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National foreword

This British Standard is the UK implementation of EN 13977:2011. It supersedes BS EN 13977:2005 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RAE/2, Railway Applications - Track.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Railway applications - Track - Safety requirements for portable machines and trolleys for construction and maintenance

Applications ferroviaires - Voie - Prescriptions de sécurité pour machines portables et lorries pour la construction et la maintenance

Bahnanwendungen - Oberbau - Sicherheitsanforderungen an tragbare Maschinen und Rollwagen für Bau und Instandhaltung

This European Standard was approved by CEN on 24 December 2010.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 13977:2011) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2011, and conflicting national standards shall be withdrawn at the latest by August 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13977:2005+A1:2007.

The main changes compared to the previous version are:

— change of scope;

— change of definition;

— addition of 5.20, Vibration;

— addition of 5.21, Environmental conditions;

— editorial modification of Annex ZA.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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

Introduction

This document is a type C standard as stated in EN ISO 12100-1:2003 and EN ISO 12100-2:2003.

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

When the provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

Technical characteristics, deviations or special national conditions may be the subject of special requirements of the infrastructure manager controller and/or negotiation between the user and the manufacturer, see Annex F.

1 Scope

1.1 General

This European Standard deals with the technical requirements to minimise the railway specific significant hazards of portable machines and trolleys intended for work on tracks as listed in Clause 4 which can arise during the commissioning, operation and maintenance of portable machines and trolleys when used as intended and under the conditions foreseen by the manufacturer. It does not deal with the performance of the machines, e.g. cutting, drilling, grinding.

This European Standard applies to portable machines and trolleys with rail wheels or rollers designed for work whilst on the track with nominal track gauges of 1 435 mm and 1 668 mm and clearance gauge as defined in Annex B[1)] including, e.g. cutting and drilling machines.

This European Standard does not apply to the additional hazards that may exist due to:

— the coupling together of trolleys;

— the towing or pushing of trolleys by other vehicles;

— the use of trolleys for the transportation of persons;

— self propelled rail wheeled machines, trolleys coupled to another towing vehicle;

— hazards due to laser systems.

Other special vehicles used on railway tracks are dealt with in other European Standards, see Annex H.

This European Standard does not apply to the following:

— requirements for quality of the work or performance of the machine;

— regulations defined by each infrastructure controller for portable machine and trolley operation which shall be the subject of negotiation between the user and the manufacturer;

— portable machines used from railway vehicles.

This European Standard establishes the additional requirements for electromagnetic compatibility due to e.g. electronic components as well as for hazards due to vibration.

This European Standard does not establish the additional requirements for the following:

— operation in severe conditions, e.g. extreme environmental conditions such as: high temperatures, corrosive environment, tropical environment, contaminating environments, strong magnetic fields;

— operation subject to special rules such as potentially explosive atmospheres;

— hazards occurring during decommissioning and/or recycling;

— hazards due to wind speed;

— hazards due to natural causes, e.g. earthquake, lightning, flooding, etc.

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1) For portable machines and trolleys used on railway lines with a different clearance gauge to that defined in Annex B, special requirements concerning the clearance gauge are permitted to be applied.

1.2 Validity of this document

This European Standard applies to portable machines and trolleys that are ordered after the date of publication of this standard.

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 614-1, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 614-2, *Safety of machinery — Ergonomic design principles — Part 2: Interactions between the design of machinery and work tasks*

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 1032, *Mechanical vibration — Testing of mobile machinery in order to determine the vibration emission value*

EN 1837, *Safety of machinery — Integral lighting of machines*

EN 13309, *Construction machinery — Electromagnetic compatibility of machines with internal power supply*

EN 13674-1:2003+A1:2007, *Railway applications — Track — Rail — Part 1: Vignole railway rails 46 kg/m and above*

EN 13715, *Railway applications — Wheelsets and bogies — Wheels — Tread profile*

EN 15273-2, *Railway applications — Gauges — Part 2: Rolling stock gauge*

EN 15746-1:2010, *Railway applications — Track — Road-rail machines and associated equipment — Part 1: Technical requirements for running and working*

EN 28662-1, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 1: General (ISO 8662-1:1988)*

EN 50121-3-1:2006, *Railway applications — Electromagnetic compatibility — Part 3-1: Rolling stock — Train and complete vehicle*

EN 50121-3-2:2006, *Railway applications — Electromagnetic compatibility — Part 3-2: Rolling stock — Apparatus*

EN 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN ISO 3744:2009, *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 3746:2009, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:1995, including Cor 1:1995)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 7731, *Ergonomics — Danger signals for public and work areas – Auditory danger signals (ISO 7731:2003)*

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

EN ISO 11202:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections (ISO 11202:2010)*

EN ISO 11204:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections (ISO 11204:2010)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 12001:2009, *Acoustics — Noise emitted by machinery and equipment — Rules for the drafting and presentation of a noise test code (ISO 12001:1996)*

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

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

EN ISO 14121-1:2007, *Safety of machinery — Risk assessment — Part 1: Principles (ISO 14121-1:2007)*

EN ISO 15744:2008, *Hand-held non-electric power tools — Noise measurement code — Engineering method (grade 2) (ISO 15744:2002)*

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs in workplaces and public areas*

ISO 3864-2, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 6405-1, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 6405-2, *Earth-moving machinery — Symbols for operator controls and other displays — Part 2: Specific symbols for machines, equipment and accessories*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

3.1
portable machine
machine designed or adapted to be manually propelled along the track with wheels or rollers which is not designed to operate track signalling systems

3.2
trolley
equipment for transport along the track of materials, tools and/or various equipment moving on wheels or runners and operated by human force only. It is designed so that it can be manually placed on or off the track

3.3
type verification
procedure for verification of the conformity of the type of portable machine or trolley to the requirements of this standard

3.4
declaration of type verification
document issued after tests, which certifies suitability of the technical design for the operation of a portable machine or trolley

3.5
conformity to type
procedure for verification of the conformity of the individual portable machine or trolley to the machine or trolley which underwent type verification

3.6
stability coefficient
ratio of restoring moment to overturning moment

4 List of significant hazard

The risks referred to in this document are listed in Annex A.

5 Safety requirements and/or safety measures

5.1 General

In addition to the other requirements of this standard, portable machines and trolleys shall be designed according to the principles of series EN ISO 12100 for hazards relevant but not significant which are not dealt with by this document, e.g. sharp edges.

For the application of type B standards EN 60204-1, EN 982, EN 983 and EN ISO 7731, the manufacturer shall carry out a risk assessment where choice is necessary. This specific risk assessment is part of the general risk assessment relating to the hazards not covered by the present document.

5.2 Handling devices

5.2.1 Handles used for handling and/or control

Portable machines and trolleys shall be ergonomically designed according to the requirements of EN 614-1 and EN 614-2 so that they are able to be lifted. Where practicable this shall be by manual handling.

Where fitted handles used for handling and/or control shall be sufficient for the weight of the portable machine or trolley and allow removal of the portable machine or trolley from the track.

Handles for lifting are to be positioned to ensure reasonable sharing of the weight. The weight permitted per person shall not exceed 20 kg when the load is shared by more than one person or 25 kg for a single person lift.

Handles for control shall be ergonomically designed and located at a reasonable height for the operating position.

The handles shall either be positioned so that they are inside the limits of the gauge indicated in Annex B with the operator in the work position intended by the manufacturer or the amount of exceedance declared in the instruction handbook.

When lifting handles are also used for control purposes they shall, when used for handling, be in the stop position.

If more than one person is recommended for putting the portable machine or trolley on or off the track the number of people necessary shall be indicated on the portable machine or trolley.

5.2.2 Lifting points and securing points

If the portable machine or trolley is not designed to be lifted manually, then lifting points shall be provided that are suitable for the weight, for maintaining the equilibrium of the machine and for preventing spillage of liquids, e.g. fuel, lubricants.

Securing points or other methods shall be provided so that a portable machine or trolley is able to be safely transported by road vehicles. This shall be described in the instruction handbook, see 7.2.

5.3 Wheels and rollers

The wheels and rollers used for moving and guidance of machines or trolleys on rail(s) shall:

— be arranged and be in sufficient numbers to ensure the stability of the machine on the track, see 5.16;

— be shaped and of the correct width to ensure good guidance on the rails and to take account of gauges between 1 425 mm and 1 470 mm with a 1 435 mm nominal gauge, and gauges 1 665 mm and 1 698 mm with a 1 668 mm nominal gauge, as well as gauges between 1 510 mm and 1 545 mm with 1 520 mm and 1 524 mm nominal gauges;

— be within the gauge or where this is not possible the instruction handbook, see 7.2, shall clearly state the limitation;

— allow free running on rail through switches and crossings, level crossings and other installations; where this is not achievable the instruction handbook, see 7.2, shall indicate this limitation;

— unless the portable machine or trolley is specifically designed to bend rails, the stresses exerted on the rails by the rail wheels of the manually propelled portable machine and trolley when working shall not exceed 350 N/mm^2;

— where the wheel profile, as shown in EN 13715, is not utilised (this could include double flanged, flat rollers etc) the manufacturer shall state the exact profile used and all wear limits in the instruction handbook, see 7.2.

5.4 Brake and immobilisation system

To avoid the risk of running away, each portable machine (considered as an assembly) and trolley fitted with rail wheels or rollers shall be capable of being immobilised either by an automatic brake or by design. All such systems shall be effective on a gradient of 40 ‰ in the fully laden condition or worst case operating condition whichever is the most unfavourable. Where this is not achievable the instruction handbook, see 7.2, shall indicate this limitation.

Portable machines and trolleys that can roll away shall be equipped with a braking device and release control (dead-man type) that can assure, at full load and at a reference speed of 6 km/h, that the braking distance will not exceed the values indicated in Table 1. The tests shall be carried out on dry rails with dry braking equipment and repeated with the brake gear wet and the head of the rail sprayed with water.

Table 1 — Braking distances

Gradient ‰	Maximum braking distance m	
	Dry rail	Wet rail
40	10	14

5.5 Clamping and/or supporting devices

If portable machines and trolleys are fitted with clamping and/or supporting devices they shall:

— be able to resist vibrations and forces generated by the work of the machine;

— be fit for purpose and not suffer permanent deformation during use.

They shall be designed not to cause:

— reduction of the stability of the track;

— damage to the infrastructure.

5.6 Power generation and transmission equipment

5.6.1 Electrical equipment

Electrical equipment and the degree of electrical protection shall meet the requirements of EN 60204-1.

Portable machines shall use voltages less than 500 V AC or less than 750 V DC.

In order to avoid inadvertent operation or damage to track circuits, any flexible cables shall not have external metallic covering.

5.6.2 Hydraulic, pneumatic and mechanical power transmission

If a portable machine is fed by exterior hydraulic, pneumatic or mechanical power transmission, risks according to EN 982 and EN 983 shall be taken into consideration. In order to avoid inadvertent operation or damage to track circuits, flexible pipes shall not be covered by metallic protection.

5.7 Electromagnetic compatibility

5.7.1 Emissions from portable machines and trolleys

Portable machines and trolleys shall meet the requirements of EN 13309 or EN 50121-3-1:2006, Clause 6.

Any electrical component that is added to a machine that has already been tested and a certificate of emissions provided shall either be assessed as an additional component for its potential to affect railway signals, or the whole machine shall be reassessed.

5.7.2 Immunity of portable machines and trolleys from railway environment

Manufacturers shall assess the component parts of portable machines and trolleys for their susceptibility and immunity to electro-magnetic induced currents. Each electrical or electronic circuit box shall be assessed for the effect they would have if the currents were induced. Any electrical or electronic circuit which the manufacturer considers vulnerable to electro-magnetic compatibility shall comply with the requirements according to EN 50121-3-2:2006, Clause 8, Tables 7, 8 and 9, or equivalent.

5.8 Tools

The release of a machine from its tools, when jammed or failed, shall be possible in order to clear the track during the time indicated in 5.18.

5.9 Interlocking device

Portable machines which are hand held and/or guided by hand and which may present a danger in their use without a guiding mechanism shall have an interlocking device that will ensure that the machine can be operated only if the guiding mechanism is in place. Hazardous functions shall be controlled by a 'hold to run' control device.

Portable machines which are used for cutting rail shall be guided by a clamp that is fixed to the rail.

5.10 Location of control devices

Portable machines or trolleys that are permitted for use with the adjacent line open to traffic shall have the location of control devices, in the conditions for work foreseen by the manufacturer, to allow the operator in control of the machine to remain within the zone delineated within the vertical limits of the gauge (position 1) and below the horizontal limits (position 2) of the gauge defined in Annex B.

When a portable machine or trolley is not permitted for use with an adjacent line open to traffic, this shall be stated in the instruction handbook, see 7.2.

5.11 Warning devices

Warning equipment if fitted to portable machines or trolleys shall be designed and manufactured according to EN ISO 7731 and be clearly distinguishable from other railway specific signals and audible above the peak sound pressure level as measured in Annex G.

5.12 Isolation from external electrical voltages

5.12.1 Operating track circuits

Portable machines and trolleys having contact with both rails (rollers, clamps, etc.), or on the same line of rail shall always have an electrical resistance between the points of contact of ≥ 1 MΩ. The resistance measurement shall be taken under a 500 V DC tension.

5.12.2 Catenaries

Portable machines and trolleys in working configuration for use under live catenary shall not have parts above rail level greater than that shown in EN 15746-1:2010, Table A.1, line 9.

5.13 Lighting

The portable machine or trolley lighting shall be sufficient to permit the intended task to be carried out correctly and safely and shall ensure a luminance level of at least 50 lx and meet the requirements of EN 1837. Dazzling of, e.g. train drivers or workers on the site, shall be prevented by appropriate measures.

The position of the lights shall not cause confusion with railway signalling.

5.14 Prevention of emission of pollutants

Effective measures shall be taken to prevent or reduce leakage or development of dust, smoke, steam gas and other particles.

Wherever practicable, portable machines or trolleys shall use biodegradable lubricants.

5.15 Painting

The use of lead based paints is forbidden.

Portable machines shall be principally yellow in colour.

NOTE This yellow colour according to ISO 3864-1 corresponds e.g. to the following standards:

- RAL 1004 as specified in DIN 6164-1;
- NCS (Natural Colour System) target value 1080-Y10 R, and the NCS exact value 1475-Y 11R;
- EC 222.69.79 in the Eurocolour table.

Conformance shall be assessed by confirmation that the particular colour has been applied using the manufacturer's specification and applied using the manufacturer's approved process. No measurement of the colour when applied to the portable machine or trolley is necessary.

Where vinyl and gel coats are used to achieve yellow colour the colour shall be a reasonable match to the yellow colours listed above. Conformance shall be assessed by visual comparison. No measurement of the colour when applied to the portable machine or trolley is necessary.

5.16 Stability

Portable machines or trolleys shall be designed so that their stability is assured in assembly, working, transport and resting positions including when on ballast or on uneven ground.

The stability of portable machines or trolleys with wheels or rollers, in the most unfavourable positions, shall be assured on a track up to a maximum cant of 200 mm and on a slope of 40 ‰ and a stability coefficient ≥ 1,25. If portable machines are equipped with stands, these shall be adapted to the size, mass and use of the portable machine in order that its stability is assured.

Where a portable machine or trolley equipped with wheels or rollers is used for lifting, the stability coefficient should be > 1,5, in the most unfavourable positions.

5.17 Conformance to gauge

Portable machines and trolleys shall either be designed to fit inside the gauge shown in Annex B or where a machine or trolley design necessitates exceedance of the clearance gauge as defined in Annex B there shall be an indication in the instruction handbook indicating the need to apply further railway specific operational measures, see 7.2.

The gauge given in Annex B is as set out in EN 15273-2. For infrastructures with different gauges the corresponding applicable gauge shall be used.

When moving or rotating about their vertical axis, portable machines equipped with running gear or mounted on trolleys, the design shall ensure conformance to the envelope defined in Annex B consisting of:

— EN 15273-2 gauge (position 1);

— the upper horizontal limit (position 2);

— lower sector gauge (position 3).

Conformance to the above shall take into account all cumulative wear on all components of the machine or of the trolley.

5.18 Time for off-tracking on tracks open to traffic

Portable machines and trolleys, which are used on tracks open to traffic and which present an obstruction to the passage of trains shall be designed in such a way that the time necessary for off-tracking is the shortest possible but shall not exceed 15 s.

A portable machine permitted to be used on tracks open to traffic shall be designed to be released from its tools when jammed or failed, so that it is possible to clear the track of the portable machine and the tools do not cause obstruction to the passage of trains during the time shown above.

5.19 Noise reduction

Noise reduction shall be an integral part of the design process for portable machines and trolleys for construction and maintenance, specifically taking into account technical progress and measures of noise reduction at source as given in EN ISO 11688-1:2009. The success of the applied noise reduction measures shall be assessed on the basis of the actual noise emission values, see Annex G, in relation to other machines of the same family.

NOTE EN ISO 11688-2:2000 gives further information on noise generation mechanisms in machinery.

The major sound sources of portable machines and trolleys for construction and maintenance are:

— the power generation and transmission equipment;

— the tools working on the rails, fastening systems, sleepers or ballast;

— the cooling system (if fitted).

Established measures for noise reduction are:

— capsulated power generation and transmission equipment, capsulated cooling system;

— exhaust mufflers;

— silencers for tools.

5.20 Vibration

5.20.1 Whole body vibration (WBV)

5.20.1.1 Measurement and degree of uncertainty of WBV

Manufacturers shall either state the highest rms value of weighted acceleration to which the whole body is subjected to by the machine, if it exceeds 0,5 m/s^2 or state that it is less than 0,5 m/s^2 when this is correct. The manufacturer shall also state the degree of uncertainty of each vibration measurement. The degree of uncertainty can either be determined by compliance with the recommendation given in EN 12096:1997, Annex D or through an analysis of test methods and measurements where the production run is sufficiently large to give measurements from at least 10 machines.

5.20.1.2 WBV measurement

Measurements shall be taken at locations where personnel can either stand or sit. For standing locations the measurement shall be taken on the floor and for seated locations the measurement shall be taken on the seat cushion, there is no requirement for measurements on the seat back support. Measurements shall be made using tri-axial accelerometers, in accordance with the requirements of EN 1032. Only the largest of the three readings needs to be used in the assessment process.

Measurements shall be taken under the following conditions, as appropriate for the intended use of the machine:

— machine stationary with the engine running;

— machine at maximum permitted running speed on continuous welded rail for a statistically significant length of time as determined by a technically competent person;

— machine at maximum permitted running speed on jointed track for a statistically significant length of time as determined by a technically competent person;

— in working mode for each of the working functions for a statistically significant length of time as determined by a technically competent person.

5.20.1.3 Reporting WBV data

Manufacturers shall give information on the actual test method and machine operating conditions, the actual test results and the degree of uncertainty of the results in the instruction handbook supplied with the machine, see 7.2.

The manufacturer shall clearly state how the vibration value was derived, i.e. the operations carried out by the machine and the type and condition of track being traversed. The manufacturer shall record the actual vibration levels measured and the degree of uncertainty of these results. The information shall be declared to the purchaser in the instruction handbook, see 7.2.

5.20.2 Hand arm vibration (HAV)

5.20.2.1 Measurement and degree of uncertainty of HAV

Manufacturers shall either state the vibration total value to which the hand / arm system is subjected by the machine, if it exceeds 2,5 m/s^2, or state that it is less than 2,5 m/s^2 when this is correct. The manufacturer shall also state the degree of uncertainty of each vibration measurement. The degree of uncertainty can either be determined by compliance with the recommendation given in EN 12096:1997, Annex D or through an analysis of test methods and measurements where the production run is sufficiently large to give readings from at least 10 machines.

5.20.2.2 HAV measurement

Measurements shall be taken for all hand held equipment, examples of equipment that should be considered for hand-arm vibration assessment are (but not limited to):

a) hand-held tools;

b) handle bars and guard rails;

c) powered pneumatic tools;

d) control handles of machines where the control has to be held for significant periods.

Measurement shall be made using a tri-axial accelerometer fixed to the part of the equipment being held in the hand, in accordance with EN 28662-1. The method of fixing shall be carefully considered to avoid inaccurate results e.g. plastic cable ties are not suitable for this purpose because of the elasticity of the cable tie. The vector sum of the three readings shall be used in the assessment process. The equipment to be measured shall be in use in its intended mode of operation and in its intended environment, e.g. a hand-held ballast tamper shall be measured when in use with ballast.

5.20.2.3 Reporting HAV data

Manufacturers shall record information about the actual testing method and machine operating conditions, actual test results and the degree of uncertainty of the results and provide this information in the instruction handbook supplied with the machine.

The manufacturer shall clearly state how the vibration value was derived, i.e the machine operations being carried out and the type and condition of the track being traversed. The manufacturer shall record the actual vibration levels measured and the degree of uncertainty of these results. The information shall be declared to the purchaser in the instruction handbook, see 7.2.

5.21 Environmental conditions

Portable machines and trolleys shall be designed, manufactured and tested for the conditions and climatic zones where they are likely to be operated. This information shall be stated in the instruction handbook, see 7.2.

6 Verification of the safety requirements and/or measures

6.1 General

The safety requirements and/or safety measures of Clauses 5 and 7 shall be verified according to the requirements of Clause 6.

6.2 Type verification

Type verification of the portable machine or trolley is required to ensure conformity with the requirements of this standard, see Annex C.

6.3 Conformity to type

Conformity to type is the process whereby the compliance of each portable machine or trolley with this standard is assessed. A recommended assessment procedure is given at Annex E. Where the portable machine or trolley is assembled on site, any part of the verification procedure that cannot be made at the manufacturers premises shall be carried out at the place of use.

6.4 Verification methods

6.4.1 General

The following methods of verification shall be applied:

6.4.2 Visual check

To establish the presence of a protective device or safety measure on the portable machine or trolley, system or component, e.g. guarding, visual warning device, marking, or that documents, drawings are provided and are adequate to meet the requirements of this document (Symbol “V”).

6.4.3 Measurement

To establish whether the stated measurable parameters have been met, e.g. geometric dimensions, safety distance, insulation of electrical circuits, vibration (Symbol “M”).

6.4.4 Test(s)

The tests shall consist of one of the following:

— functional test: to establish whether, in an unloaded working condition the machine, including all safety devices, works as intended and all functions comply with the requirements and with the technical documentation (symbol “FT”);

— loading test(s): the intention of which is to establish the strength and/or stability when the equipment is loaded and whether all the safety devices and their adjustments are in accordance with the requirements of this document (symbol “LT”);

— specific verification/measurements to establish whether the stated parameters have been met (symbol “SV”).

6.5 Conformity evaluation procedures

6.5.1 Type verification

For type verification the schedule in Annex C shall be used.

6.5.2 Conformity to type

For verification of conformity to type of each portable machine or trolley the schedule in Annex E shall be used.

6.5.3 Marking of conformity

Conformity with the standard is denoted by special marking according to the requirements of Annex D.

7 Information for use

7.1 General

The instruction handbook shall be in accordance with Clause 7 of this standard and EN ISO 12100-2 and shall include information mentioned in EN ISO 12100-2:2003, Clause 6.

7.2 Instruction handbook

This information shall include the duties and conditions under which the portable machine or trolley is intended to be used, in particular with regard to:

— working areas and lines open to traffic;

— operating conditions, e.g. indication of the operating mode(s);

— range of intended environmental conditions, e.g. wind, temperature, relative humidity;

— restrictions of use;

— vibrations generated by the machine;

— exchangeable equipment;

— vibration total value to which the hand-arm system is subjected if the value exceeds 2,5 m/s^2 or information that this value is not exceeded, when this is correct, and the uncertainty of measurement;

— noise levels generated.

Details of safety functions and list and location of safety devices shall be provided.

The instruction handbook shall contain information on prohibited applications.

7.3 Instructions for assembly

When the portable machine or trolley is designed to be supplied to site unassembled, the manufacturer shall provide suitable assembly specifications preferably with drawings showing:

— instructions for assembling the component parts;

— any special requirements for storage;

— weights, dimensions and lifting points of the separate components supplied;

— methods for safe handling of the components;

— assembly procedure;

— any fixing positions and fixing methods to ensure stability during assembly;

— electric, hydraulic and pneumatic connections;

— any special equipment for assembly.

7.4 Instructions for use

7.4.1 Additional instructions

The instruction handbook shall include, in addition to EN ISO 12100-2, at least the following requirements:

— only authorised personnel shall start, operate or interfere with the normal working of portable machines or trolleys;

— specification of any personal protective equipment needed for the operation of portable machines or trolleys and the hazards which it is designed to protect against;

— stopping modes, in particular means of operation of normal and emergency-stopping devices shall be made known to all appropriate personnel; areas giving access to them shall be kept clear of obstacles. Their proper working shall be periodically checked;

— cleaning requirements;

— if an emergency stop switch is fitted it shall not be used for normal stopping;

— all restarting operations on portable machines or trolleys which have been inoperative because of an emergency or accidental stoppage shall be preceded by an inspection to determine the cause of the emergency or accidental stoppage;

— details of a restarting procedure to be followed after an emergency or accidental stoppage;

— the user shall be careful to use the machine in the normal way avoiding over-loading;

— the user shall not modify the design or configuration of portable machines or trolleys without consulting the manufacturer;

— the noise emission declaration according to Annex G;

— recommendation for operator and other members of staff to be trained in the instructions for use before the start of operation.

7.4.2 Restriction of use

The instruction handbook shall indicate the restrictions of use of the portable machine or trolley according to the requirements of this document e.g.

— if the machine cannot negotiate switches, crossings, level crossings and other installations;

— if special conditions apply when the machine is working in track circuited areas;

— if special conditions apply in the presence of live conductor rails, see 7.4.3;

— if the machine cannot be immobilised on a gradient steeper than 40 ‰, that special measures shall be established by the infrastructure controller.

7.4.3 Use in the vicinity of conductor rails

The instruction handbook shall clearly indicate that the portable machine or trolley can only be used on a live conductor rail system with the approval of the infrastructure manager.

In this case the manual shall give the following information:

— distances between the portable machine or trolley and the conductor rails;

— where the machine is powered by an external supply, e.g. electric, hydraulic, pneumatic, information on the safety measures to be met;

— the position of the operator while using the portable machine or trolley in relation to the live conductor rails.

7.4.4 Personal protective equipment

If a portable machine or trolley involves a risk to the operator, the instruction handbook shall give advice on the use of appropriate protective equipment.

7.4.5 Engine exhaust emission

The instruction handbook shall indicate the values of the engine exhaust emissions.

NOTE These machines are subject of the Non-Road Mobile Machine Directive 2004/26/EC.

7.4.6 Fuel tank

The instruction handbook shall indicate the fuel tank capacity as well as the consumption per operational hour.

7.4.7 Weight

The instruction handbook shall indicate:

— total weight of the machine in its operational condition with its tanks full;

— weight of its separate parts;

— sketch indicating the distribution of weight so that the user can establish an appropriate method of handling the portable machine or trolley and/or its components.

7.4.8 Stability

The value of the stability coefficient and the limits of cant and/or gradient for which the stability of the portable machine or the trolley is assured shall be indicated in the instruction handbook.

7.4.9 Remaining within gauge

The instruction handbook shall indicate dimensions of the portable machine or trolley in all its working configurations in relation to Annex B as well as to the operator position during work.

7.4.10 Off-tracking

The instruction handbook shall inform the operator about the method to be used and the minimum duration for off-tracking the portable machine or trolley:

— in normal working conditions;

— in case of failure or emergency, e.g. freeing of the tool, etc.

The instruction handbook shall also indicate the necessary number of persons required for off-tracking the portable machine or trolley.

7.4.11 Interlocking devices

Interlocking devices between the machine and its support, if present, shall be detailed in the instruction handbook.

7.4.12 Instructions for maintenance

The instruction handbook shall specify in particular the following according to EN ISO 12100-2:

— technical knowledge and skills of the maintenance staff for particular operations which need specific training, and shall specify that all adjustments, whether mechanical or electrical, shall only be carried out by persons authorised to do so in accordance with a safe system of work and the manufacturer’s instructions;

— conditions under which maintenance work and rectification of faults that can be performed, e.g. portable machines or trolleys are isolated, protected against unexpected start-up and measures taken against unexpected movements;

— list of wearing parts, as well as the approximate frequency and conditions for their replacement;

— the specification of the spare parts to be used when these affect the health and safety of operators;

— list of parts to be checked periodically;

— list of equipment and accessories essential for maintenance;

— portable machines or trolleys shall be maintained and kept clean in accordance with the manufacturer's instructions;

— inspection, adjustment, maintenance and cleaning of moving parts and safety devices shall be carried out regularly in a safe manner according to the manufacturer's instructions;

— inspection and adjustment in motion shall only be carried out with guards in position and other protective systems, if the machine is equipped with them;

— maintenance of guards, safety signs, information signs and lighting;

— method of testing the braking system.

7.4.13 Instructions for training

Where the training of the portable machine or trolley operator has been deemed necessary a programme of this training shall be included in the instruction handbook.

7.5 Marking — General

The portable machine or trolley, according to the requirements of EN ISO 12100-2, shall be marked legibly and indelibly with at least the following particulars:

— business name and full address of the manufacturer and, where applicable, his authorised representative;

— designation of the machinery;

— mandatory marking[2)];

— type designation;

— serial number;

— rating information (supply), e.g. voltage, frequency, power, pressure, flow;

— rating information (capacity), e.g. working load limit, maximum capacity;

— year of construction, that is the year in which the manufacturing process is completed.

Portable machines or trolleys shall also bear full information relevant to their type and essential to their safe use, e.g. personal protective equipment, maximum speed, maximum inclination.

Portable machines or trolleys shall carry an indication of the number of people required to remove it from the track if more than one person is required.

The weight of the portable machine or trolley in working order or the weight of the separate portable components shall be indicated at the lifting point(s). The lifting point(s) shall be indicated by a pictogram.

The portable machine or trolley shall be marked legibly and indelibly according to Annex D and the number of persons required to lift the portable machine or trolley.

7.6 Symbols and warnings

Adequate warnings shall be placed on the portable machines and trolleys to indicate dangerous areas which cannot be protected by the protection devices and to indicate the residual risks caused by:

— moving parts;

— electrical danger.

All symbols used on portable machines and trolleys shall be those corresponding to ISO and EN standards, in particular according to ISO 3864-1, ISO 3864-2, ISO 6405-1 and ISO 6405-2.

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2) For machines and their related products, except those trolleys that are intended solely for the transportation of materials, intended to be put on the market in EEA, CE-marking as defined in the applicable European Directive(s).

Annex A
(normative)

List of significant hazards

This list is based on EN ISO 14121-1:2007 and includes those hazards which are considered significant to the working conditions of the portable machines and trolleys which are the subject of this document.

The other hazards are not dealt with in this document.

Table A.1 — List of significant hazards

NOTE This list may not be exhaustive for all machines and the manufacturer remains responsible for supplying a safe machine taking due account of all likely hazards.

From EN ISO 14121-1:2007		EN 13977:2011
Clause	**Hazards**	**Clause**
Hazards, hazardous situations and hazardous events		
1	**Mechanical hazards** due to machine parts or work pieces, e.g.: a) relative location; b) inadequacy of mechanical strength	5.2, 5.3, 5.4, 5.5, 5.6.2, 5.8, 5.9, 5.10, 5.16, 5.17, 7.3, 7.4.8, 7.4.9, 7.4.10, 7.4.11, 7.4.12
1.1	Crushing hazard	5.2, 5.3, 5.4, 5.8, 5.17, 7.4.2, 7.4.8, 7.4.9, 7.4.10, 7.4.11
1.4	Entanglement hazard	5.8, 5.9, 7.4.12
2	**Electrical hazard** due to:	
2.1	Contact of persons with live parts (direct contact)	5.6.1, 7.4.2, 7.4.3
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	5.6.1, 7.4.2, 7.4.3
2.3	Approach to live parts under high voltage (catenary, conductor rail, return conductors)	5.11, 7.4.2, 7.4.3
7	**Hazards generated by materials and substances** (and their constituent elements) processed or used by the machiner	
7.2	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	5.2.2, 5.14, 7.4.6, 7.4.5
8	**Hazards generated by neglecting ergonomic principles in machinery design** as, e.g. hazards from:	
8.4	Inadequate local lighting	5.12
8.7	Inadequate design, location or identification of manual controls	5.2.1, 5.2.2, 5.9, 5.17, 7.4.10
15	**Errors of fitting**	7.3
16	**Break-up during operation**	5.5, 5.6.2, 5.8, 7.4.12

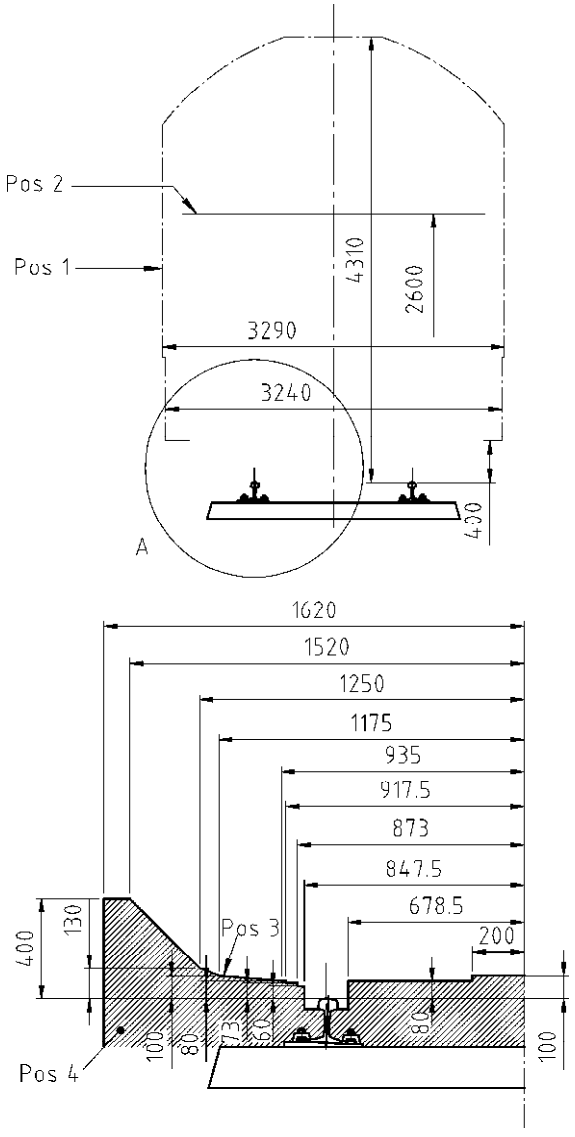
Table A.1 *(continued)*

From EN ISO 14121-1:2007		EN 13977:2011
Clause	**Hazards**	**Clause**
Additional hazards, hazardous situations and hazardous events due to mobility		
18	**Loss of stability / overturning of machinery**	5.2.2, 5.3, 5.4, 5.16, 7.4.2, 7.4.8, 7.4.9, 7.4.11
20	**Relating to the travelling function**	5.4, 5.5
20.3	Movement without all parts in a safe position	7.4.12
20.6	Insufficient ability of the machine to be slowed down, stopped or immobilised	5.4, 7.4.1
21	**Linked to the work position (including driving station) on the machine**	
21.2	Exhaust gases/lack of oxygen at the work position	5.14, 7.4.5
21.6	Inadequate lighting	5.13
22	**Due to the control system**	
22.1	Inadequate location of controls/control devices	5.10, 7.4.11
23	**From handling the machine (lack of stability)**	5.3, 5.4, 5.5, 5.16, 7.4.8, 7.4.9
24	**Due to the power source and the transmission of power**	
24.1	Hazards from the engine and the batteries	5.6, 7.4.3
25	**Hazards from/to third persons**	
25.3	Lack or inadequacy of visual or acoustic warning	5.10, 5.11
26	**Insufficient instructions for the driver/operator**	7
33	**Emission of dust, gases, etc.**	5.14, 7.4.5, 7.4.6
34	**Hazards generated by noise resulting in:**	
34.1	Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness, tinnitus)	5.19
34.2	Interference of speech communication and the reception of acoustic warning signals	5.19
35	Hazards due to vibration	5.20

Annex B
(normative)

Clearance gauge for portable machines and trolleys

Dimensions in millimetres



Key
Pos. 1 EN 15273-2 gauge
Pos. 2 Upper limit of the portable machines relative to the top of the rail
Det. A Pos. 3 – Lower sector gauge in presence of signalling device

NOTE As an alternative to EN 15273-1 and EN 15273-2, other clearance gauges may be specified by the infrastructure manager.

Figure B.1 — Track with nominal 1 435 mm gauge

Dimensions in millimetres

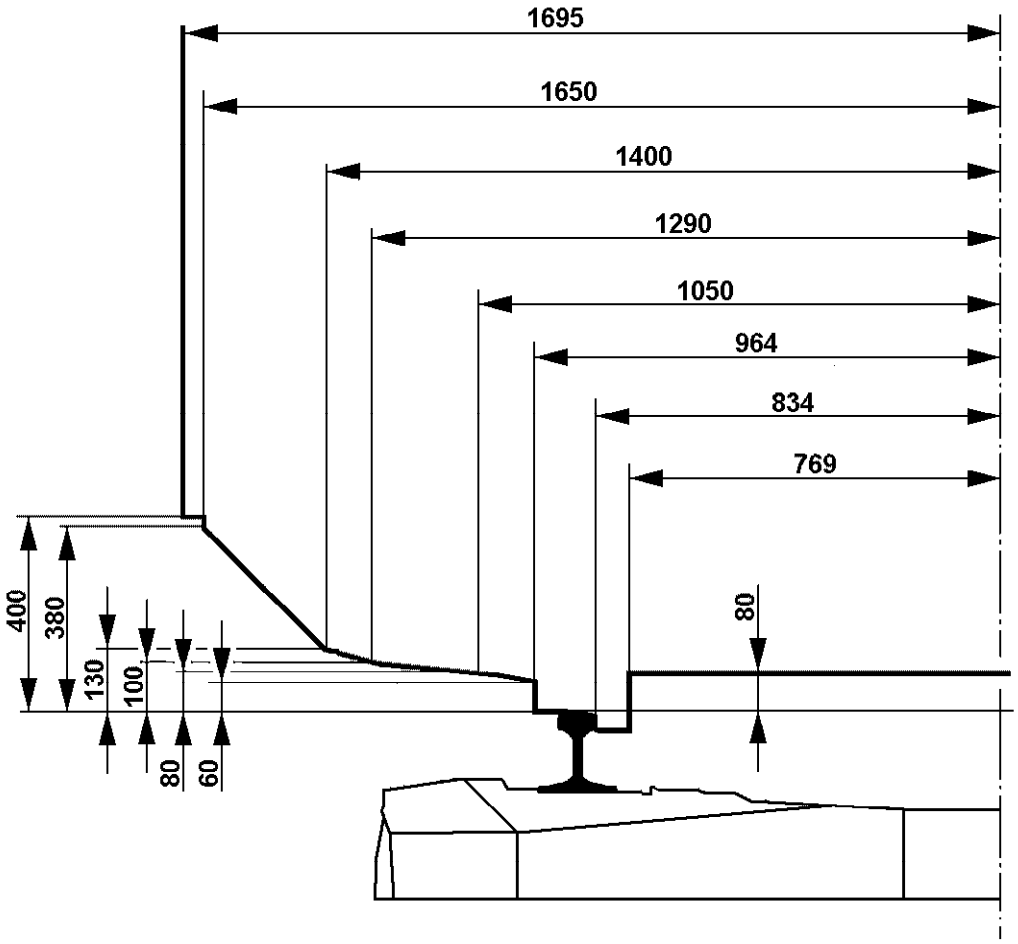


Figure B.2 — Detail A of track with nominal 1 668 mm gauge

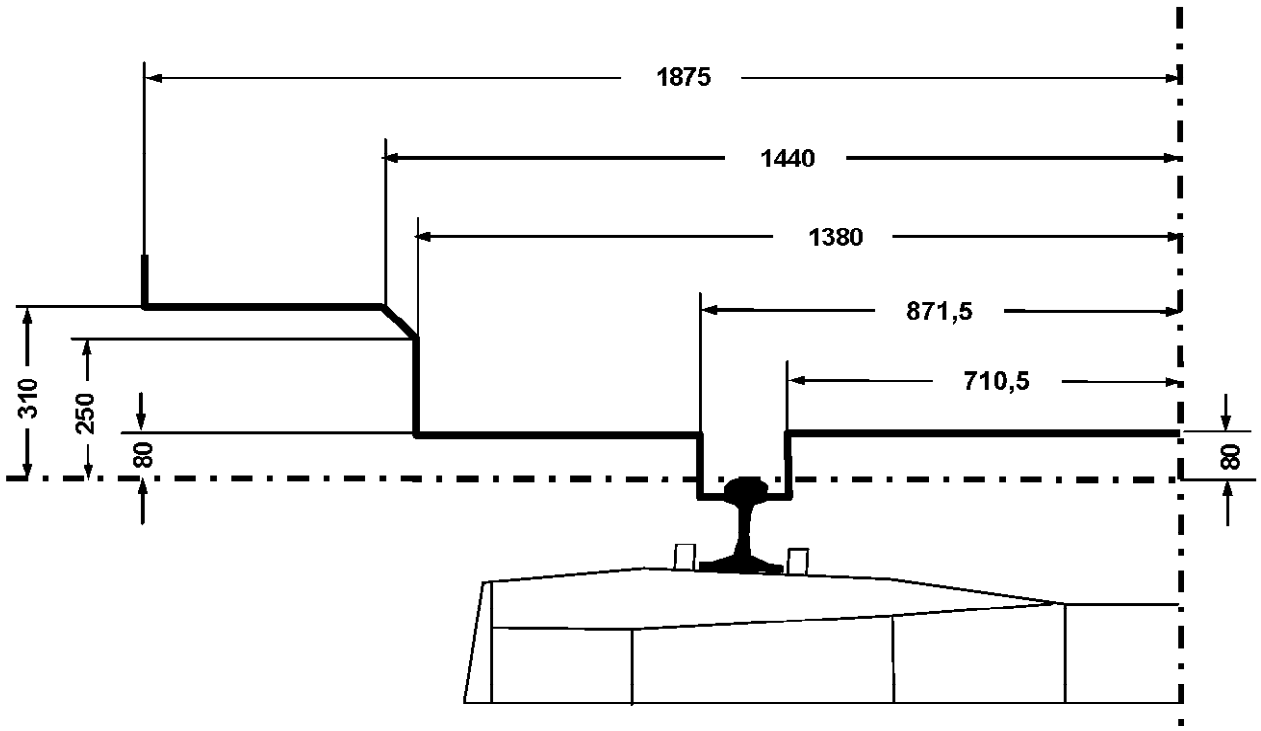


Figure B.3 — Detail A of track with nominal 1 520 mm and 1 524 mm gauges

Annex C
(normative)

Type verification

C.1 Identification

Designation of the portable machine/ trolley: ….....

Type: ..... Number(s): .....

Manufacturer: .....

Construction date (month, year): .....

C.2 Technical documents

Complete: Yes/No .....

C.3 Conformance check to EN 13977:2011

Table C.1 — Conformance check to EN 13977:2011

	Reference to clause/subclause	Verifications and results						Observations
		VE	R	VE	R	VE	R	
5.2	Handling devices							
5.2.1	Handles used for handling and/or control	V		M				
5.2.2	Lifting points and securing points	V				FT		
5.3	Wheels and rollers	V		M		FT		
5.4	Brake and immobilisation system	V				FT, LT		
5.5	Clamping and/or supporting devices	V				FT, LT		
5.6	Power generation and transmission equipment	V		M		FT		
5.6.1	Electrical equipment	V				FT, SV		
5.6.2	Hydraulic, pneumatic and mechanical power transmission	V						
5.8	Tools	V				FT		
5.9	Interlocking device	V		SV		FT		

Table C.1 *(continued)*

	Reference to clause/subclause	Verifications and results						Observations
		VE	R	VE	R	VE	R	
5.10	Location of control devices	V		M		FT		
5.11	Warning devices	V				FT		
5.12.1	Operating track circuits	V		M				MΩ
5.12.2	Catenaries	V		M				
5.13	Lighting	V		M		FT		
5.14	Prevention of emission of pollutants	V				FT		
5.15	Painting	V						
5.16	Stability			SV		FT, LT		
5.17	Conformance to gauge			M		FT, LT		
5.18	Time for off-tracking on tracks open to traffic			M				
5.19	Noise reduction			SV				
7	Information for use	V						
7.2	Instructions handbook	V						
7.3	Instructions for assembly	V						
7.4.1	Additional instructions	V						
7.4.2	Restriction of use	V				FT		
7.4.3	Use in the vicinity of conductor rails	V				FT		
7.4.4	Personal protective equipment	V						
7.4.5	Engine exhaust emission	V						
7.4.6	Fuel tank							
	- capacity					FT		ℓ
	- working time					FT		min
	- working cycles					FT		
7.4.7	Weight	V						
	- total weight					FT		kg
	- weight of its separate parts					FT		kg
7.4.8	Stability	V				FT		
7.4.9	Remaining within gauge	V				FT		
7.4.10	Off-tracking	V				FT		
7.4.11	Interlocking devices	V				FT		

Table C.1 *(continued)*

	Reference to clause/subclause	Verifications and results						Observations
		VE	**R**	**VE**	**R**	**VE**	**R**	
7.4.12	Instructions for maintenance	V						
7.4.13	Instructions for training	V						
7.5	Marking	V						
7.6	Symbols and warnings	V						
	NOTE value of vibration if >2,5 m/s^2					SV		m/s^2

Verification (VE):	**Results (R):**
V = Visual	**C = Conforms**
M = Measurement	**NC = Does not Conform**
FT= Functional Test	**NA = Not Applicable**
LT= Loaded Test	
SV= Specific verification	

Annex D
(normative)

Portable machine and trolley marking

The conformity to this document after check according to C.3 is indicated by the marking as shown in Figure D.1:

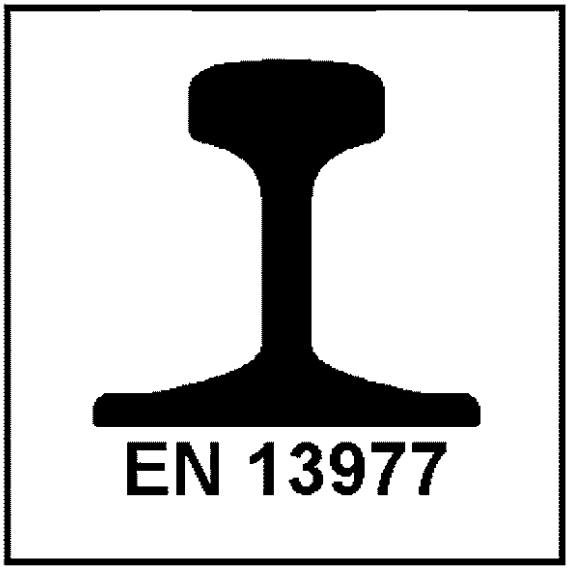


Figure D.1 — Conformity marking

Annex E
(normative)

Conformity to type verification

E.1 Identification

Designation of the portable machine/ trolley: .....

Type: ..... Number(s): .....from.....to.....

Manufacturer: .....

Construction date (month, year): .....

E.2 Conformance check to EN 13977:2011

Table E.1 — Conformance check to EN 13977:2011

	Reference to clause/subclause	Verifications and results						Observations
		VE	**R**	**VE**	**R**	**VE**	**R**	
5.2	Handling devices							
5.2.1	Handles used for handling and/or control	V		M				
5.2.2	Lifting points and securing points	V				FT		
5.3	Wheels and rollers	V		M				
5.4	Brake and immobilisation system	V				FT		
5.5	Clamping and/or supporting devices	V						
5.6	Power generation and transmission equipment	V						
5.6.1	Electrical equipment	V				FT, SV		
5.6.2	Hydraulic, pneumatic and mechanical power transmission	V						
5.8	Tools	V						
5.9	Interlocking device	V				FT		
5.10	Location of control devices	V						
5.11	Warning devices	V						

Table E.1 *(continued)*

	Reference to clause/subclause	Verifications and results						Observations
		VE	R	VE	R	VE	R	
5.12.1	Operating track circuits			M				MΩ
5.12.2	Catenaries	V						
5.13	Lighting	V						
5.14	Prevention of emission of pollutants					FT		
5.15	Painting	V						
5.16	Stability	V						
5.17	Conformance to gauge	V						
5.18	Time for off-tracking on tracks open to traffic	V						
5.19	Noise reduction	Measurement according to Annex G						
7	Information for use	V						
7.2	Instruction handbook	V						
7.3	Instructions for assembly	V						
7.4.1	Additional instructions	V						
7.4.2	Restriction of use	V						
7.4.3	Use in the vicinity of conductor rails	V						
7.4.4	Personal protective equipment	V						
7.4.5	Engine exhaust emission	V						
7.4.6	Fuel tank	V						
	- capacity	V						ℓ
	- working time	V						min
	- working cycles	V						
7.4.7	Weight	V						
	- total weight			M				kg
	- weight of separate parts			M				kg
7.4.8	Stability	V						
7.4.9	Remaining within gauge	V						
7.4.10	Off-tracking	V						
7.4.11	Interlocking devices	V						
7.4.12	Instructions for maintenance	V						
7.4.13	Instructions for training	V						

Table E.1 *(continued)*

	Reference to clause/subclause	Verifications and results						Observations
		VE	**R**	**VE**	**R**	**VE**	**R**	
7.5	Marking	V						
7.6	Symbols and warnings	V						
	NOTE value of vibration if > 2,5 m/s^2							m/s^2
Verification (VE): **V= Visual** **M = Measurement** **FT = Functional Test** **LT = Loaded Test** **SV = Specific Verification**				**Results (R):** **C = Conforms** **NC = Does not Conform** **NA = Not Applicable**				

E.3 Declaration of conformity to type

Name: .....

Title: .....

Date: ..... Signature of Manufacturer: .....

Annex F
(informative)

Special conditions

Special conditions: national characteristics or practice that cannot be changed even over a long period, e.g.:

— gauge different from the gauge defined in Annex B;

— track gauge different from 1 435 mm or 1 668 mm nominal track gauges;

— super-elevation or gradient greater than those foreseen in this standard;

— special signalling system;

— different electrical conditions;

— position of the conductor rail;

— other special conditions, see 1.1.

These special conditions will be the subject of negotiation between the user and the manufacturer taking into consideration the infrastructure manager requirements.

Annex G
(normative)

Noise test code for portable machines and trolleys for construction and maintenance – Grade of accuracy 2 and 3

G.1 Scope

The following rules for the determination and declaration of noise emission values are applicable to portable machines and trolleys for construction and maintenance.

For hand-held non-electric powered machines the noise test code according to EN ISO 15744:2008 shall be applied.

G.2 Terms and definitions

General terms in this noise test code are defined in EN ISO 12001:2009, Clause 3.

G.2.1
work station
position defined by the manufacturer, in the vicinity of the machine that is intended to be assumed by the operator

NOTE See Table G.1.

G.3 Determination of the emission sound pressure level at the workstation or other specified positions

The A-weighted emission sound pressure level at the workstation shall be determined according to EN ISO 11204:2010 following the requirements for grade 2. If it is not possible to comply with the requirements of grade 2, it is permissible to apply EN ISO 11204:2010 grade 3 or EN ISO 11202:2010 grade 3. The microphone positions and operating conditions are given in Table G.1.

G.4 Sound power level determination

The A-weighted sound power level shall be determined according to EN ISO 3744 or EN ISO 9614-2:1996, following the requirements for grade 2. If it is not possible to comply with the requirements of grade 2, it is permissible to apply EN ISO 3746:2009 grade 3 or EN ISO 9614-2:1996 grade 3.

For machines type 2 (Table G.1) the box shaped measurement surface shall be used with the microphones located at a distance of 1 m from the reference box (EN ISO 3744:2009, Figure C.2). For machines type 1 and 3 (Table G.1) which are moving during the measurement a hemispherical measurement surface shall be used with a radius of 4 m according to EN ISO 3744:2009, 7.2, Figure B.1. The working conditions are given in Table G.1.

G.5 Installation and mounting conditions

The installation and mounting conditions shall be identical for the determination of both the sound power level and the emission sound pressure level at specified positions. Care shall be taken to ensure that any electrical

conduits, piping or air ducts, which are connected to the machine, do not radiate significant amounts of sound energy.

For the purpose of measurements, the machine shall be installed on a sound reflecting plane according to EN ISO 3744 either outside or in a room providing for the necessary free field above the reflecting plane.

The test environment shall meet the requirements of the standards stated in G.3.

G.6 Operating conditions

The operating conditions shall be the same for the determination of the sound power level and of the emission sound pressure level at specified positions.

The operating conditions of the machines are defined in Table G.1.

The measuring time at each measurement position shall be 30 s. In general a minimum of 5 measuring cycles is required; however, only 3 cycles are required for drilling and cutting machines.

For portable machines and trolleys with predetermined operator positions, the measurement shall be carried out at the usual position of the operator without the operator being present.

For drilling machines, grinding machines and cutting machines: measurements shall be applied for each intended kind of tool which shall fulfil the requirements for working on kind of steel R350LHT according to EN 13674-1:2003+A1:2007.

Table G.1 — Measuring points and operating conditions for determination of emission sound pressure level

Machine	Microphone positions to determine the emission sound pressure level at the workstation	Operating conditions for measurement
Type 1: Machines guided by the operator in upright position on the rails as sleeper screwing machines, combined screwing/drilling machines, clipping machines, grinding-machines, machines for warming rails	Machine on the rail in working position. Measuring point 1,6 m above the working tool concentric over the rail head.	1. Maximum no-load speed 2. Tools in function, full load (machine for warming rails: maximum gas flow)
Type 2: Machines guided by the operator in stopped position as grinding machines, cutting machines, drilling machines for drilling the rails at the side or for the screws of the sleepers	Machine on the rail in working position. Measuring point 0,5 m above the working tool concentric over the rail head because of the stooped position.	1. Maximum no-load speed 2. Tool in working position, full load
Type 3: Machines with a seat for a riding operator as trolleys for tamping, trolleys for warming rails	Machine on the rail in working position. Measuring point 0,8 m vertically above the seat surface.	Trolley with tamping units under full load at maximum digging depth. Trolley for warming rails in working speed with maximum gas flow with hammering machine running.

If required the L_{pCpeak} is to be measured at the work station.

G.7 Measurement uncertainties

The application of the proposed noise emission measurement methods results in different measurement uncertainties. These are stated as standard deviations of reproducibility in the basic noise emission measurement standards. Thus a standard deviation of reproducibility σ_R of 0,5 dB up to 2,5 dB is expected for the A-weighted emission sound pressure level determined according to EN ISO 11204:2010 grade 2.

A standard deviation of reproducibility σ_R of 1 dB up to 5 dB is expected for the A-weighted emission sound pressure level determined according to EN ISO 11202:2010 grade 3.

Considering the sound power level determination according to EN ISO 3744 or EN ISO 9614-2:1996 grade 2 a standard deviation of reproducibility σ_R of 0,5 dB up to 1,5 dB is expected.

The application of EN ISO 3746:2009 results in a standard deviation of reproducibility with σ_R between 1,5 dB and 4 dB.

G.8 Recordings

The information, which shall be recorded, covers all of the technical requirements of the noise test code. Any deviations from the noise test code or from the basic standards upon which it is based are to be recorded together with the technical justification for such deviations.

G.9 Information to be reported

The information to be included in the test report is at least that which the manufacturer requires preparing a noise declaration or the user requires verifying the declared values.

The following minimum information shall be given:

a) identification of the manufacturer, machine type, machine model, serial number and year of production;

b) place and date of the test and personnel involved;

c) reference to this noise test code and the basic standards applied;

d) description of installation and operating conditions (drilling machines, grinding machines, cutting machines: kind of tool);

e) location of work stations and other specified positions;

f) description of microphone positions (work station and other specified positions);

g) description of the measurement instrument and last date of calibration;

h) description of the test room and environment respectively by background and environmental corrections;

i) determined noise emission values;

j) emission sound pressure level L_{pA} at the workstations and other specified positions;

k) L_{pCpeak} if required;

l) sound power level L_{WA};

m) confirmation that all requirements of this noise test code have either been fulfilled, or, if this is not the case, any unfulfilled requirements shall be mentioned. All unfulfilled requirements shall be specified;

deviations from the requirements shall be stated and technical justifications for the deviations shall be given;

n) detailed information on the reasons for using the measurement methods grade 3 if the methods according to grade 2 were not applied.

G.10 Declaration and verification of noise emission values

The declaration of the noise emission values shall be made as a dual number noise emission declaration according to EN ISO 4871. It shall declare the emission sound pressure level L_{pA} at the workstation or at other specified positions and if necessary the sound power level L_{WA} together with the respective uncertainty K (K_{pA} and K_{WA}).

If requested the peak sound pressure level L_{pCpeak} shall be given together with its uncertainty K_{pCpeak}.

The uncertainties K_{pA} and K_{WA} are expected to have values as given in Table G.2.

Table G.2 — Expected uncertainties

Applied measurement standard	Grade 2	Grade 3
EN ISO 11204:2010	K_{pA} = 3 dB	K_{pA} = 4 dB
EN ISO 11202:2010		K_{pA} = 6 dB
EN ISO 3744:2009	K_{WA} = 3 dB	
EN ISO 3746:2009		K_{WA} = 4 dB
EN ISO 9614-2:1996	K_{WA} = 3 dB	K_{WA} = 4 dB

The noise emission value shall be rounded to the nearest decibel.

The noise emission declaration shall explicitly state that the emission values have been measured according to the specification of this noise test code as well as to EN ISO 11204:2010 grade 2, respectively EN ISO 3744:2009 or EN ISO 9614-2:1996 grade 2. In case of grade 3 measurements it shall be stated that EN ISO 11202:2010 or EN ISO 11204:2010 grade 3 respectively EN ISO 3746:2009 were applied. If this statement is not true, the noise declaration shall indicate what the deviations are from this noise test code and/or from the basic standards.

If undertaken, verification shall be done according to EN ISO 4871 by using the same mounting, installation and operating conditions as those used for the initial determination of noise emission values.

An example of a noise emission declaration according to B.2 of EN ISO 4871:2009 is given in Table G.3.

Table G.3 — Example of a noise emission declaration

Machine **Type: …… Model: ……etc.**		
Declared dual-number noise emission values in accordance with EN ISO 4871		
	On Load	**No load**
Measured A-weighted emission sound pressure level L_{pA} (ref. 20 µPa) at the operator's position in dB(A)	92	89
Uncertainty K_{pA} in dB(A)	3	3
Measured A-weighted sound power level L_{WA} (ref. 1 pW) in dB(A)	107	105
Uncertainty K_{WA} in dB(A)	3	3
Values determined according to EN ISO 11204:2010, grade 2 and EN ISO 3744		
NOTE The sum of a measured noise emission value and its associated uncertainty represents an upper boundary of the range of values that is likely to occur in measurements.		

Annex H
(informative)

Structure of European Standards for track construction and maintenance machines

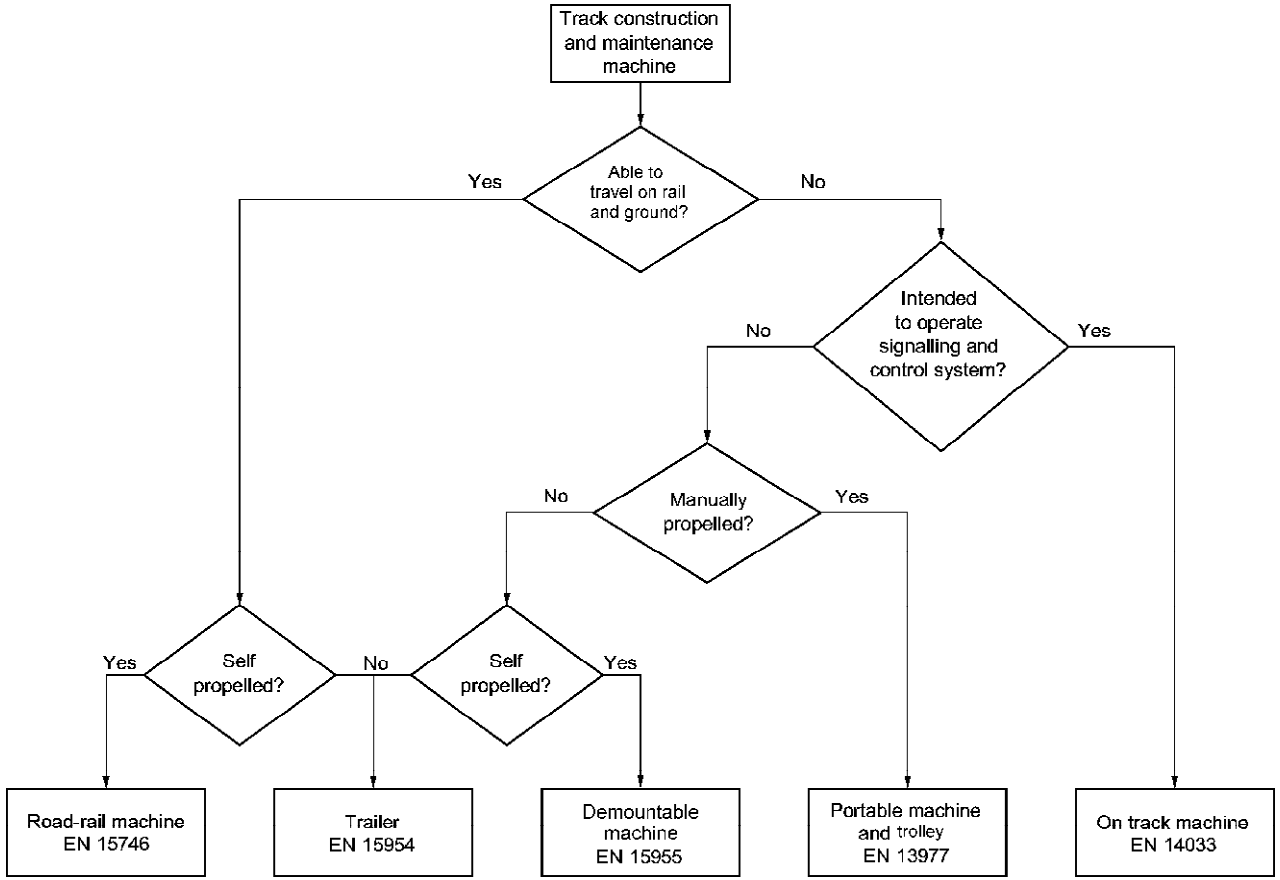


Figure H.1 — Flowchart of European Standards for track construction and maintenance machines

Table H.1 — Structure of European Standards for track construction and maintenance machines

European Standard / Specifications	On track machines (Railbound machines) EN 14033-1:2008 EN 14033-2 EN 14033-3		Road-rail machines EN 15746-1 EN 15746-2		Demountable machines prEN 15955-1:2009 prEN 15955-2:2009	Trailers prEN 15954-1:2009 prEN 15954-2:2009	Portable machines and trolleys EN 13977:2011
Designed for rail or road	rail only		rail and road		rail only	rail only or rail and road	rail only
Designed for operating train control / signalling systems	yes		yes[c]	no[d]	no	no	no
Method of propulsion on the rails	self propelled [a]	towed [b]	self propelled		self propelled	towed	manually

a Category 1, 2, 4 and 6 machines

b Category 3, 5 and 7 machines

c Category 8 machines as well as Category 9 machines designed to operate signalling and control systems

d Category 9 machines

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

[1] EN 12096:1997, *Mechanical vibration — Declaration and verification of vibration emission values*

[2] EN 14033-1:2008, *Railway applications — Track — Railbound construction and maintenance machines — Part 1: Technical requirements for running*

[3] EN 14033-2, *Railway applications — Track — Railbound construction and maintenance machines — Part 2: Technical requirements for working*

[4] EN 14033-3, *Railway applications — Track — Railbound construction and maintenance machines — Part 3: General safety requirements*

[5] EN 15273-1, *Railway applications — Gauges — Part 1: General — Common rules for infrastructure and rolling stock*

[6] CEN/TR 15350, *Mechanical vibration — Guideline for the assessment of exposure to hand-transmitted vibration using available information including that provided by manufacturers of machinery*

[7] EN 15746-2, *Railway applications — Track — Road-rail machines and associated equipment — Part 2: General safety requirements*

[8] prEN 15954-1:2009, *Railway applications — Track — Trailers and associated equipment — Part 1: Technical requirements for running and working*

[9] prEN 15954-2:2009, *Railway applications — Track — Trailers and associated equipment — Part 2: General safety requirements*

[10] prEN 15955-1:2009, *Railway applications — Track — Demountable machines and associated equipment — Part 1: Technical requirements for running and working*

[11] prEN 15955-2:2009, *Railway applications — Track — Demountable machines and associated equipment — Part 2: General safety requirements*

[12] EN ISO 11688-2:2000, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 2: Introduction to the physics of low-noise design (ISO/TR 11688-2:1998)*

[13] CEN ISO/TS 15694, *Mechanical vibration and shock — Measurement and evaluation of single shocks transmitted from hand-held and hand-guided machines to the hand-arm system (ISO/TS 15694:2004)*

[14] DIN 6164-1, *DIN-Farbenkarte — System der DIN-Farbenkarte für den 2°-Normalbeobachter*[3)]

[15] EC 222.69.79 in the Eurocolour table

[16] 2002/44/EC, *Directive of the European Parliament and of the Council of 25 June 2002 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration) (sixteenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC)*[4)]

3) May be purchased from: Beuth Verlag GmbH, D-10772 Berlin.

4) Official Journal of the European Communities No L 177 of 06.07.2002.

[17] 2003/10/EC, *Directive of the European Parliament and of the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise) (Seventeenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC)*[5)]

[18] 2004/26/EC, *Directive of the European Parliament and of the Council of 21 April 2004 amending Directive 97/68/EC on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery*[6)]

[19] Eurocolor-System auf der farbmetrischen Grundlage des CIELAB-Systems or DIN 6174, Schwabenmuster eurocolorcard

[20] NCS-Natural Colour System according to Swedish standard SS 019100/01/02/03[7)]

5) Official Journal of the European Communities No L 42 of 15.02.2003.

6) Official Journal of the European Communities No L 146/1 of 30.04.04.

7) May be purchased from: SKANDINAVISKA FÄRGINSTITUTET AB, SCANDINAVIAN COLOUR INSTITUTE AB, Igeldammsgaten 30, S-10028 Stockholm.

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