



SLOVENSKI STANDARD
SIST EN 1804-3:2006+A1:2010
01-marec-2010

**Stroji za podzemne rudnike - Varnostne zahteve za hidravlično podporje - 3. del:
Hidravlični krmilni sistemi**

Machines for underground mines - Safety requirements for hydraulic powered roof supports - Part 3: Hydraulic control systems

Maschinen für den Bergbau unter Tage - Sicherheitsanforderungen an hydraulischen Schreitausbau - Teil 3: Hydraulische Steuerungen

Machines pour mines souterraines - Exigences de sécurité concernant les soutènements marchants applicables aux piles - Partie 3: Systèmes de commande hydrauliques

<https://standards.iteh.ai/catalog/standards/sist/9e7488f8-bda2-41a3-a75b-853e0c2b14ad/sist-en-1804-3-2006a1-2010>

Ta slovenski standard je istoveten z: EN 1804-3:2006+A1:2010

ICS:

73.100.10 Oprema za gradnjo predorov Tunnelling and tubbing
in podzemnih železnih equipment

SIST EN 1804-3:2006+A1:2010

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 1804-3:2006+A1:2010

<https://standards.iteh.ai/catalog/standards/sist/9e7488f8-bda2-41a3-a75b-853e0c2b14ad/sist-en-1804-3-2006a1-2010>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1804-3:2006+A1

January 2010

ICS 73.100.10

Supersedes EN 1804-3:2006

English Version

Machines for underground mines - Safety requirements for hydraulic powered roof supports - Part 3: Hydraulic control systems

Machines pour mines souterraines - Exigences de sécurité concernant les soutènements marchants applicables aux piles - Partie 3: Systèmes de commande hydrauliques

Maschinen für den Bergbau unter Tage - Sicherheitsanforderungen an hydraulischen Schreitausbau - Teil 3: Hydraulische Steuerungen

This European Standard was approved by CEN on 21 September 2004 and includes Amendment 1 approved by CEN on 21 December 2009.

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 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 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	4
Introduction	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 List of hazards.....	8
5 Safety requirements	10
5.1 General requirements.....	10
5.1.1 General.....	10
5.1.2 Hazard areas.....	10
5.1.3 Arrangement of the control devices	10
5.1.4 Dead man's control.....	10
5.1.5 Automatic hydraulic control system.....	10
5.1.6 Automatic guaranteed setting control.....	10
5.1.7 Shut-off devices	10
5.1.8 Pressure indicator	10
5.1.9 Pipe and hose assemblies	10
5.1.10 Hydraulic fluids	11
5.1.11 Lifting points	11
5.2 Design requirements	12
5.2.1 Protection against ejected fluids	12
5.2.2 Roof contact advance	12
5.2.3 Pressure limiting.....	12
5.2.4 Interruption of the operating pressure	12
5.2.5 Travel speeds	12
5.2.6 Actuating forces.....	12
5.2.7 Resistance to back pressure	12
5.2.8 Adjustable valves.....	12
5.3 Requirements of type A valves	12
5.3.1 General.....	12
5.3.2 Leaktightness.....	12
5.3.3 Yield pressure	13
5.3.4 Opening pressure	13
5.3.5 Closing pressure.....	13
5.3.6 Pressure pulses	13
5.3.7 Impact resistance.....	13
5.3.8 Pressure flow behaviour	13
5.3.9 Operating reliability	13
5.3.10 Temperature effects	13
5.3.11 Resistance to back pressure	13
5.4 Requirements for type B and C valves.....	13
5.4.1 General.....	13
5.4.2 Leaktightness.....	13
5.4.3 Resistance to pressure	14
5.4.4 Switching behaviour.....	14
5.4.5 Operating reliability	14
5.4.6 Resistance to back pressure	14
5.5 Requirements for type D valves	14
5.6 Materials	14

5.6.1	Metallic materials.....	14
5.6.2	Light metal	14
5.6.3	Other materials	14
5.6.4	Seals	14
6	Verification of the safety requirements.....	15
6.1	Type testing	15
6.2	Additional tests.....	15
7	User Information.....	17
7.1	General requirements	17
7.2	Technical and application data	17
7.2.1	Introduction.....	17
7.2.2	General description.....	17
7.2.3	Performance data	17
7.2.4	Hydraulic data.....	17
7.2.5	List of additional drawings and documents	17
7.3	Handling, transport and storage.....	18
7.3.1	Introduction.....	18
7.3.2	Handling and transport.....	18
7.3.3	Storage	18
7.4	Installation and commissioning.....	18
7.4.1	Installation.....	18
7.4.2	Commissioning.....	18
7.5	Operation.....	18
7.6	Maintenance.....	19
7.6.1	Introduction.....	19
7.6.2	Technical description.....	19
7.6.3	Maintenance instructions.....	19
7.6.4	Fault diagnosis and correction.....	19
7.6.5	Preventative maintenance schedules	19
7.7	Parts identification lists.....	19
7.8	Marking.....	19
7.9	Residual risks	20
Annex A	(normative) Tests for verification of the safety requirements.....	21
A.1	Load tests.....	21
A.1.1	General	21
A.1.2	Lifting points.....	21
A.1.3	Testing of type A valves	21
A.1.4	Testing of type B valves	26
A.1.5	Testing of type C valves	29
A.1.6	Testing of type D valves	30
Annex B	(normative) Deviations from EN 982:1996	31
B.1	General	31
B.2	5.1.7 (EN 982:1996)	31
B.3	5.3.4.1.3 Contamination control (EN 982:1996)	32
B.4	5.3.4.3.2 Failure (EN 982:1996)	32
B.5	5.3.6 Sequence control (EN 982:1996).....	32
B.6	7.3.4.1 Non-electrical control mechanisms (EN 982:1996).....	32
Annex ZA	(informative) ZA Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC ZA	33
Bibliography	34

EN 1804-3:2006+A1:2010 (E)**Foreword**

This document (EN 1804-3:2006+A1:2010) has been prepared by Technical Committee CEN/TC 196 "Machines for underground mines - Safety", 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 July 2010, and conflicting national standards shall be withdrawn at the latest by July 2010.

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 includes Amendment 1, approved by CEN on 2009-12-21.

This document supersedes EN 1804-3:2006.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**.

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.

This document is Part 3 of a European Standard specifying the safety requirements for hydraulic control systems.

The other parts are:

Part 1: Support units and general requirements

Part 2: Power set legs and rams

Part 4¹: Electro-hydraulic control systems

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 United Kingdom.

¹ In preparation

Introduction

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

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

When 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.

The extent to which hazards are covered is indicated in the scope of this document. While preparing this document, it was assumed that:

- only trained and competent persons operate the machine;
- components without specific requirements are:
 - a) designed in accordance with the usual engineering practice and calculation code;
 - b) of sound mechanical construction;
 - c) free of defects;
- components are kept in good working order;
- a negotiation took place between the user and the manufacturer concerning the use of the machinery.

ITEH STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 1804-3:2006+A1:2010

<https://standards.iteh.ai/catalog/standards/sist/9e7488f8-bda2-41a3-a75b-853e0c2b14ad/sist-en-1804-3-2006a1-2010>

EN 1804-3:2006+A1:2010 (E)**1 Scope**

This document specifies the safety requirements for hydraulic control devices, including hydraulic valves and their control elements, valve combinations, control systems, pipes and hose assemblies, fittings, shut-off devices, measuring devices, filters, built-in pressure limiting and check valves in legs and rams and water spraying and dust suppression valves when used as specified by the manufacturer or his authorized representative. Excluded are electronic control devices, pressure generators, and internal valves of legs and rams (e.g. constant yield valves, see EN1804-2).

Some components are dealt with in other parts of this standard.

NOTE prEN1804-4 also applies to electro-hydraulic control devices. Part 4 also contains requirements for electrical control elements of valves.

This document applies to hydraulic control devices at ambient temperatures from $-10\text{ }^{\circ}\text{C}$ to $60\text{ }^{\circ}\text{C}$.
This document identifies and takes into account:

- possible hazards which may be caused by the operation of hydraulic control devices;
- areas and operating conditions which may create such hazards;
- hazardous situations which may cause injury or may be damaging to health;
- hazards which may be caused by firedamp and/or combustible dusts.

This document describes methods for the reduction of these hazards.

A list of significant hazards covered appears in clause 4.

This document is applicable to all hydraulic control devices placed on the market for the first time after the date of issue of this standard.

This document does not specify any additional requirements for:

- use in particularly corrosive environments;
- hazards occurring during construction, transportation, decommissioning;
- earthquakes.

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 853, *Rubber hoses and hose assemblies — Wire braid reinforced hydraulic type — Specification*

EN 854, *Rubber hoses and hose assemblies — Textile reinforced hydraulic type — Specification*

EN 855, *Plastic hoses and hose assemblies — Thermoplastics textile reinforced hydraulic type — Specification*

EN 856, *Rubber hoses and hose assemblies — Rubber-covered spiral wire reinforced hydraulic type — Specification*

EN 857, *Rubber hoses and hose assemblies — Wire braid reinforced compact type for hydraulic applications — Specification*

EN 982:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 1050:1996, *Safety of machinery — Principles for risk assessment*

EN 1804-1:2001, *Machines for underground mines — Safety requirements for hydraulic powered roof supports — Part 1: Support units and general requirements*

EN 1804-2:2001, *Machines for underground mines — Safety requirements for hydraulic powered roof supports — Part 2: Power set legs and rams*

prEN 1804-4:2004, *Machines for underground mines — Safety requirements for hydraulic powered roof supports — Part 4: Electro-hydraulic control systems*

EN 13463-1:2001, *Non-electrical equipment for potentially explosive atmospheres — Part 1: Basic method and requirements*

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 6743-4:2001, *Lubricants, industrial oils and related products (class L) — Classification — Part 4: Family H (Hydraulic systems) (ISO 6743-4:1999)*.

ISO 1219-1 *Fluid power systems and components — Graphic symbols and circuit diagrams — Part 1: Graphic symbols*

ISO 6805:1994, *Rubber hoses and hose assemblies for underground mining — Wire-reinforced hydraulic types for coal mining — Specification*

ISO 7745:1989 *Hydraulic fluid power — Fire-resistant (FR) fluids — Guidelines for use*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1804-1:2001, EN 1804-2:2001, prEN 1804-4:2004 and the following apply:

3.1

hydraulic control devices

system required to control all the functions of the hydraulic powered roof supports

3.2

pressures

3.2.1

maximum permissible working pressure

maximum hydraulic pressure at which a hydraulic component may be operated (see EN 1804-2:2001)

3.2.2

setting pressure

hydraulic pressure in the legs and support rams on completion of the setting procedure. This pressure is supplied by the hydraulic system (see EN 1804-2:2001)

3.2.3

yield pressure of a pressure limiting valve

nominal hydraulic pressure to which a pressure limiting valve is adjusted and at which it should operate (see Figure A.2 and 5.3.3)

3.2.4

opening pressure of a pressure limiting valve

hydraulic pressure at which a valve begins to open and hydraulic fluid is passing through it (see Figure A.2 and 5.3.4)

EN 1804-3:2006+A1:2010 (E)**3.2.5****closing pressure**

pressure at which the valve is closed and the flow of hydraulic fluid is shut off (see Figure A.2 and 5.3.5)

3.3**valves**

devices for controlling the hydraulic functions (see EN 1804-2:2001)

3.3.1**type A valves**

(pressure limiting valves) limit the internal hydraulic pressure of actuators

3.3.2**type B valves**

(e.g. check valves) shut off the hydraulic fluid directly from the actuators

3.3.3**type C valves**

(e.g. directional control valves) in their neutral position, block off the supply pressure to the actuators. When these valves are operated, the hydraulic fluid is switched to the actuators or is used to control other valves

3.3.4**type D valves**

all those valves that cannot be classified specifically in one of the types A to C. These may be special types of valves or integrated types (e.g. valve combinations and control systems)

3.4**types of control systems**

ITeH STANDARD PREVIEW
(standards.iteh.ai)

3.4.1**adjacent control system**

type of control system in which the individual functions of one support unit are manually operated from an adjacent support unit

SIST EN 1804-3:2006+A1:2010

https://standards.iteh.ai/en/standards/SIST-EN-1804-3-2006+A1-2010

853e0c2b14ad/sist-en-1804-3-2006a1-2010

3.4.2**unit sequence control system**

control system in which a functional sequence, (e.g. lowering - advancing - setting) operates in one single support unit

3.4.3**automatic guaranteed setting control**

type of control system where the setting function of legs and/or support rams is operated automatically, at least until the rated value of the setting pressure of legs and/or support rams in the support unit has been attained

3.5**pushbutton override control (dead man's control)**

function that remains active for as long a pushbutton is pressed

3.6**intended roof support yield parameters**

parameter of the valves that is maintained at the intended yield of the hydraulic roof support

4 List of hazards

The following list of hazards relates in all points to continuous operation and to installation and maintenance.

This list contains the 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 with cross-references to corresponding requirements

No. acc. to EN 1050:1996	Hazards	Essential requirements of Directive 98/37/EC Annex 1	Relevant clause/subclause of this document
1	Mechanical hazards due to: - machine parts or work pieces, e.g. - accumulation of energy inside the machinery, e.g.:		
1.1	Crushing hazard	1.3	5.1.2, 5.2.5, 5.4, 5.5
1.2	Shearing hazard		5.1.2, 5.2.5, 5.4, 5.5
1.3	Cutting or severing hazard		5.1.2, 5.2.5, 5.4, 5.5
1.9	High pressure fluid injection or ejection hazard	1.3.2	5.1.3, 5.1.9, 5.2.1, 5.3, 5.4, 5.5
2	Electrical hazards due to:		
2.4	Electrostatic phenomena	1.5.2	5.6
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	1.1.3, 1.5.13, 1.6.5	5.2.2
7.2	Fire or explosion hazard	1.5.6, 1.5.7	5.1.10, 5.6
8	Hazards generated by neglecting ergonomic principles in machinery design, e.g. hazards from:		
8.1	Unhealthy postures or excessive effort	1.1.2d, 1.1.5, 1.6.2, 1.6.4	5.1.3, 5.2.6
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	1.1.2d, 2.2	5.1.3, 5.2.6
8.3	Neglected use of personal protection equipment	1.1.2e	5.2.1, 5.2.8, 5.3, 5.4, 5.5
10	Unexpected start-up, unexpected overrun/overspeed (or any similar malfunction) from:		5.1.4, 5.1.6, 5.2.7, 5.2.8, 5.3, 5.4, 5.5, 5.6
13	Failure of the power supply	1.2.6	5.2.4
17	Falling or ejected objects or fluids	1.3.3	5.1.9, 5.2.3, 5.3, 5.4, 5.5, 5.6
26	Insufficient instructions for the driver/operator	3.6	5.1.3, 5.1.6, 5.1.8, 5.2.5
27	Mechanical hazards and hazardous events		
27.4	From insufficient mechanical strength of parts	4.1.2.3	5.2.3, 5.3, 5.4, 5.5, 5.6
27.8	From abnormal conditions of assembly/testing/use/maintenance	4.4.1, 4.4.2d	5.1.11
34	Mechanical hazards and hazardous events due to:		
34.1	Inadequate mechanical strength – inadequate working coefficients	6.1.2	5.2.3, 5.3, 5.4, 5.5, 5.6
	Absence or incorrect installation of starting and stopping devices		5.1.4, 5.1.5
	Absence or incorrect installation of power supply shut-off devices		5.1.7

EN 1804-3:2006+A1:2010 (E)**5 Safety requirements****5.1 General requirements****5.1.1 General**

Hydraulic control systems of hydraulic roof supports shall comply with the safety requirements of EN 982 except for the deviations listed in normative Annex B.

Hydraulic control systems of hydraulic powered roof supports which are designed according to this part of EN 1804 shall also meet the requirements of the other parts of EN 1804, if relevant.

Hydraulic control systems of hydraulic powered roof supports should comply as appropriate with EN ISO 12100-1:2003 and EN ISO 12100-2:2003 for hazards which are not covered in this document.

5.1.2 Hazard areas

Hydraulic control devices shall be designed and positioned so that it is not necessary for personnel to be located in the area of the operated support units. (e.g. by operating with adjacent control system according to 3.3.1)

5.1.3 Arrangement of the control devices

Hydraulic control devices shall be designed and located so that they cannot be operated unintentionally from the travel way. They shall not restrict the travel way (see 5.1.1 of EN 1804-1:2001). Information and warning devices (e.g. symbols, pressure indicators) shall be arranged so that they are clearly visible from the travel way.

5.1.4 Dead man's control

The controls for operating the individual functions to move the hydraulic powered support (lowering, advancing, setting) shall interrupt the movement when the control is released. This also applies to other individual functions which may lead to the narrowing of the travel way and/or the alignment functions.

5.1.5 Automatic hydraulic control system

The automatic hydraulic control system shall control the movement of the hydraulic powered supports (lowering, advancing and setting) only if they are fitted with pre-start warning and emergency stop devices. This also applies to other automatically hydraulic controlled functions which may lead to the narrowing of the travel way. Excluded from this requirement is the automatic guaranteed setting control.

5.1.6 Automatic guaranteed setting control

The automatic guaranteed setting control shall not come into operation until a minimum pressure of 80 MPa (bar) is reached in the leg. The automatic guaranteed setting control shall be capable of being switched off.

5.1.7 Shut-off devices

It shall be possible to isolate each support unit from the hydraulic pressure supply.

5.1.8 Pressure indicator

Hydraulic circuits of each leg of the support unit shall be fitted with a device indicating the pressure in the leg.

5.1.9 Pipe and hose assemblies

Pipe and hose assemblies for hydraulic control systems of hydraulic roof supports shall be designed to withstand the maximum permissible working pressure in that system.

Hose assemblies shall meet either conditions a) or b) as follows: