DRAFT FOR DEVELOPMENT

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Mobile demolition machinery — Safety requirements

ICS 53.100; 91.220

BSI
British Standards

National foreword

This Draft for Development is the official English language version of CEN/TS 13778:2004.

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because not all the safety requirements could be verified at the time of drafting. It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the European organization responsible for its conversion to a European standard. A review of this publication will be initiated 2 years after its publication by the European organization so that a decision can be taken on its status at the end of its 3-year life. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into a European Standard, to extend the life of the Technical Specification or to withdraw it. Comments should be sent in writing to the Secretary of BSI Committee B/513, Construction equipment and plant, and site safety, at 389 Chiswick High Road, London W4 4AL, giving the document reference and clause number and proposing, where possible, an appropriate revision of the text.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

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TECHNICAL SPECIFICATION

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English version

Mobile demolition machinery - Safety requirements

Engins mobiles de démolition - Exigences de sécurité

Mobile Abbruchmaschinen - Sicherheitsanforderungen

This Technical Specification (CEN/TS) was approved by CEN on 18 June 2004 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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Contents

Page

Foreword

This document (CEN/TS 13778:2004) has been prepared by Technical Committee CEN/TC 151 “Construction equipment and building material machines — Safety”, the secretariat of which is held by DIN.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this CEN Technical Specification: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This document is equivalent to a Type C-standard as stated in EN 1070.

The machinery concerned and the extent to which hazards are covered are indicated in the scope of this document.

Those hazards that are relevant for all mechanical, electrical, hydraulic, pneumatic and other equipment of machinery and that are dealt with in standards for common use are not covered by this document. Reference to pertinent standards of this kind is made where such standards are applicable and so far as is necessary.

1 Scope

This document specifies the safety requirements for mobile demolition machinery that is designed for demolishing by pushing or pulling, or fragmenting by crushing or shearing, buildings and/or other civil engineering structures and their component parts and/or separating the resultant debris.

NOTE 1 Demolition machines can also be used for separating and sorting the resultant debris, but this is not their primary purpose.

NOTE 2 Where demolition machines are used on public roads, the national traffic regulations apply.

Mobile demolition machinery can be an earth-moving machine (see EN 474-1:1994, -3:1996, -4:1996, –5:1996 and prEN 474-12:1998) equipped with special equipment and attachments for demolition work, for example, ball, breaker, crusher, hydraulic or free-fall hammers, jaws. Mobile demolition machinery may be controlled either by a ride-on operator or by a remote control system (see Figure 1).

Machines for specific applications, for example, road surface breaking machines and remotely controlled demolition machines are also included in this document.

This document deals with all significant hazards pertinent to mobile demolition machinery (see Clause 4), when they are used as intended and under the conditions foreseen by the manufacturer. This document specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards.

The base machine can have the same safety requirements as other types of mobile construction machinery and these will therefore comply with the requirements of the European and International standards written for other machines (see normative references).

This document includes those requirements which are necessary for mobile machinery only when they are designed to be used in the demolition process.

This document applies primarily to the machines which are manufactured after the date of approval of the standard by CEN.

NOTE 3 Directive 94/9/EC concerning equipment and protective systems intended for use in potentially explosive atmospheres can be applicable to the type of machine or equipment covered by this document. The present standard is not intended to provide means of complying with the essential health and safety requirements of Directive 94/9/EC.

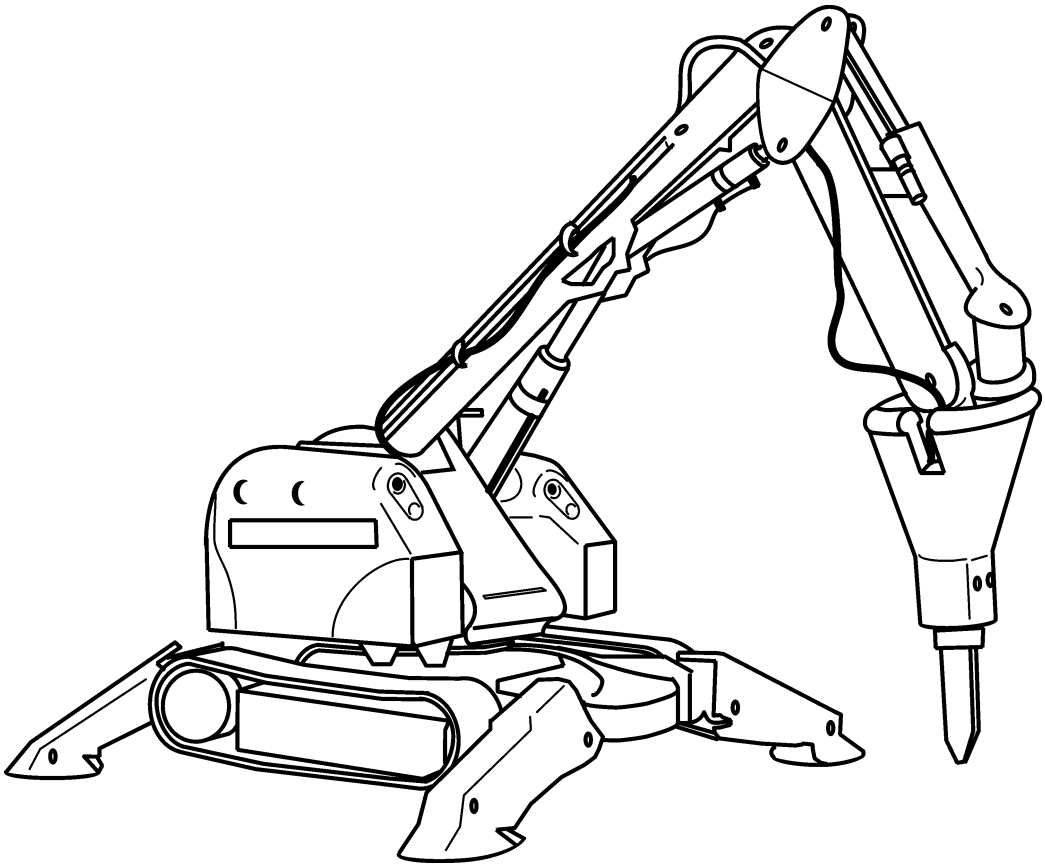


Figure 1 — Demolition machine operated by remote control system

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 474-1:1994, *Earth-moving machinery — Safety — Part 1: General requirements.*

EN 474-3:1996*, Earth-moving machinery — Safety — Part 3: Requirements for loaders.*

EN 474-4:1996, *Earth-moving machinery — Safety — Part 4: Requirements for backhoe l*oaders.

EN 474-5:1996, *Earth-moving machinery — Safety — Part 5: Requirements for hydraulic excavators.*

prEN 474-12:1998, *Earth-moving machinery — Safety — Part 12: Requirements for cable excavators.*

EN 500-1, *Mobile road construction machinery — Safety — Part 1: Common requirements.*

EN 982, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics.*

EN 983, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics.*

EN 1070:1998, *Safety of machinery — Terminology.*

EN 13309:2001, *Construction equipment — Electromagnetic compatibility of machines with internal electrical power supply.*

EN 13627, *Earth-moving machinery - Falling-object protective structures - Laboratory tests and performance requirements (ISO 3449:1992 modified)*

EN 60204-1:1992, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements.*

EN 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, auditory and tactile signals.*

EN 61310-2, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking.*

EN ISO 3744:1995, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994).*

EN ISO 6165:2002, *Earth-moving machinery - Basic types - Vocabulary (ISO 6165:2001)*

EN ISO 9614-2, *Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning (ISO 9614-2:1996)*

EN ISO 11203, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level (ISO 11203:1995).*

EN ISO 12100-1*, Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2*, Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles (ISO 12100-2:2003)*

ISO 4309:1990, *Cranes — Wire ropes — Code of practice for examination and discard.*

ISO 6395:1988 *Acoustics -- Measurement of exterior noise emitted by earth-moving machinery -- Dynamic test conditions*

ISO 6396:1992, *Acoustics -- Measurement at the operator's position of noise emitted by earth-moving machinery -- Dynamic test conditions*

ISO 6750, *Earth-moving machinery — Operation and maintenance — Format and content of manuals.*

ISO 9244:1995, *Earth-moving machinery — General principles*

ISO 10262, *Earth-moving machinery — Hydraulic excavators — Laboratory tests and performance requirements for operator protective guards.*

ISO 12508, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges.*

3 Terms and definitions

For the purposes of this document the terms and definitions given in EN 1070:1998 and the following apply.

Definitions used in EN and ISO standards referred to in this document are also valid for this document.

3.1
mobile demolition machine
machine, including equipment and attachment (working tool) (see EN ISO 6165:1999), which is purpose built to demolish, cut, loosen, separate, pick up, transport and distribute component parts of buildings, civil engineering structures, road works or other areas such as quarries

3.2
base machine
machine without equipment or attachment, that includes the mountings necessary to secure equipment, as required, e. g. operator protective structures for demolition

3.3
equipment
boom, arm and associated linkage which provides articulation and which is attached to the base machine and provides at its outer end a mounting either for direct fixing of an attachment or for fixing an attachment via an attachment bracket

3.4
attachment (working tool)
removable device mounted either directly to the equipment or on an attachment bracket to fulfil the primary function of the machine or for a specific use

3.5
breaker
attachment with tooth, teeth and/or cutting edges, used for breaking concrete or cutting steel

3.6
hydraulic hammer
attachment with a hydraulically operated working tool (e. g. chisel) used to demolish structures. The working tool is impacted by a piston to penetrate the material

3.7
road surface breaker
mobile demolition machine designed and built for the breaking of roads or similar surfaces

3.8
danger zone
zone within and/or around demolition machinery in which a person risks being injured by movement of the base machine, its equipment or attachments, and flying and/or falling debris

3.9
working zone
space around a machine in which the machine, its equipment and attachment are moved in order to carry out work

3.10
exposed person
person wholly or partially in the danger zone

4 List of significant hazards

This Clause contains all significant hazards and hazardous situations, as far as they are dealt with in this document, identified by risk assessment significant for this type of machinery and which require action to eliminate or reduce risk.

Table 1 — List of significant hazards *(continued)*

No.	Hazards	EN ISO 12100		This document
		Part 1:2003	Part 2:2003	
Hazards, hazardous situations and hazardous events				
1	**Mechanical hazards** due to:			
	- machine parts or workpieces, e.g.:	4.2	4.2.1, 4.2.2, 5.1	
	a) shape; b) relative location; c) mass and stability (potential energy of elements which may move under the effect of gravity); d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion); e) inadequacy of mechanical strength;	4.2	4.10, 5.5.4	5.19.2 5.6.1 5.6.2 5.17.2
	- accumulation of energy inside the machinery e. g.: f) elastic elements (springs) g) liquids and gases under pressure; h) the effect of vacuum	4.2	4.10, 5.5.4	5.3
1.1	Crushing hazard	4.2.1		
1.2	Shearing hazard			5.11
1.3	Cutting or severing hazard			
1.4	Entanglement hazard			
1.5	Drawing-in or trapping hazard			5.11
1.6	Impact hazard			
1.7	Stabbing or puncture hazard			
1.8	Friction or abrasion hazard			
1.9	High pressure fluid injection or ejection hazard	4.2.1	4.10	5.3
2	**Electrical hazards** due to :			
2.1	Contact of persons with live parts (direct contact)	4.3	4.9, 5.5.4	5.12.1
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	4.3	4.9	

Table 1 — *(continued)*

No.	Hazards	EN ISO 12100		This document
		Part 1:2003	Part 2:2003	
2.3	Approach to live parts under high voltage	4.3	4.9, 5.5.4	
2.4	Electrostatic phenomena	4.3	4.9	
2.5	Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short circuits, overloads, etc.	4.3	4.9	
3	**Thermal hazards**, resulting in:			
3.1	Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	4.4		5.3.2
3.2	Damage to health by hot or cold working environment	4.4		
4	**Hazards generated by noise,** resulting in:	4.5	4.2.2, 5.1	
4.1	Hearing loss (deafness), other physiological disorders (e. g. loss of balance, loss of awareness)			5.8 Annex B
4.2	Interference with speech communication, acoustic signals, etc.			
5	**Hazards generated by vibration**	4.6	4.2.2	
5.1	Use of hand-held machines resulting in a variety of neurological and vascular disorders			
5.2	Whole body vibration, particularly when combined with poor postures			
6	**Hazards generated by radiation**			
6.1	Low frequency, radio frequency radiation, micro waves	4.7		
6.2	Infrared, visible and ultraviolet light			
6.3	X and gamma rays			
6.4	Alpha, beta rays, electron or ion beams, neutrons	4.7	4.12.1, 4.11.11	
6.5	Lasers	4.7		
7	**Hazards generated by materials and substances** (and their constituent elements) processed or used by the machinery			
7.1	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	4.8	4.3c, 4.4	5.3.2, 5.4
7.2	Fire or explosion hazard	4.8	4.4	
7.3	Biological or microbiological (viral or bacterial) hazards			
8	**Hazards generated by neglecting ergonomic principles in machinery design** as, e. g. hazards from:			
8.1	Unhealthy postures or excessive effort	4.9	4.8.2, 4.7, 5.5.5, 5.5.6, 4.11.12	5.2
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	4.9	4.8.3	5.2
8.3	Neglected use of personal protection equipment		4.8.7	5.8
8.4	Inadequate local lighting		4.8.6	
8.5	Mental overload and underload, stress	4.9	4.8.5	

Table 1 — *(continued)*

No.	Hazards	EN ISO 12100		This document
		Part 1:2003	Part 2:2003	
8.6	Human error, human behaviour	4.9	4.8, 4.11.8, 4.11.10, 6, 5.5.2	
8.7	Inadequate design, location or identification of manual controls		4.7.8, 4.11.8	
8.8	Inadequate design or location of visual display units			
9	**Combination of hazards**	4.11		
10	**Unexpected start-up, unexpected over-run/over-speed** (or any similar malfunction) from:			
10.1	Failure/disorder of the control system		4.11.1, 5.5.4	5.3.2
10.2	Restoration of energy supply after an interruption		4.11.4	
10.3	External influences on electrical equipment		4.11.11	5.12.2
10.4	Other external influences (gravity, wind, etc.)		4.12.1	
10.5	Errors in the software		4.11.7	
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	4.9	4.8, 4.11.8, 4.11.10, 6, 5.5.2	
11	**Impossibility of stopping the machine in the best possible conditions**		4.11.1, 4.11.3, 5.5.2	5.6.2
12	**Variations in the rotational speedf tools**		4.11.1, 5.5.4	
13	**Failure of the power supply**		4.11.1, 4.11.4	5.3.2
14	**Failure of the control circuit**		4.11.1, 5.5.4	
15	**Errors of fitting**	4.9	6.5, 4.7	5.15
16	**Break-up during operation**	4.2.2	4.3	
17	**Falling or ejected objects or fluids**	4.2.2	4.3, 5.2.1	5.3.2
18	**Loss of stability/overturning of machinery**	4.2.2	4.6	5.7, 5.15
19	**Slip, trip and fall of persons** (related to machinery)	4.10	5.5.6	
Additional hazards, hazardous situations and hazardous events due to mobility				
20	**Relating to the travelling function**			
20.1	Movement when starting the engine			
20.2	Movement without a driver at the driving position			5.6.3
20.3	Movement without all parts in a safe position			
20.4	Excessive speed of pedestrian controlled machinery			
20.5	Excessive oscillations when moving			
20.6	Insufficient ability of machinery to be slowed down, stopped and immobilised			5.6.2
21	**Linked to the work position** (including driving station) on the machine			
21.1	Fall of persons during access to (or at/from) the work position			
21.2	Exhaust gases/lack of oxygen at the work position			5.2
21.3	Fire (flammability of the cab, lack of extinguishing means)			5.2

Table 1 — *(continued)*

No.	Hazards	EN ISO 12100		This document
		Part 1:2003	Part 2:2003	
21.4	Mechanical hazards at the work position: a) contact with the wheels b) rollover c) fall of objects, penetration by objects d) break-up of parts rotating at high speed e) contact of persons with machine parts or tools (pedestrian controlled machines)			5.9.2, 5.9.3 5.9.4, 5.9.5
21.5	Insufficient visibility from the work positions			5.13
21.6	Inadequate lighting			5.5
21.7	Inadequate seating			
21.8	Noise at the work position			5.8
21.9	Vibration at the work position			
21.10	Insufficient means for evacuation/ emergency exit			
22	**Due to the control system**			
22.1	Inadequate location of manual controls			5.6
22.2	Inadequate design of manual controls and their mode of operation			
23	**From handling the machine** (lack of stability)			5.7
24	**Due to the power source and to the transmission of power**			
24.1	Hazards from the engine and the batteries			
24.2	Hazards from transmission of power between machines			
24.3	Hazards from coupling and towing			5.14, 5.15
25	**From/to third persons**			
25.1	Unauthorised start-up/use			
25.2	Drift of a part away from its stopping position			5.6.3
25.3	Lack or inadequacy of visual or acoustic warning means			5.18
26	**Insufficient instructions for the driver/operator**			
Additional hazards, hazardous situations and hazardous events due to lifting				
27	**Mechanical hazards and hazardous events**			
27.1	from load falls, collisions, machine tipping caused by:			
27.1.1	lack of stability			5.7
27.1.2	uncontrolled loading – overloading – overturning moments exceeded			5.7
27.1.3	uncontrolled amplitude of movements			5.6.3
27.1.4	unexpected/unintended movement of loads			
27.1.5	inadequate holding devices/accessories			
27.1.6	collision of more than one machine			
27.2	from access of persons to load support			
27.3	from derailment			
27.4	from insufficient mechanical strength of parts			5.17.2

Table 1 — *(concluded)*

No.	Hazards	EN ISO 12100		This document
		Part 1:2003	Part 2:2003	
27.5	from inadequate design of pulleys, drums			5.16
27.6	from inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine			5.16
27.7	from lowering of the load under the control of friction brake			
27.8	from abnormal conditions of assembly/esting/use/maintenance			
27.9	from the effect of load on persons (impact by load or counterweight)			
28	**Electrical hazard**			
28.1	from lightning			
29	**Hazards generated by neglecting ergonomic principles**			
29.1	insufficient visibility from the driving position			5.13
Additional hazards, hazardous situations and hazardous events due to underground work				
30	**Mechanical hazards and hazardous events** due to:			
30.1	Lack of stability of powered roof supports			
30.2	Failing accelerator or brake control of machinery running on rails			
30.3	Failing or lack of deadman's control of machinery running on rails			
31	**Restricted movement of persons**			
32	**Fire and explosion**			
33	**Emission of dust, gases etc.**			5.4
Additional hazards, hazardous situations and hazardous events due to the lifting or moving of persons				
34	**Mechanical hazards and hazardous events** due to:			
34.1	Inadequate mechanical strength - inadequate working coefficients			
34.2	Failing of loading control			
34.3	Failing of controls in person carrier (function, priority)			
34.4	Overspeed of person carrier			
35	**Falling of person from person carrier**			
36	**Falling or overturning of person carrier**			
37	**Human error, human behaviour**			

5 Safety requirements and/or measures

5.1 General

For demolition machines with a ride-on operator, the safety requirements of the base machine are addressed in EN 474-1 and -3, -4, -5 or prEN 474-12, or EN 500-1.

The equipment and attachments of demolition machines shall comply with the safety requirements and/or measures of this Clause and in addition with EN ISO 12100-1 and

EN ISO 12100-2 for hazards which are relevant but not significant and which are not dealt with in this document.

5.2 Operator's station

All demolition machines with a ride-on operator shall be fitted with a cab in accordance with 4.2 of EN 474-1:1994, with the requirement for additional protection being determined by the intended use of the machine.

5.3 Pipes and hoses

5.3.1 General

Pipes and hoses shall be in accordance with 4.14 of EN 474-1:1994.

Pipes and hoses for which the risk of damaging during demolition work exists, shall be protected or guarded.

5.3.2 Hydraulic systems

The hydraulic systems shall comply with the safety requirements of 4.10 of EN ISO 12100-2 and EN 982.

Pipes and hoses which have to be disconnected in operation shall be fitted with self-sealing couplings with built-in check valves or shut-off valves. Couplings shall be marked to ensure correct reconnection.

Hydraulic cylinders used for object handling application shall be fitted with load-sustaining devices in accordance with 4.10.2.2.3 of EN 474-4:1996 or 4.1.7.5 of EN 474-5:1996.

5.3.3 Pneumatic installations

Pneumatic installations shall comply with EN 983.

5.4 Dust

For demolition machines with a ride-on operator, if the risk of a dusty environment exists, provision for the installation of a filter system for the operator station shall be made. Specific consideration may need to be given to the presence of toxic dusts, for example, asbestos.

5.5 Illumination of danger zone, working area and for travelling on site

Mobile demolition machinery with a ride-on operator shall be fitted with lights to provide sufficient illumination of the working areas.

5.6 Controls and indicators

5.6.1 General

Controls and indicators shall be in accordance with 4.4 of EN 474-1:1994, or EN 500-1.

5.6.2 Uncontrolled movement

There shall be no uncontrolled movement of either the base machine or the equipment and/or attachment.

5.6.3 Remote control

The fitting and operation of control systems for the remote control of demolition machinery shall be in accordance with 4.2.1 of EN 474-5:1996.

5.6.4 Indicators and control panel

Indicators and control panels shall be in accordance with 4.4.3 of EN 474-1:1994.

5.7 Stability

For mobile demolition machinery with a ride-on operator, the machine, including its equipment and attachments shall be designed and constructed so that it remains stable under the intended operating conditions as specified in 4.9 of EN 474-3:1996, 4.1.7 of EN 474-3:1996 and 4.10 of EN 474-4:1996).

Device(s) intended to increase the stability of mobile demolition machinery in working mode (for example, outriggers, oscillating axle locking) shall be fitted with locking devices which keep them in position.

NOTE Special stability requirements are not needed for road surface breakers due to their design and method of use.

5.8 Noise

5.8.1 General

NOTE EN ISO 11688-2 gives useful information on noise generation mechanisms in machinery.

5.8.2 Sound power level - exterior

5.8.2.1 Base machine The sound power level of the base machine shall be measured in accordance with ISO 6395:1988 and Amd 1:1996, and shall be stated in the operator's manual.

5.8.2.2 Equipment/attachment

When it is provided, the sound power level of a hydraulic hammer shall be measured according to Annex B.

5.8.3 Sound pressure level at the operator's station

For machines with ride-on operators, the sound pressure level at the operator's station shall be in accordance with ISO 6396.

5.9 Protective structures

5.9.1 General

Depending on the type of base machine, mobile demolition machines with ride-on operators shall be fitted with one or more of the protective structures given in 5.9.2 to 5.9.6, except for road surface breakers (see 3.7).

5.9.2 Roll-over protective structure (ROPS)

Loaders used as a base machine shall meet the requirements of 4.2.3 of EN 474-1:1994.

Where ROPS is not fitted to a mobile demolition machine, falling object protection should meet the requirements of ISO 10262.

5.9.3 Tipover protective structure (TOPS)

Compact excavators used as base machines shall be fitted with a TOPS as specified in 4.1.3.3 of EN 474-5:1996.

5.9.4 Falling-object protective structure (FOPS)

Mobile demolition machines shall be fitted with a falling object protective structure complying with EN 13627.

5.9.5 Front protective structure

Mobile demolition machines shall be fitted with a front guard protective structure. The performance and test procedure shall be in accordance with ISO 10262.

5.9.6 Door and window protection

Where a cab is fitted with door(s) and/or windows, wire-mesh screens shall be fitted, intended to prevent the glazed areas being broken by falling or flying debris.

5.10 Sharp edges and acute angles

All the accessible parts which have to be manually handled shall comply with ISO 12508.

5.11 Protection devices

All moving parts transmitting power within a mobile demolition machine shall be in accordance with 4.11 of EN 474-1:1994.

5.12 Electrical components

5.12.1 Base machine

The base machine shall meet the requirements specified in 4.13 of EN 474-1:1994.

5.12.2 Attachments

Electrical components and conductors shall be installed in accordance with Clauses 4, 5, 6, 14, 15 and 16 of EN 60204-1:1992.

5.12.3 Electromagnetic compatibility

The electromagnetic compatibility of mobile demolition machinery shall comply with EN 13309.

5.13 Visibility

For mobile demolition machines with ride-on operators, the operator’s field of view shall be in accordance with 4.7.1 of EN 474-1:1994.

5.14 Retrieval and transportation

Mobile demolition machines shall be fitted with retrieval, transportation, lifting and towing points in accordance with 4.12 EN 474-1:1994.

5.15 Attachments and demountable fittings

All attachments intended to be used as tools on the mobile demolition machine shall be designed to ensure safe assembly and disassembly.

Attachments shall be designed to ensure they are adequate for the intended use.

The technique for mounting and demounting the attachment shall ensure that when demounted it stands in a safe and stable condition.

The parts of the mobile machine and the attachment which are involved in mounting and dismounting the attachment shall be dimensioned adequately to allow for all the anticipated loadings during all phases of the operation.

The attachment shall be designed to be securely lockable in its working position. The means for locking shall be positive in operation and any removable locking devices, for example, a pin, shall be secured captive to the machine or attachment as appropriate. This requirement does not preclude the use of automatic devices on self-loading attachments.

5.16 Wire ropes

Cable-operated demolition machines using a ball for demolition work shall meet the requirements for wire ropes and its devices as specified in Clauses 4.2.6 to 4.2.9 of prEN 474-12:1998.

5.17 Object handling

5.17.1 General

If mobile demolition machines are used for object handling application they shall meet the requirements of 4.10.2.2 of EN 474-4:1996, 4.1.7.3 to 4.1.7.5 of EN 474-5:1996 or 4.2.10 and 4.3 of prEN 474-12:1998, and a table of capacity provided in accordance with 4.9.1.3 of EN 474-3 or 4.3.1 of prEN 474-12:1998.

5.17.2 Load hooking system

For object handling operations, or demolition by the use of a demolition ball, a load hooking system shall be provided which can either be fixed or removed. The system may be located on an attachment, or an arm, or any other part of the machine and shall:

— be so located or designed that the risk of being damaged during the demolition operation is minimised;

— be designed such that unintended unhooking or uncontrolled movement is minimised;

— have the capacity of at least the maximum rated lift capacity of the machine;

— be able to withstand a test load of twice the maximum rated lift capacity of the machine. This test load shall be applied in the most unfavourable position of the load hooking system. No permanent deformation of the hooking system is acceptable.

5.18 Warning and signalling devices

Warning devices and signals shall be clear and easily perceived (see EN 61310-1 and EN 61310-2). The operator shall have facilities to check the operation of all essential warning devices at all times.

There shall be a manually operated, audible alert signal to warn persons in the working zone of impending danger.

Where risks remain despite all measures adopted, and in the case of potential risks which are not evident, warning signs shall be provided. Such signs shall preferably use readily understandable pictograms (see Annex C) or be drawn up in the language of the country in which the machine is intended to be put on the market.

5.19 Maintenance

5.19.1 General

The base machine shall be maintained in accordance with 4.17 of EN 474-1:1994. Equipment and attachments and their components which need to be regularly maintained shall be designed and located so as to be easily accessible.

If this maintenance cannot be done from the ground, access and locations necessary for these operations shall be arranged in order to avoid the risk of falling.

5.19.2 Lift-arm support devices

Where maintenance can only be performed with the equipment with or without attachment(s) in a raised position, means shall be provided whereby the equipment may be mechanically secured in position (see 4.5 of EN 474-3:1996 and 4.5 of EN 474-4:1996).

5.19.3 Illumination for maintenance

Illumination should be provided for the dark areas or those generally concealed when exposed for maintenance, adjustment, testing or repair. This can be done by means of either a permanent installation on the machine or consist of an electrical installation to enable a portable handlamp to be used.

6 Verification of safety requirements and/or measures

It is necessary to verify that the requirements of this document have been incorporated in the design and manufacture of the demolition machine. This verification shall be achieved by one, or by a combination, of the following as appropriate (see Table 2):

a) measurement;

b) visual examination;

c) test, when a method is prescribed in the standard referred to in any particular requirement;

d) documentary evidence, by assessment of the contents of the documentation required to be kept by the manufacturer that all parts have been manufactured in accordance with this document.

Mechanical systems shall be tested at their rated capacities.

Hydraulic systems and their associated controls shall be tested at their rated flows and pressures.

Verification shall be carried out before delivery by the manufacturer.

Table 2 — Methods of verification

Clause	Measurement	Visual examination	Test	Documentary evidence	Manufacturers technical file
5.2		✓			✓
5.3.1		✓			
5.3.2		✓			✓
5.3.3		✓			✓
5.4		✓			
5.6.2		✓			✓
5.6.3		✓			
5.6.3		✓			
5.6.4		✓			
5.6.5		✓			
5.7		✓			✓
5.8.2	✓				✓
5.8.3	✓				
5.8.4	✓				
5.8.5					✓
5.9.1		✓			
5.9.2					✓
5.9.3					✓
5.9.4					✓
5.9.5					✓
5.9.6		✓			
5.10		✓			
5.11		✓			
5.12.1		✓			
5.12.2	✓	✓			
5.13		✓			
5.14		✓			
5.15		✓			✓
5.16		✓			✓
5.17.1		✓			✓
5.17.2		✓			✓
5.18		✓		✓	✓
5.19.1		✓			✓
5.19.2		✓			
5.19.3		✓			
7.1		✓			
7.2		✓			
7.3		✓			
7.3.1		✓			
7.3.2.1		✓			
7.3.2.2		✓			
7.3.2.3		✓			
7.3.2.4		✓			
7.3.3		✓			
7.3.4		✓			
7.4.1		✓			
7.4.2		✓			

7 Information for use

7.1 General

Written instructions shall be drawn up in accordance with 6.5 of EN ISO 12100-2:2003.

7.2 Warning signs

When the movement of a machine or its tools/attachments creates hazards not obvious to un-authorized personnel, warning signs relating to the working zone shall be affixed to the machine to warn against approaching the machine whilst it is working.

Warning signs shall be in accordance with Annex C.

Any information regarding warnings additional to the signs shall be included in the operator's manual.

7.3 Accompanying documents

7.3.1 General

The following instruction manuals shall be provided with every attachment or equipment covered by this document.

— operators instructions;

— maintenance instructions;

— spare parts list.

The instructions are part of the product and are important documents for the safe and proper operation, maintenance and service of the machine. The text shall be simple, adequate and complete. The wording shall be adapted to the people who will use the product. The information shall be comprehensive and complete.

All information concerning personal safety shall be printed in a type-face conspicuously deviating from the rest of the text.

NOTE For guidance on the format and content of manuals refer to ISO 6750.

7.3.2 Operators manual

7.3.2.1 General

A handbook, giving the instructions for operating the equipment and/or attachment and written in at least one of the official languages of the country in which the machine is to be used shall be supplied with each machine.

The format and content shall comply with ISO 6750 and 6.5 of EN ISO 12100-2:2003.

The following items, which are of particular importance, shall be at least included:

— type designation of the equipment and/or attachment together with information on type, model and serial number;

— name and full address of manufacture or distributor or authorised agent;

— information listed on the equipment and/or attachment data plate;

— specification of the intended use of the equipment and/or attachment;

— description of the operator's controls and an explanation of their safe use;

— explanation of the symbols used;

— all necessary drawings, diagrams and illustrations of sufficient size to clearly show the designation of major components, their functions, locations and relationships with the complete machine;

— explanation of the pictograms and symbols used on the equipment and/or attachment and in the documentation;

— schedule of the types of material which may be demolished;

— declared noise emission value of the hydraulic hammer (if provided) in accordance with EN ISO 4871 and determined according to Annex B of this document as follows:

— A-weighted sound power level emitted by the machine, where the equivalent continuous A-weighted emission sound pressure level at the operator`s position(s) exceeds 85 dB;

— equivalent continuous A-weighted emission sound pressure level at the operator`s position(s), where this exceeds 70 dB; where this level does not exceed 70 dB, this fact shall be indicated

— information regarding fuel, lubricants, coolants and any other fluids used;

— documentation confirming conformity with existing regulations;

— warning to the effect that no modification be carried out to the equipment and/or attachment without the approval of the manufacturer.

— list of ways - which as shown by experience are applied - in which the equipment and/or attachment shall not be used and any other foreseeable misuse.

7.3.2.2 Instructions for transport, handling and storage of the equipment and/or attachment and its demountable parts

The instructions for transport, handling and storage of the equipment and/or attachment and their demountable parts shall contain at least the following items and be included in the operators manual:

— the nominal mass of the equipment and/or attachment;

— the maximum operating mass of the equipment and/or attachment;

— instructions and information on modular assembly and disassembly of the equipment and/or attachment;

— position of any lifting points and slinging instructions.

7.3.2.3 Instructions for the installation and use of the equipment and/or attachment

The instructions for the installation and use of the equipment and/or attachment shall be included in the operator's manual and contain at least the following items:

— instructions for setting up the equipment and/or attachment safely;

— where applicable, the power supply;

— the selection of the equipment and/or attachment, together with their conditions of use according to the type of work they have to perform;

— precautions to be taken when mounting the equipment or attachment;

— advice regarding the need to use personal protection equipment, for example, ear protection;

— information on the correct mounting of guards;

— information regarding the working zone of the equipment and/or attachment;

— information for operating machines in confined spaces;

— information about wire ropes in accordance with Annex A;

— limits of ambient temperature for which the machine is intended.

7.3.2.4 Special safety instructions in the operators manual

In order to achieve a satisfactory safety level the following safety instructions shall be given in a separate section in the operators manual:

— instructions shall be given on how the emergency stops, when fitted in accordance with 5.6.2 are installed and how they function;

— the need to check emergency stops, when fitted, for their correct function before the start of each shift;

— it shall be made clear to the operator where the major risks are and what measures he shall take to make the operation safe;

— illustrations showing the danger zone of the demolition machine;

— the instructions shall specify that the operators be given practical training in the operation of the equipment with special emphasis on the necessary safety precautions;

— instructions for the use of equipment for monitoring the ambient atmospheric conditions when operating in confined areas;

— special warnings against actions which can cause injuries to the operator or other persons including, where the demolition operation generates dust, the need for provision of adequate personal protective equipment to eliminate the hazard for personnel working in the danger zone;

— requirement to wear a hearing protector if the mobile demolition machine or its attachment are so noisy during the operating cycle that manufacturers know by experience that the safety of the operator requires it;

— information as to who shall be allowed in the working zone;

— the need to lower the equipment and/or attachment to the ground at the end of the work.

7.3.3 Maintenance manual

The maintenance manual shall at least contain:

— the same identification as the operators manual;

— a reference list of authorised repair and service agents;

— maintenance work at daily, weekly and other intervals;

— specifications of lubricants, coolants and hydraulic fluids;

— instruction for the safe assembly and disassembly of parts which are heavy or in other ways difficult to handle;

— information as to the installation of safety support devices (see 5.19.2);

— drawings for electric, hydraulic and pneumatic circuits. Illustrations shall be of sufficient size to be clear and show the designation of major components, their actions, functions and relationship to the whole machine;

— instructions for the frequency of checking and for replacement of parts which are classified by the manufacturer to be of particular importance for safety, including blocks, wire ropes and chains (see Annex A). Methods for checking the validity of such parts shall be given;

— special warnings against actions which may cause injuries to maintenance personnel or others.

7.3.4 Spare parts list

The spare parts list shall contain all components relevant for safety, maintenance and repair, with un-ambiguous identification and information on the location of the component in the equipment or attachment.

7.4 Marking

7.4.1 Base machine

The base machine shall be marked in accordance with 6.1 of EN 474-1:1994 or EN 500-1, as appropriate.

7.4.2 Equipment and attachment

The data plate for the equipment and/or attachment shall bear, legibly and indelibly, the following information:

— manufacturer’s name and address;

— mandatory marking (for EU countries, CE marking);

— type designation and serial number;

— year of manufacture;

— installed power requirement and limitation, in kW;

— nominal mass of the equipment and/or attachment.

The following information should also be displayed on the machine:

— symbol “read the operator’s manual”.

Annex A
(normative)

Instructions for the examination and checking of wire ropes, chains and blocks

A.1 Instructions for selecting and fitting wire rope grips

A.1.1 General

The following instructions are applicable to ropes using wire rope grips.

Other designs of grip may be used providing they have been satisfactorily tested by the grip manufacturer, and sustain a minimum of 80 % of the minimum breaking load of the rope. In this case they shall be installed to the grip manufacturer's instructions.

A.1.2 Installation

The distance between the grips, "E", shall be at least 1,5 times, and not more than 3,0 times the width of the bridge, "H", (see Figures A.1 and A.2)

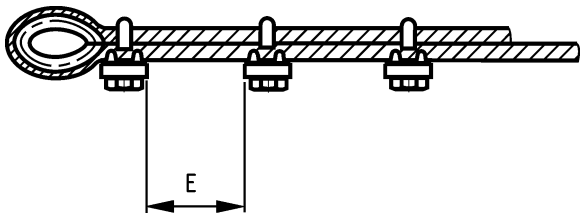


Figure A.1 — Installation and spacing of grips

When using a thimble in the eye, the first wire rope grip shall be placed immediately against the thimble. The bridge should always be placed on the load bearing part of the rope.

A.1.3 Number of grips

The recommended number of grips to be used is given in Table A.1.

A.1.4 Tightening torque

When making the assembly, and before bringing into service, the collar nuts shall be tightened to the torque given in Table A.1.

The recommended tightening torques are for grips with the bearing surfaces and threads of the nuts greased.

After the load has been applied for a few times, the torque shall be checked again and if necessary, corrected.

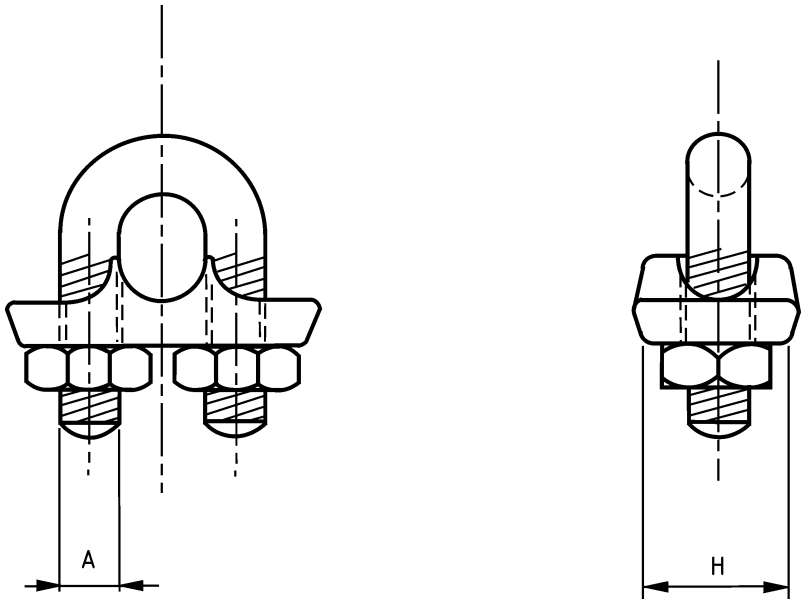


Figure A.2 — Thickness and tightening thread diameter

Table A.1 — Number and torque of wire rope grips

Nominal size of grip to suit wire rope diameter [1)] Mm	Number of grips	Tightening thread diameter "A"	Tightening torque Nm
14	4	M12	33
16	4	M14	49
19	4	M14	68
22	5	M16	107
26	5	M20	147
30	6	M20	212
34	6	M22	296
40	6	M24	363
[1)] For intermediate sizes of wire rope, use the next larger grip size.			

A.2 Instructions for the examination and maintenance of travelling blocks and wire ropes

Wire ropes used in demolition operations become unusable because of wear and wire breakage and shall be discarded according to certain criteria. The code of practice for examination and discard of wire ropes given in ISO 4309 shall be followed.

The winch ropes, including their anchorages, and the other load-carrying components of the travelling block and winch system, for example, sheave bearings, rope sheaves and hooks shall be checked at least once a week.

Wire ropes shall be discarded in accordance with 3.5 of ISO 4309:1990. In Table 1 of ISO 4309:1990, classification groups M1 and M2 shall be used.

On equipment with normal loads of more than 1000 kN, the draw-works or winch rope shall be regularly paid out and shortened according to a plan laid down by the manufacturer on the basis of experience and relevant working conditions.

Before work is carried out, in which the normal load is to be exceeded, the draw-works or winch rope shall be examined. The work may only be carried out if the rope is free from any defect which influences the load-carrying capacity.

Annex B
(normative)

Noise test methods for hydraulic hammers

B.1 Introduction

Hydraulic hammers are hydraulically powered impact stools used as attachments to hydraulic excavators, hydraulic booms or to some other type of carriers allowing positioning and stability of the hammer in the course of work. Hydraulic hammers are widely used for rock breaking and concrete demolition, quarries, tunnel work, crusher feeding, etc..

Because hydraulic hammers are attachments by nature they are connected to a very wide range of other machinery that often have operator cabins of varying acoustical quality. Therefore this noise test code makes no reference to noise emission values at the actual operator's position instead a reference point, referred to as the 'conventional workstation' is selected (see B.6).

The primary noise emission quantity determined for hydraulic hammers is the sound power level. Using a calculation method given in a basic noise test method the emission sound pressure level at the conventional workstation can be estimated based on the determined sound power level.

B.2 Scope

This Annex specifies all the information necessary to carry out efficiently and under standardized conditions the determination, declaration and verification of the noise emission characteristics of hydraulic hammers.

The noise emission characteristics that can be determined using this method include the emission sound pressure level at a specified work position and the sound power level.

The use of this method ensures reproducibility of the determination of noise emission characteristics within specified limits set by the grade of accuracy of the basic noise measurement method used. Noise measurement methods allowed by this noise test code are engineering methods (grade 2 of accuracy).

B.3 Definitions

B.3.1 A-weighted sound power level, L_{WA}

See EN ISO 3744 (with the modifications allowed by this noise test code for hydraulic hammers) or another European Technical Specification method with the same or better grade of accuracy.

NOTE The reference sound power is 1 pW/L_{WA} expressed in decibels.

B.3.2 A-weighted emission sound pressure level, L_{pA}

See EN ISO 11203 sub-method where Q = Q2.

NOTE Sound pressure level is expressed in decibels.

B.3.3 Declared single-number noise emission value, L plus K

The noise emission value of hydraulic hammers is declared using single-number declaration.

NOTE The single-number declaration is defined in EN ISO 4871.

The single-number declaration consists of the sum of the A-weighted sound power level, L_{WA}, together with the associated measurement uncertainty, K.

The single-number declared value indicates the statistical upper limit below which the measured noise emission values of the batch of equipment are projected to lie when new. The declared single-number value is rounded to the nearest higher whole decibel.

B.3.4 Background noise

The noise from all sources other than the source under test. When determining noise emission of a hydraulic hammer the carrier machine is usually the major source of background noise and shall be measured as such using the same engine speed as is used during hammer operation.

B.4 Description of machinery family

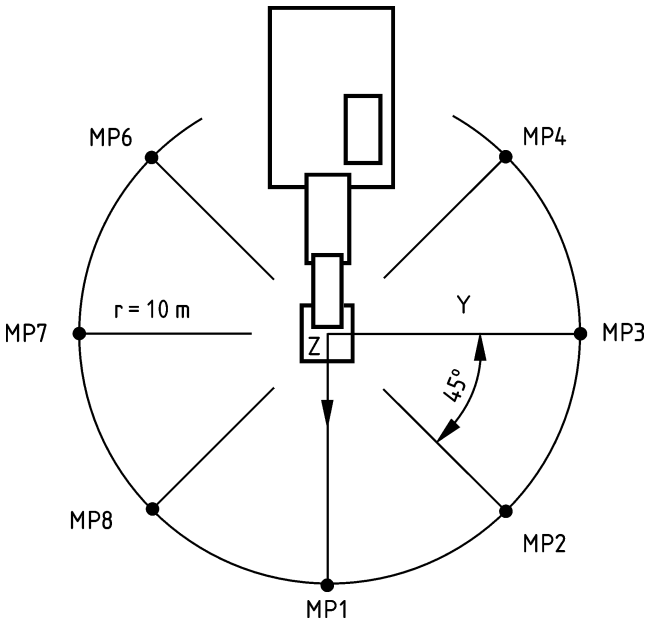
Hydraulic hammers are machines designed to break materials. They use a hydraulic power source to accelerate a piston (the piston acceleration can be gas assisted), which then hits a tool. The stress wave generated by this kinetic action flows through the tool into the material and causes it to break. Hydraulic hammers need a supply of pressurized oil to function. The complete carrier/hammer unit is controlled by an operator, usually seated in the carrier cabin.

B.5 Sound power level determination

B.5.1 Using EN ISO 3744 as a reference standard for the sound power level determination

The A-weighted sound power level shall be preferably determined according to EN ISO 3744 with a hemispherical measuring surface. The radius of the hemisphere is 10 m. The measuring time at each microphone position shall be at least 15 s. The 7 microphone array given in Figure B.1 shall be used.

NOTE Preliminary investigations have shown that this array does not give significantly different results from those obtained using the 10 microphone array of EN ISO 3744.



Microphone position	X	Y	Z
MP1	10 m	0 m	1,5 m
MP2	7 m	7 m	1,5 m
MP3	0 m	10 m	1,5 m
MP4	-7 m	7 m	1,5 m
MP6	-7 m	-7 m	1,5 m
MP7	0 m	10 m	1,5 m
MP8	7 m	-7 m	1,5 m

Figure B.1 — Microphone array to use in determining the sound power level of a hydraulic hammer (7 measuring points)

The test environment shall consist of a hard reflecting plane, preferably made of asphalt or concrete, with no sound-reflecting obstacles within a distance from the sound source equal to three times the distance from the source center to the measurement points.

The measurement environment shall be in accordance with the selected basic standard.

B.5.2 Using other basic European standards as a reference for sound power level determination

Other European Standard methods, for example EN ISO 9614-2, can be used for the determination of sound power levels as long as the accuracy of the method, is engineering grade or better.

B.5.3 Repetition of measurements and calculation of the result

The measurements shall be repeated three times at each measurement point (or more if necessary) and the final result shall be calculated as the arithmetic mean of the two highest values that do not differ by more than 1 dB.

B.5.4 Optional measurements

For example, 1/3- or 1/1-octave band sound power levels may be measured and reported as additional information for engineering purposes according to the selected basic standard (e. g. EN ISO 3744 or EN ISO 9614-2).

B.6 Emission sound pressure level determination

A conventional workstation is specified at 10 m distance from the hydraulic hammer. EN ISO 11203 sub-method with Q2 shall be used to estimate the A-weighted emission sound pressure level. The estimate is based on the determined A-weighted sound power level using the following formulas:

$r = 10$ m

$Q_2 = 10 \log (S/S_0) = 10 \log (2\pi r^2) = 28$ dB

$L_{pA} = L_{WA} - Q_2 = L_{WA} - 28$ dB

NOTE The so-determined emission sound pressure level at 10 m distance is not meant to represent the emission sound pressure level inside the cabin of the basic machine. It is only a quantity that is useful:

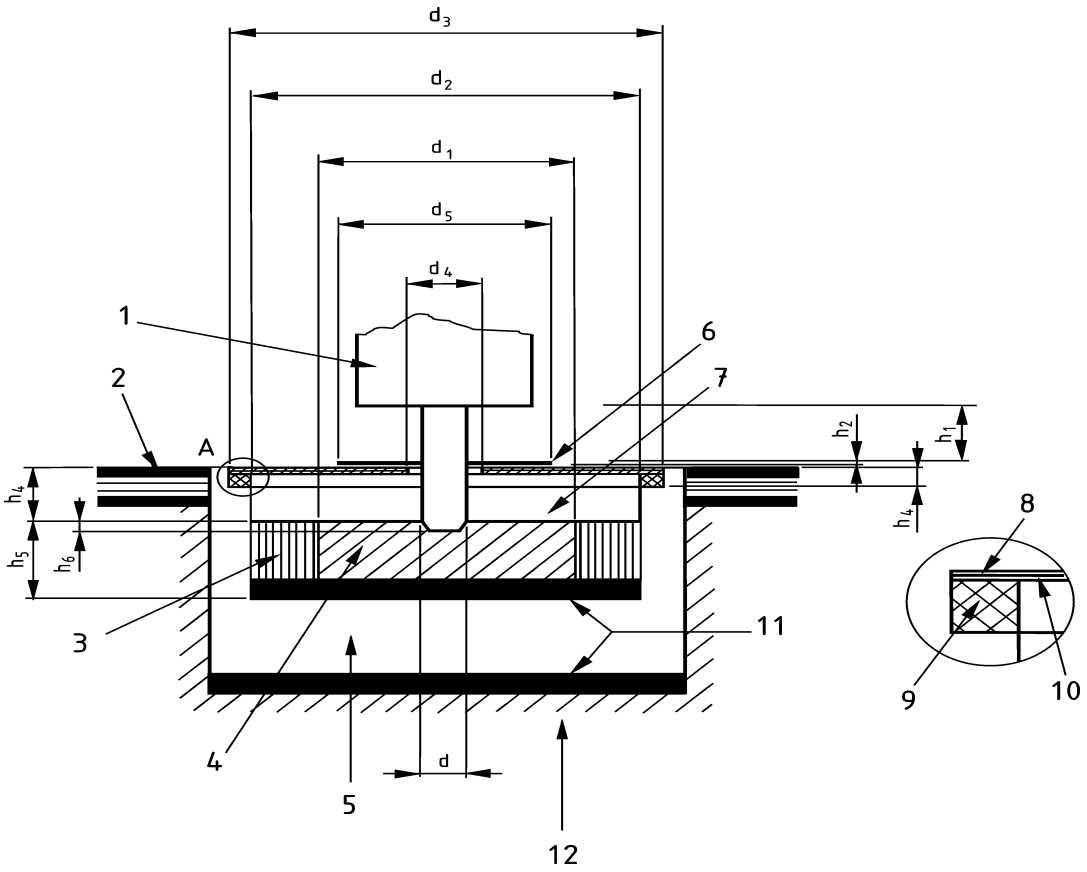
— for the purpose of comparing hydraulic hammers of different makes,

— as a descriptor of noise emission from the hydraulic hammer at a by-stander position located 10 m away from the hydraulic hammer.

B.7 Installation and mounting conditions

B.7.1 Test block structure

Figure B.2 presents the applicable test block structure.



Key

d Tool diameter [mm]
d_1 Anvil diameter, 1200 ± 100 mm
d_2 Inner diameter of the anvil support structure, ≤ 1800 mm
d_3 Diameter of the test block deck, ≤ 2200 mm
d_4 Diameter of the tool opening in the deck, ≤ 350 mm
d_5 Diameter of the tool seal, ≤ 1000 mm
h_1 Visible tool length between the lowest part of the housing and tool seal upper surface [mm]
$h_1 = d \pm d/2$
h_2 Tool seal thickness above the deck, ≤ 20 mm (if the tool seal is located below the deck its' thickness is not limited; it may be made of foam rubber)
h_3 Distance between deck upper surface and anvil upper surface, 250 ± 50 mm
h_4 Isolating foam rubber deck seal thickness, ≤ 30 mm
h_5 Anvil thickness, 350 ± 50 mm
h_6 Tool penetration, ≤ 50 mm
1 hammer
2 test site surface
3 guide/supports (optional)
4 anvil
5 foundation structure (optional)
6 tool seal
7 empty space
8 steel plate s = 10 + 5
9 deck seal
10 rubber plate s = 10 + 10
11 elastic structures (optional)
12 primary ground

Figure B.2 — Test block structure for noise emission measurements

If the quadratic shape of the test block structure is used, the maximum length dimension equals 0,89 x corresponding diameter.

The empty space between the deck and the anvil can be filled with elastic foam rubber or other absorption material, density < 220 kg/m^3.

B.7.2 Carrier

Carrier for the test hammer shall meet the requirements of the test hammer's technical specifications especially in weight range, hydraulic output power, supply oil flow and return line back pressure.

B.7.3 Mounting

Mechanical mounting as well as connections (hoses, pipes etc.) shall correspond to specifications given in hammer's technical data. All significant noise caused by pipes and various mechanical components needed for installation, shall be eliminated. All component connections shall be well tightened.

B.7.4 Hammer stability and static hold force

The hammer shall be firmly held down by the carrier in order to give stability as that existing under normal operating conditions. The hammer shall be operated in an upright position.

B.7.5 Tool

A blunt tool shall be used in the measurements. The length of the tool shall meet the requirements given in B.7.1 (test block).

B.8 Operating conditions

B.8.1 Hydraulic input power and oil flow

Operating conditions of the hydraulic hammer shall be appropriately adjusted, measured, recorded and reported along with the corresponding technical specification values. The hammer under test shall be used in such a way that 90% or more of the maximum hydraulic input power and oil flow of the hammer can be reached.

Care shall be taken that the total uncertainty of the measurement chains of p_s and Q is kept within $\pm$ 5 %.

NOTE This assures the hydraulic input power determination within $\pm$ 10 % accuracy. Assuming linear correlation between hydraulic input power and emitted sound power this would mean variation of less than $\pm$ 0,4 dB in the determination of the sound power level.

B.8.2 Adjustable components having effect on the hammer power

Pre-settings of all accumulators, pressure control valves and other possible adjustable components shall meet the values given in the technical data. If more than one fixed impact rate is optional, measurements shall be made using all settings. The maximum values shall be recorded and the highest value shall be declared (see B.11).

B.8.3 Quantities to be measured

p_s The mean value of the hydraulic supply line pressure during hammer operation including at least 10 blows.

Q The mean value of the breaker inlet oil flow measured simultaneously with p_s.

T The oil temperature shall lie between + 40 C ... + 60 °C during measurements. The temperature of the hydraulic breaker body shall have stabilized to the above mentioned operating temperature before starting the measurements.

p_a The prefill gas pressures of all accumulators shall be measured in static situation (hammer not operating) at stable ambient temperature of + 15 C...+ 25 °C. The measured ambient temperature shall be recorded with the measured accumulator prefill gas pressure.

B.8.4 Parameters to be evaluated from the measured operating parameters

P_{IN} Hydraulic input power of the breaker $P_{IN} = p_s \cdot Q$.

B.8.5 Hydraulic supply line pressure measurement, p_s

— p_s shall be measured as close to the hammer IN-port as possible;

— p_s shall be measured with a pressure gauge (min. diameter: 100 mm; accuracy class: ± 1,0 % FSO).

B.8.6 Hammer inlet oil flow, Q

— Q shall be measured from the supply pressure line as close to the breaker IN-port as possible;

— Q shall be measured with an electric flowmeter (accuracy class: ± 2,5 % of the flow reading).

B.8.7 Measuring point of the oil temperature, T

— T shall be measured from the oil tank of the carrier or the from the hydraulic line connected to hammer. The measuring point shall be recorded and reported;

— Accuracy of the temperature reading shall lie within ± 2 °C of the actual value.

B.9 Measurement uncertainties

Measurements made according to this noise test code have an estimated standard deviation of reproducibility of 1,5 dB or less for A-weighted sound power level as defined in EN ISO 3744 and EN ISO 9614-2 with engineering grade of accuracy.

B.10 Information to be recorded

The basic standard used specifies the information to be recorded. This noise test code sets some additional requirements on measuring and recording of operational data of the hydraulic hammer and the test conditions. Rounding of data values shall occur only after performing the final computational step on the measured values before reporting.

Precise quantitative description of operating conditions as measured in accordance with this noise test code shall be recorded. Location of the tested hammer and carrier in the test environment and relative to one another shall be recorded. If the carrier that is used has multiple significant noise sources, a description shall be given of the sources in operation during the measurements.

B.11 Information to be reported

The test report shall include at least the following information:

a) name and address of the organisation and person who ordered the test;

b) identification number of the test report;

c) name and address of the organisation and person who carried out the test;

d) purpose of the test;

e) test method; references shall be made to both this noise test code and the relevant standards used for determining the sound power level and the emission sound pressure level at a conventional work station;

f) identification of test site;

g) any deviations from the test method with justification;

h) description of the carrier (manufacturer, type, weight, etc.);

i) name and address of the manufacturer or supplier of the tested hammer;

j) description of the tested hammer;

k) manufacturer, type and serial number of the tested hammer;

l) maximum operating pressure, oil flow and striking frequency as defined in the technical data;

m) operating pressure, oil flow and hydraulic input power determined according to this noise test code;

n) net weight of the tested hammer;

o) tool length;

p) date of the test;

q) test results:

The A-weighted sound power level is calculated as the arithmetic mean of the two highest values that do not differ by more than 1 dB. L_{WA} shall be stated in decibels and rounded off to the nearest half dB.

An estimate for the sound pressure level is determined at the distance of 10 m from the hammer. This shall be stated along with the determined sound pressure level value.

If provided as additional information, the measured sound emission values in selected frequency bands can be stated.

r) results due to the effect

s) estimated uncertainty of the test result;

t) date and signature of the person responsible of the test

B.12 Declaration and verification of noise emission values

B.12.1 General

The noise declaration shall explicitly state that the noise emission values have been obtained according this noise test code. If this statement is not true, the noise declaration shall indicate clearly what the deviations are.

NOTE 1 Additional noise emission values may be given in the noise declaration, but only in such a way, that they cannot be confused with the declared values.

NOTE 2 EN ISO 4871:1996 gives a method to determine noise emission values to be declared and to verify the declared values. The methodology is based on the use of the measured values and measured uncertainties. The latter are the uncertainties associated to the measurement procedure (which is determined by the grade of accuracy of the measurement method used) and the production uncertainty (variation of noise emission from one machine to another of the same type made by the same manufacturer).

B.12.2 Values to be declared

The declaration shall be made as a dual-number declaration. The following values shall be declared:

a) A-weighted sound power level L_{WA} in decibels with the respective uncertainty K_{WA};

b) A-weighted emission sound pressure level L_{pA} at a conventional work station in decibels with the respective uncertainty K_{pA}.

The dual-number declaration of noise emission values for a hydraulic hammer shall be made in accordance with the model given in EN ISO 4871. The declared noise emission values shall be rounded to the nearest whole decibel.

NOTE Additional noise emission quantities may also be given in the declaration.

B.12.3 Verification of the declared noise emission values

Due to the mass product nature of hydraulic hammers the verification of declared noise emission values shall be made following the procedure for a batch of machines defined in EN ISO 4871. The verification shall be conducted by using the same mounting, installation and operating conditions as those used for the initial determination of noise emission values.

Annex C
(normative)

Requirements for non-text safety signs for use on demolition machinery

C.1 General

C.1.1 Introduction

Safety signs and hazard pictorials shall follow the general principles in ISO 9244; be of general nature and without text. They shall be permanently affixed to demolition machinery and be shown and described in the operation manual. The location on the machine shall be illustrated in the manual.

The warnings on the signs shall be indelible and shall be legible at the distance necessary to ensure the safety of persons required to be in the vicinity of the hazard.

C.1.2 Safety alert symbol (see Figure C.1)

The safety alert symbol shall be used as outlined in ISO 9244:1995, Figure 7. It shall be primarily used to warn casual spectators who approach the machine whilst it is in operation. The safety alert symbol should also be used with hazard description pictorials (see C.1.3).

C.1.3 Non-text hazard pictorials

Additional hazard pictorials combined with a safety alert symbol shall be used to warn the operator or service personnel when they carry out maintenance or service work on the machine. The safety signs shall be according to Clause 4 of ISO 9244:1995 in two-panel format with either vertical or horizontal configuration (see Figures C.2 to C.5).

C.1.4 Dimensions

Minimum recommended dimensions for two-panel format safety signs shall be according to ISO 9244:1995, Figure 13. Larger or smaller sizes may be used if required.

Safety signs, warning casual spectators approaching the machine whilst working, shall be legible from outside the danger zone.

C.1.5 Colours of safety signs

The colours of pictorial panels, border and panel separation lines shall follow 9.2.2, 9.2.3, 9.2.4 and 9.5 of ISO 9244:1995.

C.1.6 Location

Warning signs and hazard pictorials shall be distinctively located at a clearly visible location as close as possible to the hazardous area of the machine.

Figure C.1 — Safety alert symbol

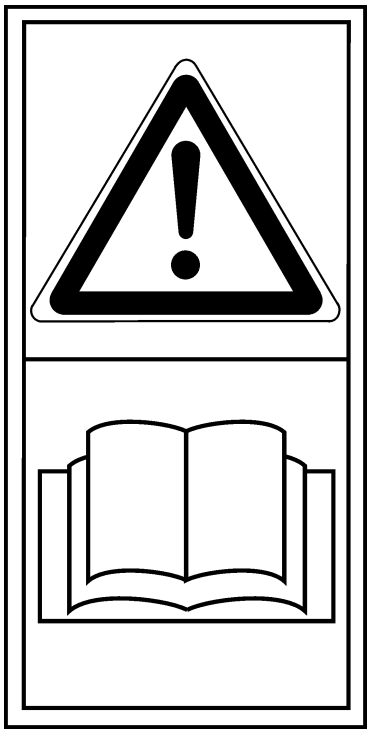


Figure C.2 — Read operation manual

Figure C.3:
Crushing hazard

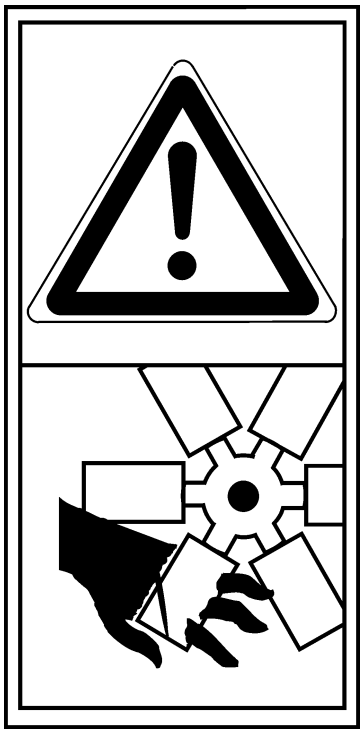


Figure C.4:
Cutting hazard

Figure C.5:
Hot surface

NOTE The safety alert symbol, (see Figure C.1) may be replaced by hazard avoidance pictorials if there is a need to present visual instructions on how the hazard should be avoided.

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