

BS EN 16191:2014



BSI Standards Publication

Tunnelling machinery — Safety requirements

bsi.

...making excellence a habit.TM

This is a preview. Click here to purchase the full publication.

National foreword

This British Standard is the UK implementation of EN 16191:2014. It supersedes BS EN 12336:2005+A1:2008 and BS EN 815:1996+A2:2008 which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/513, Construction equipment and plant and site safety.

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.

© The British Standards Institution 2014.
Published by BSI Standards Limited 2014

ISBN 978 0 580 73023 8
ICS 91.220; 93.060

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2014.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 16191

May 2014

ICS 91.220; 93.060

Supersedes EN 12336:2005+A1:2008, EN
815:1996+A2:2008

English Version

Tunnelling machinery - Safety requirements

Tunneliers - Prescriptions de sécurité

Tunnelbaumaschinen - Sicherheitstechnische
Anforderungen

This European Standard was approved by CEN on 10 April 2014.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
 COMITÉ EUROPÉEN DE NORMALISATION
 EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

	Page
Contents	
Foreword	5
Introduction	6
1 Scope	7
2 Normative references	7
3 Terms and definitions	10
4 List of significant hazards	12
5 Safety requirements and/or protective measures	14
5.1 General	14
5.2 Specific requirements	14
5.2.1 Sharp corners and edges	14
5.2.2 Hot surfaces	14
5.2.3 Hydraulic hoses, installation and shielding	14
5.2.4 Cutter head	14
5.2.5 Handling of heavy loads	15
5.2.6 Rotation and displacement (axial movement)	16
5.2.7 Structural collapse of the shield	16
5.2.8 Air locks	16
5.2.9 Rock bolting devices	17
5.2.10 Access to and egress from operating positions and servicing points	17
5.2.11 Protection against falling objects, face collapse, rockfall and flood	18
5.2.12 Pipe jacking rigs	18
5.3 Control stations	19
5.3.1 General	19
5.3.2 Ergonomics	19
5.3.3 Visibility	19
5.4 Guards and protective devices	19
5.4.1 General	19
5.4.2 Design of guards	19
5.4.3 Belt conveyor	19
5.4.4 Access to excavation chamber, cutter head or other digging equipment	19
5.4.5 Auger extensions during jacking operations	20
5.5 Control systems	20
5.5.1 Safety and reliability of control systems	20
5.5.2 Control devices	21
5.5.3 Remote control	21
5.5.4 Starting and stopping	22
5.5.5 Warning system	22
5.5.6 Failure of power supply	23
5.6 Towing connection	24
5.7 Laser guidance	24
5.8 Ventilation and the control of dust and gas	24
5.8.1 General	24
5.8.2 Dust control	25
5.8.3 Ventilation	25
5.8.4 Atmospheric changes and ingress of gases	25
5.8.5 Internal combustion engines	26
5.9 Noise	26
5.9.1 General	26
5.9.2 Noise reduction at source at the design stage	26
5.9.3 Information on residual risk	27

5.10 Electrical equipment.....	27
5.10.1 General.....	27
5.10.2 Protective measures.....	27
5.10.3 Cables	28
5.10.4 Transformers.....	28
5.10.5 Bonding	28
5.10.6 Switch gear.....	28
5.10.7 Lighting.....	28
5.10.8 Emergency lighting	29
5.10.9 Electromagnetic compatibility (EMC)	29
5.10.10 Isolation of high voltage power supply	29
5.11 Hydraulic and pneumatic systems	29
5.12 Fire prevention and protection.....	30
5.12.1 General.....	30
5.12.2 Fixed fire extinguishing systems	30
5.12.3 Installation of portable fire extinguishers	30
5.12.4 Water curtain on towed back-up equipment.....	30
5.13 Storage of rescue equipment	30
5.14 Refuge chamber.....	31
5.15 Probe drilling equipment	31
5.16 Transportation, lifting and assembly.....	31
5.16.1 Transportation	31
5.16.2 Lifting	31
5.16.3 Assembly	31
5.17 Maintenance	31
5.17.1 General.....	31
5.17.2 Work on cutter heads or shield-mounted cutter booms and excavators	31
5.17.3 Work on micro tunnelling machines.....	32
6 Verification of the safety requirements and/or protective measures.....	32
7 Information for use	32
7.1 General.....	32
7.2 Emergency information, warning signs and symbols	32
7.2.1 Warning signs	32
7.2.2 Warning devices	32
7.2.3 Symbols	32
7.2.4 Emergency information.....	32
7.3 Instruction handbook	33
7.3.1 General.....	33
7.3.2 Operating instructions	34
7.3.3 Maintenance	35
7.4 Marking	35
Annex A (informative) Examples of tunnelling machines	37
Annex B (normative) Verification of safety requirements and/or protective measures.....	41
Annex C (normative) Noise test code	45
C.1 Scope	45
C.2 A-weighted emission sound pressure levels at working areas	45
C.3 Installation and operating conditions.....	46
C.4 Information to be recorded and reported.....	46
C.5 Declaration noise emission values	46
Annex D (normative) Minimum requirements for refuge chamber.....	47
D.1 General.....	47
D.2 Concept and design	47

D.3	Air supply	47
D.4	Visual identification	48
D.5	Power supply.....	48
D.6	Interior equipment	48
D.7	Instruction manual.....	48
	Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC	49
	Bibliography	50