



# SLOVENSKI STANDARD

## SIST EN 50436-3:2017

01-februar-2017

Nadomešča:

SIST-TP CLC/TR 50436-3:2011

---

### Alkoholne zapore - Preskusne metode in zahtevane lastnosti - 3. del: Navodilo za upravne organe, nosilce odločanja, kupce in uporabnike

Alcohol interlocks - Test methods and performance requirements - Part 3: Guidance for authorities, decision makers, purchasers and users

Alkohol-Interlocks - Prüfverfahren und Anforderungen an das Betriebsverhalten Teil 3: Leitfaden für Behörden, Entscheider, Käufer und Nutzer

Alcootests électroniques anti-démarrage - Méthodes d'essai et exigences de performance - Partie 3: Lignes directrices pour décideurs, acheteurs et utilisateurs

Ta slovenski standard je istoveten z: **EN 50436-3:2016**

---

#### **ICS:**

13.200	Preprečevanje nesreč in katastrof	Accident and disaster control
43.040.80	Sistemi za zaščito pri trku in sistemi za zadrževanje potnikov	Crash protection and restraint systems

**SIST EN 50436-3:2017**

**en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 50436-3:2017](#)

<https://standards.iteh.ai/catalog/standards/sist/dfae7fdb-6374-4119-8fb6-9e8d2455a6a0/sist-en-50436-3-2017>

EUROPEAN STANDARD

**EN 50436-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2016

ICS 71.040.40; 43.040.10

Supersedes CLC/TR 50436-3:2010

English Version

## Alcohol interlocks - Test methods and performance requirements - Part 3: Guidance for authorities, decision makers, purchasers and users

thylotests antidémarrage - Méthodes d'essais et exigences de performance - Partie 3 : Document d'orientation pour les autorités, les décideurs, les acheteurs et les utilisateurs

Alkohol-Interlocks - Prüfverfahren und Anforderungen an das Betriebsverhalten - Teil 3: Leitfaden für Behörden, Entscheider, Käufer und Nutzer

This European Standard was approved by CENELEC on 2016-10-31. CENELEC 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 CENELEC 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 CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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

<b>Contents</b>	<b>Page</b>
European foreword.....	5
Introduction.....	6
<b>1 Scope.....</b>	<b>7</b>
<b>2 Normative references.....</b>	<b>7</b>
<b>3 Terms and definitions .....</b>	<b>8</b>
<b>4 Application of alcohol interlocks as a road safety measure .....</b>	<b>10</b>
<b>4.1 General.....</b>	<b>10</b>
<b>4.2 Primary preventive application.....</b>	<b>10</b>
<b>4.3 Secondary preventive application.....</b>	<b>11</b>
<b>5 Application of alcohol interlocks for automatic access control.....</b>	<b>11</b>
<b>6 Introduction of alcohol interlocks for commercial and professional use .....</b>	<b>12</b>
<b>6.1 Alcohol interlocks, a way to ensure quality .....</b>	<b>12</b>
<b>6.2 International Standard ISO 39001.....</b>	<b>12</b>
<b>6.3 Systematic procedures to introduce alcohol interlocks .....</b>	<b>12</b>
<b>6.4 Dialogue with unions or other representatives .....</b>	<b>13</b>
<b>6.5 Dealing with alcohol problems.....</b>	<b>14</b>
<b>7 Alcohol interlocks in drink driving offender programmes .....</b>	<b>14</b>
<b>7.1 Overview .....</b>	<b>14</b>
<b>7.2 Participation rate.....</b>	<b>15</b>
<b>8 Criteria for selection .....</b>	<b>15</b>
<b>8.1 Approvals and performance testing .....</b>	<b>15</b>
<b>8.1.1 EMC legislation.....</b>	<b>15</b>
<b>8.1.2 Performance standards .....</b>	<b>16</b>
<b>8.2 Breath alcohol measurement techniques.....</b>	<b>17</b>
<b>8.2.1 General .....</b>	<b>17</b>
<b>8.2.2 Electrochemical sensors .....</b>	<b>17</b>
<b>8.2.3 Semiconductor sensors .....</b>	<b>18</b>
<b>8.2.4 Optical sensors .....</b>	<b>18</b>
<b>8.3 Quality demands and choice of products .....</b>	<b>18</b>
<b>8.4 Parameter settings.....</b>	<b>20</b>
<b>8.4.1 Alcohol concentration limit .....</b>	<b>20</b>
<b>8.4.2 Other parameters .....</b>	<b>20</b>
<b>8.5 Circumvention, manipulation and tampering .....</b>	<b>21</b>
<b>8.6 Data memory, download and analysis.....</b>	<b>22</b>

<b>9</b>	<b>Installation in vehicles .....</b>	<b>22</b>
<b>9.1</b>	<b>General.....</b>	<b>22</b>
<b>9.2</b>	<b>Instructions for installation.....</b>	<b>22</b>
<b>9.3</b>	<b>Criteria for placement.....</b>	<b>23</b>
<b>10</b>	<b>Use.....</b>	<b>24</b>
<b>10.1</b>	<b>Education and information for the user.....</b>	<b>24</b>
<b>10.2</b>	<b>Instructions for use .....</b>	<b>25</b>
<b>10.3</b>	<b>Environmental conditions.....</b>	<b>26</b>
<b>10.4</b>	<b>Override function .....</b>	<b>26</b>
<b>10.4.1</b>	<b>Override function for emergency situations .....</b>	<b>26</b>
<b>10.4.2</b>	<b>Override function for technical service .....</b>	<b>26</b>
<b>10.5</b>	<b>Retest function.....</b>	<b>26</b>
<b>10.6</b>	<b>Change driver function.....</b>	<b>27</b>
<b>10.7</b>	<b>Effects of mouth alcohol and environmental contamination .....</b>	<b>27</b>
<b>10.8</b>	<b>Interfering substances .....</b>	<b>28</b>
<b>11</b>	<b>Maintenance.....</b>	<b>28</b>
<b>11.1</b>	<b>Training.....</b>	<b>28</b>
<b>11.2</b>	<b>Periodic inspection, functional tests and calibration .....</b>	<b>28</b>
<b>11.3</b>	<b>Instructions for service .....</b>	<b>28</b>
<b>12</b>	<b>Removal .....</b>	<b>29</b>
<b>13</b>	<b>Conclusion.....</b>	<b>29</b>
<a href="https://standards.iteh.ai/catalog/standards/sist/dfae7fdb-6374-4119-8fb6-9e8d2455a6a0/sist-en-50436-3-2017">https://standards.iteh.ai/catalog/standards/sist/dfae7fdb-6374-4119-8fb6-9e8d2455a6a0/sist-en-50436-3-2017</a>		
<b>Annex A (informative) Questions and answers .....</b>		
<b>A.1</b>	<b>What is an alcohol interlock ?.....</b>	<b>30</b>
<b>A.2</b>	<b>Where are alcohol interlocks used ?.....</b>	<b>30</b>
<b>A.3</b>	<b>Is it difficult to install an alcohol interlock ? .....</b>	<b>30</b>
<b>A.4</b>	<b>Is it possible to install an alcohol interlock in motorcycles ? .....</b>	<b>30</b>
<b>A.5</b>	<b>Can an alcohol interlock be circumvented ?.....</b>	<b>30</b>
<b>A.6</b>	<b>Can a sober person blow into the alcohol interlock to allow an impaired person to drive ?.....</b>	<b>30</b>
<b>A.7</b>	<b>Do alcohol interlocks detect tampering or attempts to bypass them ?.....</b>	<b>31</b>
<b>A.8</b>	<b>Can any person use a car with an alcohol interlock ? .....</b>	<b>31</b>
<b>A.9</b>	<b>Is it necessary to deliver a breath test after a short stop ? .....</b>	<b>31</b>
<b>A.10</b>	<b>What is a retest ?.....</b>	<b>31</b>
<b>A.11</b>	<b>Is it dangerous to deliver a retest during driving ? .....</b>	<b>31</b>
<b>A.12</b>	<b>Should an alcohol interlock be calibrated regularly ?.....</b>	<b>31</b>
<b>A.13</b>	<b>What happens if the alcohol interlock is defective ? Can the motor then be started ?.....</b>	<b>31</b>
<b>A.14</b>	<b>What happens if the alcohol interlock becomes defective while the motor is running ? .....</b>	<b>32</b>
<b>A.15</b>	<b>Can a sober person have a positive test result ? .....</b>	<b>32</b>
<b>A.16</b>	<b>How long does it take until residual mouth alcohol disappears ?.....</b>	<b>32</b>

## EN 50436-3:2016 (E)

<b>A.17 What happens if a person has taken medicines containing alcohol ? .....</b>	<b>33</b>
<b>A.18 How effective are alcohol interlocks in preventing (repeat) drink driving ? .....</b>	<b>33</b>
<b>A.19 Can alcohol dependent drivers benefit from alcohol interlocks ? .....</b>	<b>33</b>
<b>A.20 Are there further beneficial effects apart from road safety ? .....</b>	<b>33</b>
<b>Annex B (informative) Items to be considered when selecting an alcohol interlock .....</b>	<b>34</b>
<b>Annex C (informative) Description of basic parameter settings.....</b>	<b>35</b>
<b>Annex D (informative) Basic steps of a drink-driving-offender programme .....</b>	<b>39</b>
<b>Bibliography.....</b>	<b>44</b>
<b>Tables</b>	
<b>Table C.1 – Summary of typical parameter settings of alcohol interlocks .....</b>	<b>35</b>
<b>Table D.1 – Summary of typical steps of drink-driving-offender programme .....</b>	<b>39</b>

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 50436-3:2017](https://standards.iteh.ai/catalog/standards/sist/dfae7fdb-6374-4119-8fb6-9e8d2455a6a0/sist-en-50436-3-2017)

<https://standards.iteh.ai/catalog/standards/sist/dfae7fdb-6374-4119-8fb6-9e8d2455a6a0/sist-en-50436-3-2017>

## European foreword

This document (EN 50436-3:2016) has been prepared by CLC/BTTF 116-2 "Alcohol interlocks".

The following dates are fixed:

- latest date by which this document (dop) [2017-10-31]  
has to be implemented  
at national level by publication of an identical  
national standard or by endorsement
- latest date by which the national standards (dow) [2019-10-31]  
conflicting with this document  
have to be withdrawn

This document supersedes CLC/TR 50436-3:2010.

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

EN 50436-3:2016 includes the following significant technical changes with respect to CLC/TR 50436-3:2010:

- Clause 3: definitions are added for primary prevention and secondary prevention.
- Clause 4: this clause has been revised including primary prevention and secondary prevention.
- Clause 5: the former content for automatic access control is now in a separate clause.
- Subclause 6.2: the chapter on International Standard ISO 39001 is added.
- Clause 7: the chapter on alcohol interlocks in drink driving offender programmes is added.
- Subclause 8.1: the text is updated with respect to the current legislation.
- Informative Annex C with a description of basic parameter settings is added.
- Informative Annex D with a description of basic steps of a drink driving offender programme is added.

## Introduction

According to the European Transport Safety Council (ETSC), in about a quarter of the fatal accidents that occur in traffic on European roads, alcohol impairment has been a contributory factor. Drink-driving is found in all social classes and professional categories, often without their families, friends, colleagues or supervisors knowing about it. In those cases where there actually is an awareness, it is often difficult to know how to act or confront the problem. A strategy has been drawn up within the European Commission to decrease alcohol related injuries as well as to support countries that are working in different ways to tackle the problem of drink-driving.

One strategy to decrease alcohol-related accidents is to implement the use of alcohol interlocks. The main purpose of alcohol interlocks is to prevent persons with breath alcohol concentrations exceeding a set limit value from driving a vehicle.

The use of alcohol interlocks in the vehicles of drink-driving offenders was started in the USA in 1985 and followed a few years later in Canada. From the end of the 1990s, the use of alcohol interlocks has spread worldwide, especially in Australia and several European countries. In Sweden, offender programmes started in 1999, followed closely by the use of alcohol interlocks for quality assurance of transportation. Further examples for the implementation of alcohol interlocks saving human lives every year in Europe are Finland, France and the Netherlands. A continuously updated overview is published by ETSC ([www.etsc.eu](http://www.etsc.eu)).

There are several areas in which alcohol interlocks may be used:

- installed in a vehicle as a general preventive measure for the promotion of traffic safety; or
- in vehicles as ordered by a court or an administrative authority as part of a drink-driving offender programme; or
- for persons subject to a medical or rehabilitation programme; or
- as a safety measure for the access to machinery or certain restricted areas.

This guidance for authorities, governments, political decision makers, transport companies, purchasers, unions and users contains numerous recommendations for those interested in the use of alcohol interlocks. However, it is not mandatory and it does not contain any requirements.

This European Standard is part of a series of European Standards which mainly describe test methods and requirements for alcohol interlocks. It is assumed that the recommendations given in this document are used for alcohol interlocks fulfilling the requirements of one or more of the performance standards of this series.

## 1 Scope

An alcohol interlock is a system comprising a breath alcohol measuring instrument and an immobiliser which may be easily installed in motor vehicles as passenger cars, coaches, taxis, hazardous goods transporters, lorries, trams, trains, motorcycles, boats, or snow mobiles. Before the vehicle motor can be started or the vehicle can be moved, a breath sample needs to be provided to the alcohol interlock, normally through a mouthpiece. Once the breath alcohol measurement has been performed, the alcohol interlock will prevent drivers from starting the motor if they have an alcohol concentration above a predetermined limit value. This limit may be set at the legal limit of a respective country or lower.

Alcohol interlocks that meet the relevant European Standards detect, for example, if the sample is delivered by a human being. They are also capable of preventing and detecting tampering with the instrument.

Additional parts of the system may include identity checking or recording mechanisms.

The purpose of this European Standard is to give practical guidance for selection, installation, use and maintenance of alcohol interlocks. It is directed to all those who have an interest in alcohol interlocks as well as companies selling and installing alcohol interlocks, purchasers and users for commercial, professional or private use. The European Standard gives information about the alcohol interlock and how it is to be used.

This European Standard describes alcohol interlocks for use in vehicles as a general preventive measure in traffic safety as well as for use in drink driving offender programmes. However, information provided may also be useful for alcohol interlocks in other applications.

STANDARD PREVIEW

## 2 Normative references (standards.iteh.ai)

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

EN 50436-1:2014, *Alcohol interlocks - Test methods and performance requirements - Part 1: Instruments for drink-driving-offender programs*

EN 50436-2:2014, *Alcohol interlocks - Test methods and performance requirements - Part 2: Instruments having a mouthpiece and measuring breath alcohol for general preventive use*

EN 50436-6:2015, *Alcohol interlocks - Test methods and performance requirements - Part 6: Data security*

NOTE The technology of alcohol interlocks is rapidly evolving, and further innovations can be expected, which could be considered in future amendments or new parts of these European Standards.

ISO 39001:2012, *Road traffic safety (RTS) management systems - Requirements with guidance for use*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions, given in EN 50436-1:2014, apply.

#### 3.1

##### **alcohol interlock**

device which is normally in the blocking state when installed to prevent the starting of the vehicle motor, and which can be brought into the not-blocking state only after the presentation and analysis of a breath sample with an alcohol concentration below a limit value

Note 1 to entry: It normally consists of a handset and a control unit electrically connected to the vehicle.

Note 2 to entry: In this European Standard the expression “starting of the vehicle motor” includes provision of an output signal from the alcohol interlock to the vehicle to enable the starting, operation or movement of the vehicle.

#### 3.2

##### **Breath Alcohol Concentration**

##### **BrAC**

mass concentration of ethanol, expressed in mg/l (milligram ethanol per litre breath air), in a breath sample delivered into an alcohol interlock

#### 3.3

##### **breath sample**

breath air sample taken under forced expiration

#### 3.4

##### **accepted breath sample**

breath sample fulfilling set requirements for volume, flow, exhalation time and other human breath sample characteristics

NOTE 1 to entry: The acceptance of a breath sample is independent from the alcohol concentration.

#### 3.5

##### **breath test**

providing a breath sample to an alcohol interlock

#### 3.6

##### **mouthpiece**

part through which the breath sample is delivered into the alcohol interlock

#### 3.7

##### **blocking state**

state in which the alcohol interlock inhibits the starting of the vehicle motor

#### 3.8

##### **not-blocking state**

state in which the vehicle motor can be started

#### 3.9

##### **breath alcohol concentration limit**

set value of the breath alcohol concentration at or above which the vehicle motor will be prevented from being started

#### 3.10

##### **initial test**

breath test provided before the vehicle motor is started

**3.11****retest**

breath test provided after the vehicle motor has started

NOTE 1 to entry: The retest function is a measure to assist in the detection of circumvention.

**3.12****start period**

time interval after an accepted breath sample with an alcohol concentration below the breath alcohol concentration limit has been delivered, during which the vehicle motor may be started

**3.13****restart period**

time interval after the ignition is switched off during which the vehicle motor may be started again without the delivery of another breath sample

NOTE 1 to entry: This restart period is intended to ensure the drivers ability to restart the vehicle motor after a stall situation.

**3.14****override**

method of allowing the start of the vehicle motor without providing a breath sample

NOTE 1 to entry: The override function is for use in exceptional circumstances only, for example in case of a device malfunction.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

**3.15****bypass**

starting the vehicle motor without providing a breath sample or without engaging the override function

[SIST EN 50436-3:2017](https://standards.iteh.ai/catalog/standards/sist/dfae7fdb-6374-4119-8fb6-9e8d2455a6a0/sist-en-50436-3-2017)

**3.16****tampering**

unauthorised change to or interference with the alcohol interlock or its installation in the vehicle or its functioning

<https://standards.iteh.ai/catalog/standards/sist/dfae7fdb-6374-4119-8fb6-9e8d2455a6a0/sist-en-50436-3-2017>

**3.17****violation**

act of doing something that is not allowed by the rules of a drink-driving-offender programme

**3.18****data memory**

record of breath test results and other events with date and time stored in the internal memory of the alcohol interlock

**3.19****supply voltage**

voltage obtained from the electric power source of the vehicle for operation of the alcohol interlock

**3.20****calibration interval**

time period between calibrations during which the alcohol interlock fulfils the stability requirements for the measurement of the breath alcohol concentration

**3.21****manufacturer**

person or organisation responsible for the design, construction and/or production of the alcohol interlock

**EN 50436-3:2016 (E)****3.22****warm-up time**

duration from power-up of the alcohol interlock until it is ready to accept a breath sample and to fulfil the functional test requirements

**3.23****primary prevention**

prevention of a driver with no current alcohol related driving licence restriction from starting the vehicle motor while under the influence of alcohol

**3.24****secondary prevention**

prevention of a driver with a current alcohol related driving licence restriction from starting the vehicle motor while under the influence of alcohol

**4 Application of alcohol interlocks as a road safety measure****4.1 General**

To date, alcohol interlocks have been applied predominantly in the framework of road safety policies, in the beginning exclusively aimed at the secondary prevention of drink-driving among arrested offenders. In recent years, however, especially in Europe, the primary prevention among commercial, professional and even private drivers has become more and more important.

**4.2 Primary preventive application***Commercial and professional use*

Installing an alcohol interlock as a general preventive measure in vehicles for the safe transport of persons or goods such as hazardous goods transporters, lorries, coaches, taxis, trams, trains, motorcycles, boats, snow mobiles or other modes of transportation can reduce accidents and related downtime. An installation can also improve the image of the transport company by increasing road safety, and improve their customers perception of their own safety. Alcohol interlocks may be used as a transport quality instrument for vehicles operated by companies or authorities. They may also be a requirement of employment within an alcohol policy of a company or authority, where they may be used for compliance monitoring.

Several countries have required legally to install alcohol interlocks in certain vehicles (e.g. buses) as a primary preventive application.

*Private use by the general driving population*

The control of drink-driving behaviour through alcohol interlocks may also be proposed for private use on a personal voluntary decision basis. In private vehicles, boats, snow mobiles or recreational vehicles the voluntary installation of an alcohol interlock as a preventive measure can help to ensure that vehicle drivers are sober. Furthermore, they can offer reassurance to partners or for example to parents whose children may also drive a vehicle. Interlocks may also be applicable with regard to self-control for families who wish to avoid drink driving under any circumstances, or to insurance companies which may allow a reduced insurance premium for drivers, especially young drivers or drivers with a personal history of alcohol problems.

The self-evaluation of alcohol levels is considered as a major factor in the prevention of alcohol related accidents. If alcohol interlocks are installed in private vehicles, then this will provide an additional means for self-evaluation.

*Private use as part of addiction treatment*

In European countries, the number of problem drinkers who voluntarily enter addiction care and have a valid driver's license, is much larger than the number of drink-driving offenders who are eligible to enter a mandatory alcohol interlock programme. These persons are probably higher motivated to use an

alcohol interlock than arrested offenders. Furthermore, the alcohol interlock may be helpful in the process of rehabilitation, both as a diagnostic instrument and as a remedial tool. The type of programme for this category of high-risk drivers shall be more or less similar to an offender programme. This means that the costs will be relatively high compared to the cost of a primary prevention programme which does not need close monitoring. But the cost-benefit rate may be even better than the one associated with offender programmes.

### 4.3 Secondary preventive application

The secondary preventive application of alcohol interlocks always has a more or less mandatory character. Participation in an alcohol interlock programme is ordered by the court or by an administrative body. Target groups may be all offenders or specific groups like offenders with high alcohol concentrations and/or recidivists. Some programmes are called 'voluntary', but generally the only alternatives are license revocation or (extended) suspension.

According to the results of North American and Swedish evaluation studies, alcohol interlocks may reduce repeat drink driving by approximately 75 % when compared to more conventional countermeasures like license suspension or revocation. In addition to road safety effects, evaluation of the Swedish offender programme produced strong indications of a beneficial health effect. Swedish programme participants, in vast majority diagnosed as problem drinker or alcohol-addicted, needed significantly less hospital care than before entering the programme, and also less than a control group with revoked licenses. Furthermore, their number of sick leave days was significantly reduced.

In order to realize long-term effects of offender programmes, the programme duration can be made flexible, depending on the offenders ability to separate drinking from driving. Furthermore, a rehabilitation or driver improvement programme may be integrated into the alcohol interlock programme.

This application requires alcohol interlocks with special capabilities, for example possibilities to request retests after the motor has started and data memory to store all relevant information.

SIST EN 50436-3:2017

## 5 Application of alcohol interlocks for automatic access control

A wider use of alcohol interlocks includes limiting entry to locations for which an alcohol policy or regulation is in place. These locations may include, for example, nuclear power plants, laboratories, factories and gates in harbours or mines. Other stationary or mobile applications may include access control to specialized machinery, cranes or forklifts.

An alcohol interlock is able to control access based on the measured alcohol concentration and could send a notification to security personnel under pre-determined circumstances.

As an integrated device, the alcohol interlock may be used in conjunction with other access control systems such as swipe cards, retinal scanners or PIN control. In these cases, the result of the breath sample could be recorded along with details of the user who provided the breath sample.

Requiring users of machinery to use an alcohol interlock for gaining access to the operation of the machinery would prevent alcohol related damage or injuries.