acceleration transducers	37
C.4.3 Frequency weighting filter	37
C.4.4 R.m.s. detector	37
C.4.5 Calibration	37
C.5 Measurement direction and measurement location	38
C.5.1 Measurement direction	38
C.5.2 Measurement location	40
C.6 Specification of working procedure	40
C.6.1 Operator	40
C.6.2 Other quantities to be determined (forces)	40
C.6.3 Operating conditions	40
C.6.4 Requirements for the test site	40
C.6.5 Measurement procedure	41
C.7 Test report	41
C.7.1 Reference	41
C.7.2 Description of the object to be measured	41
C.7.3 List of measuring equipment	41
C.7.4 Fastening of the acceleration transducers	41
C.7.5 Operating conditions	41
C.7.6 Further specifications	41
C.7.7 Results	42
C.8 Report of results	42
C.9 Measurement uncertainty	42

Annex D (normative) Noise test code for vibratory rollers	43
D.1 Scope	43
D.2 Determination of the A-weighted sound power level	43
D.2.1 General	43
D.2.2 Measurement surface	43
D.2.3 Positioning of the machine	45
D.2.4 Repetition of the test	49
D.3 Determination of the A-weighted emission sound pressure level at the operators positions for vibratory rollers	49
D.3.1 General	49
D.3.2 Operator's positions	49
D.3.3 Enclosed operator's positions	49
D.3.4 Quantities to be determined	49
D.3.5 Microphone position(s)	49
D.3.6 Test procedure	49
D.3.7 Repetition of the test	50
D.4 Test conditions	50
D.4.1 Installation and mounting conditions	50
D.4.2 Operating conditions	50
D.5 Uncertainty	50
D.6 Information to be recorded	51
D.7 Information to be reported	51
D.8 Declaration and verification of noise emission values	52
Annex E (normative) Noise test code for non-vibrating rollers	53
E.1 Scope	53
E.2 Determination of the A-weighted sound power level	53
E.2.1 General	53
E.2.2 Measurement surface	53
E.2.3 Positioning of the machine	55
E.2.4 Repetition of the test	56
E.3 Determination of the A-weighted emission sound pressure level at operator's positions for non-vibrating rollers	56
E.3.1 General	56
E.3.2 Operators positions	56
E.3.3 Enclosed operator's positions	56
E.3.4 Quantities to be determined	56
E.3.5 Microphone position(s)	56
E.3.6 Test procedure	56
E.3.7 Repetition of the test	57
E.4 Test conditions	57
E.4.1 Installation and mounting conditions	57
E.4.2 Operating conditions	57
E.5 Uncertainty	57
E.6 Information to be recorded	58
E.7 Information to be reported	58
E.8 Declaration and verification of noise emission values	59
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC	60
Bibliography	61
Figures Figure 1 -- Vertical swinging of single-drum walk-behind rollers	12
Figure 2 -- Position of the stopping device at pedestrian-controlled rollers	13
Figure 3 -- Minimum clearance of lower limbs at access to the operator's station on machines with articulated steering	15

Figure 4 -- Deflection-limiting volume, front view, side view	16
Figure 5 -- Warning decal	17
Figure B.1 -- Arrangement of test positions for hand-guided vibratory plates and hand-guided vibratory rammers	25
Figure B.2 -- Arrangement of test positions for remote controlled vibratory plates	27
Figure B.3 -- Grading-size diagram of the material to be compacted (gravel)	31
Figure B.4 -- Test site and arrangement with test track	32
Figure C.1 -- Directions of measurement and examples for attachment of the acceleration transducer	39
Figure C.2 -- Arrangement of the coupling device on the drawbar	40
Figure D.1 -- Basic length L	44
Figure D.2 -- Arrangement of test positions for ride-on vibratory rollers	45
Figure D.3 -- Arrangement of test positions for hand-guided vibratory rollers	46
Figure D.4 -- Arrangement of test positions for remote controlled vibratory rollers	47
Figure D.5 -- Arrangement of test positions for towed vibratory rollers	48
Figure E.1 -- Basic length L	54
Figure E.2 -- Microphone positions	55
Tables Table B.1 -- Coordinates of microphones	28
Table B.2 -- Operating conditions	33
Table B.3 -- Uncertainties applicable to gravel course	33
Table D.2 -- Uncertainties applicable to cushion mounted machines	50
Table E.1 -- Coordinates of microphone positions	54
Table E.2 -- Uncertainties	57