

## Chlorine

### SECTION 1: Identification of the substance/mixture and of the company/undertaking

#### 1.1. Product identifier

Product form	: Substance
Trade name	: Chlorine
SDS code	: 022
Internal reference no.	: 002847
Chemical description	: Chlorine
CAS-No.	: 7782-50-5
EC-No.	: 231-959-5
EC Index-No.	: 017-001-00-7
Registration-No.	: 01-2119486560-35
Chemical formula	: Cl <sub>2</sub>

#### 1.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	: Industrial and professional. Perform risk assessment prior to use. Contact supplier for more information on uses.
Uses advised against	: Consumer use.

#### 1.3. Details of the supplier of the safety data sheet

Company identification	: Sapio Produzione Idrogeno Ossigeno Srl Via S. Pellico, 48 20900 Monza - ITALIA +39 039 83981   +39 039 836068 <a href="http://www.sapio.it/">http://www.sapio.it/</a> sds@sapio.it
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#### 1.4. Emergency telephone number

Emergency telephone number	: +39 0295705444 (24/7)
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### SECTION 2: Hazards identification

#### 2.1. Classification of the substance or mixture

##### Classification according to Regulation (EC) No. 1272/2008 [CLP]

Physical hazards	Oxidising Gases, Category 1	H270	
	Gases under pressure: Liquefied gas	H280	
	Acute toxicity (inhalation:gas) Category 2	H330	
Health hazards	Skin corrosion/irritation, Category 2	H315	
	Serious eye damage/eye irritation, Category 2	H319	
	Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation	H335	
Environmental hazards	Hazardous to the aquatic environment — Acute Hazard, Category 1	H400	(M=100)
	Hazardous to the aquatic environment — Chronic Hazard, Category 1	H410	

#### 2.2. Label elements

##### Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP)	:	   
		GHS03      GHS04      GHS06      GHS09

Signal word (CLP)	: Danger
Hazard statements (CLP)	: H270 - May cause or intensify fire; oxidiser.
	: H280 - Contains gas under pressure; may explode if heated.
	: H315 - Causes skin irritation.
	: H319 - Causes serious eye irritation.
	: H330 - Fatal if inhaled.
	: H410 - Very toxic to aquatic life with long lasting effects.
	: EUH071 - Corrosive to the respiratory tract.

*EUH071 supersedes H335 when assigned in the classification.*

Precautionary statements (CLP)

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- Prevention : P273 - Avoid release to the environment.  
P220 - Keep away from clothing and other combustible materials.  
P244 - Keep valves and fittings free from oil and grease.  
P260 - Do not breathe gas, vapours.  
P280 - Wear protective gloves, protective clothing, eye protection, face protection.
- Response : P332+P313 - If skin irritation occurs: Get medical advice/attention.  
P304+P340+P315 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice / attention.  
P305+P351+P338+P315 - IF IN EYES: rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice / attention.  
P370+P376 - In case of fire: stop leak if safe to do so.  
P302+P352 - IF ON SKIN: Wash with plenty of soap and water.
- Storage : P405 - Store locked up.  
P403 - Store in a well-ventilated place.

### 2.3. Other hazards

Other hazards not contributing to the classification : None.

## SECTION 3: Composition/information on ingredients

### 3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Chlorine	CAS-No.: 7782-50-5 EC-No.: 231-959-5 EC Index-No.: 017-001-00-7 Registration-No.: 01-2119486560-35	100	Ox. Gas 1, H270 Press. Gas (Liq.), H280 Acute Tox. 2 (Inhalation:gas), H330 Skin Irrit. 2, H315 Eye Irrit. 2, H319 STOT SE 3, H335 Aquatic Acute 1, H400 (M=100) Aquatic Chronic 1, H410

Contains no other components or impurities which will influence the classification of the product.

### 3.2. Mixtures

Not applicable

## SECTION 4: First aid measures

### 4.1. Description of first aid measures

- Inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.
- Skin contact : Remove contaminated clothing. Drench affected area with water for at least 15 minutes.  
In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.
- Eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes.
- Ingestion : Ingestion is not considered a potential route of exposure.

### 4.2. Most important symptoms and effects, both acute and delayed

May cause irritation to cornea (with temporary disturbance to vision).  
May cause irritation to skin.  
Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.  
Refer to section 11.

### 4.3. Indication of any immediate medical attention and special treatment needed

Obtain medical assistance.  
Treat with corticosteroid spray as soon as possible after inhalation.

## SECTION 5: Firefighting measures

### 5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog.  
Foam.
- Unsuitable extinguishing media : Do not use water jet to extinguish.

### 5.2. Special hazards arising from the substance or mixture

- Specific hazards : Supports combustion.  
Exposure to fire may cause containers to rupture/explode.
- Hazardous combustion products : None that are more hazardous than the product itself.

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### 5.3. Advice for firefighters

- Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. If possible, stop flow of product. Use water spray or fog to knock down fire fumes if possible. Move containers away from the fire area if this can be done without risk.
- Special protective equipment for fire fighters : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. Standard EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

## SECTION 6: Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

- Try to stop release.
- Evacuate area.
- Monitor concentration of released product.
- Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
- Eliminate ignition sources.
- Ensure adequate air ventilation.
- Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
- Act in accordance with local emergency plan.
- Stay upwind.

### 6.2. Environmental precautions

- Try to stop release.
- Reduce vapour with fog or fine water spray.

### 6.3. Methods and material for containment and cleaning up

- Hose down area with water.
- Keep area evacuated and free from ignition sources until any spilled liquid has evaporated (ground free from frost).
- Wash contaminated equipment or sites of leaks with copious quantities of water.

### 6.4. Reference to other sections

- See also sections 8 and 13.

## SECTION 7: Handling and storage

### 7.1. Precautions for safe handling

- Safe use of the product : The product must be handled in accordance with good industrial hygiene and safety procedures. Only experienced and properly instructed persons should handle gases under pressure. Consider pressure relief device(s) in gas installations. Ensure the complete gas system was (or is regularly) checked for leaks before use. Do not smoke while handling product. Avoid exposure, obtain special instructions before use. Avoid contact with aluminium. Keep equipment free from oil and grease. Use no oil or grease. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. Installation of a cross purge assembly between the cylinder and the regulator is recommended. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Avoid suck back of water, acid and alkalis. Do not breathe gas. Avoid release of product into atmosphere.
- Safe handling of the gas receptacle : Do not allow backfeed into the container. Protect receptacles from physical damage; do not drag, roll, slide or drop. When moving receptacles, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport receptacles. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. If user experiences any difficulty operating receptacle valve discontinue use and contact supplier. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Keep container valve outlets clean and free from contaminants particularly oil and water. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Close container valve after each use and when empty, even if still connected to equipment.

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Never attempt to transfer gases from one container to another.  
 Never use direct flame or electrical heating devices to raise the pressure of a container.  
 Do not remove or deface labels provided by the supplier for the identification of the receptacle contents.  
 Suck back of water into the container must be prevented.  
 Open valve slowly to avoid pressure shock.

### 7.2. Conditions for safe storage, including any incompatibilities

Observe all regulations and local requirements regarding storage of containers.  
 Containers should not be stored in conditions likely to encourage corrosion.  
 Container valve guards or caps should be in place.  
 Containers should be stored in the vertical position and properly secured to prevent them from falling over.  
 Stored containers should be periodically checked for general condition and leakage.  
 Keep container below 50°C in a well ventilated place.  
 Segregate from flammable gases and other flammable materials in store.  
 Store containers in location free from fire risk and away from sources of heat and ignition.  
 Keep away from combustible materials.

### 7.3. Specific end use(s)

None.

## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

Chlorine (7782-50-5)		
OEL : Occupational Exposure Limits		
ACGIH	ACGIH TWA (ppm)	0,1 ppm
	ACGIH STEL (ppm)	4 ppm
	Remark (ACGIH)	Resp tract & eye irr; airway hyperreactivity; lung edema; A4 (Not classifiable as a Human Carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories)
	Regulatory reference	ACGIH 2017
Italy	STEL (IT) OEL 15min [mg/m <sup>3</sup> ]	1,5 mg/m <sup>3</sup>
	STEL (IT) OEL 15min [ppm]	0,5 ppm
	Regulatory reference	Allegato XXXVIII del D.Lgs. 9 aprile 2008, n. 81 e s.m.i.

Chlorine (7782-50-5)	
DNEL: Derived no effect level (Workers)	
Acute - local effects, inhalation	1,5 mg/m <sup>3</sup>
Acute - systemic effects, inhalation	1,5 mg/m <sup>3</sup>
Long-term - local effects, inhalation	0,75 mg/m <sup>3</sup>
Long-term - systemic effects, inhalation	0,75 mg/m <sup>3</sup>

Chlorine (7782-50-5)	
PNEC: Predicted no effect concentration	
Aqua (freshwater)	0,00021 mg/l
Aqua (marine water)	0,000042 mg/l
Aquatic, intermittent releases	0,00026 mg/l
Micro-organisms in sewage treatment plant (STP)	0,03 mg/l

### 8.2. Exposure controls

#### 8.2.1. Appropriate engineering controls

Product to be handled in a closed system and under strictly controlled conditions.  
 Provide adequate general and local exhaust ventilation.  
 Preferably use permanent leak-tight installations (e.g. welded pipes).  
 Systems under pressure should be regularly checked for leakages.  
 Ensure exposure is below occupational exposure limits (where available).  
 Gas detectors should be used when toxic gases may be released.  
 Consider the use of a work permit system e.g. for maintenance activities.

#### 8.2.2. Individual protection measures, e.g. personal protective equipment

A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered:

PPE compliant to the recommended EN/ISO standards should be selected.

#### • Eye/face protection

- : Wear goggles and a face shield when transfilling or breaking transfer connections.
- Standard EN 166 - Personal eye-protection - specifications.
- Provide readily accessible eye wash stations and safety showers.

#### • Skin protection

##### - Hand protection

- : Wear working gloves when handling gas containers.
- Standard EN 388 - Protective gloves against mechanical risk.
- Wear cold insulating gloves when transfilling or breaking transfer connections.

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<ul style="list-style-type: none"> <li>- Other</li> <li>• Respiratory protection</li> <li>• Thermal hazards</li> </ul>	<p>Standard EN 511 - Cold insulating gloves. Wear chemically resistant protective gloves. Standard EN 374 - Protective gloves against chemicals. Permeation time: minimum &gt;30min short term exposure: material / thickness [mm] Chloroprene rubber (CR) 0.4. Permeation time: minimum &gt;480min long term exposure: material / thickness [mm] Fluoroelastomer (FKM) 0.7. Consult glove manufacturer's product information on material suitability and material thickness. The breakthrough time of the selected gloves must be greater than the intended use period.</p> <p>: Keep suitable chemically resistant protective clothing readily available for emergency use. Standard EN943-1 - Full protective suits against liquid, solid and gaseous chemicals. Wear safety shoes while handling containers. Standard EN ISO 20345 - Personal protective equipment - Safety footwear.</p> <p>: Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known. Use gas filters with full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers. Recommended: Filter B (grey). Gas filters do not protect against oxygen deficiency. Standard EN 14387 - Gas filter(s), combined filter(s) and full face mask - EN 136. Keep self contained breathing apparatus readily available for emergency use. Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.</p> <p>: None in addition to the above sections.</p>
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### 8.2.3. Environmental exposure controls

Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

Appearance	
<ul style="list-style-type: none"> <li>• Physical state at 20°C / 101.3kPa</li> <li>• Colour</li> </ul>	<p>: Gas : Greenish gas.</p>
Odour	: Pungent.
Odour threshold	: Odour threshold is subjective and inadequate to warn of overexposure.
pH	: If dissolved in water pH-value will be affected.
Melting point / Freezing point	: -101 °C
Boiling point	: -34 °C
Flash point	: Not applicable for gases and gas mixtures.
Evaporation rate	: Not applicable for gases and gas mixtures.
Flammability (solid, gas)	: Non flammable.
Explosive limits	: Non flammable.
Vapour pressure [20°C]	: 6,8 bar(a)
Vapour pressure [50°C]	: 14,3 bar(a)
Vapour density	: Not applicable.
Relative density, liquid (water=1)	: 1,6
Relative density, gas (air=1)	: 2,5
Water solubility	: 8620 mg/l
Partition coefficient n-octanol/water (Log Kow)	: Not applicable for inorganic gases.
Auto-ignition temperature	: Non flammable.
Decomposition temperature	: Not applicable.
Viscosity	: No reliable data available.
Explosive properties	: Not applicable.
Oxidising properties	: Oxidiser.

### 9.2. Other information

Molar mass	: 71 g/mol
Critical temperature	: 144 °C
- Coefficient of oxygen equivalency (Ci)	: 0,7
Other data	: Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

## SECTION 10: Stability and reactivity

## Chlorine

### 10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

### 10.2. Chemical stability

Stable under normal conditions.

### 10.3. Possibility of hazardous reactions

Violently oxidises organic material.

### 10.4. Conditions to avoid

Avoid moisture in installation systems.

### 10.5. Incompatible materials

May react violently with combustible materials.  
 May react violently with reducing agents.  
 Keep equipment free from oil and grease.  
 Reacts with water to form corrosive acids.  
 May react violently with alkalis.  
 With water causes rapid corrosion of some metals.  
 Moisture.  
 For additional information on compatibility refer to ISO 11114.

### 10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

## SECTION 11: Toxicological information

### 11.1. Information on toxicological effects

**Acute toxicity** : Fatal if inhaled.  
 Delayed fatal pulmonary oedema possible.

LC50 inhalation rat	146,5 ppm/4h
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**Skin corrosion/irritation** : Causes skin irritation.  
**Serious eye damage/irritation** : Causes serious eye irritation.  
**Respiratory or skin sensitisation** : No known effects from this product.  
**Germ cell mutagenicity** : No known effects from this product.  
**Carcinogenicity** : No known effects from this product.  
**Toxic for reproduction : Fertility** : No known effects from this product.  
**Toxic for reproduction : unborn child** : No known effects from this product.  
**STOT-single exposure** : Severe corrosion to the respiratory tract at high concentrations.  
 May cause inflammation of the respiratory system.  
**Target organ(s)** : Respiratory tract.  
**STOT-repeated exposure** : No known effects from this product.  
**Aspiration hazard** : Not applicable for gases and gas mixtures.

## SECTION 12: Ecological information

### 12.1. Toxicity

**Assessment** : Very toxic to aquatic life.  
 Very toxic to aquatic life with long lasting effects.

EC50 48h - Daphnia magna : 0,141 mg/l  
 EC50 72h - Algae : 0,001 - 0,01  
 LC50 96 h - Fish : 0,032 mg/l

### 12.2. Persistence and degradability

**Assessment** : Not applicable for inorganic gases.

### 12.3. Bioaccumulative potential

**Assessment** : No data available.

### 12.4. Mobility in soil

**Assessment** : Because of its high volatility, the product is unlikely to cause ground or water pollution.

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Partition into soil is unlikely.

### 12.5. Results of PBT and vPvB assessment

Assessment : Not classified as PBT or vPvB.

### 12.6. Other adverse effects

Other adverse effects : May cause pH changes in aqueous ecological systems.  
 Effect on the ozone layer : None.  
 Effect on global warming : No known effects from this product.

## SECTION 13: Disposal considerations

### 13.1. Waste treatment methods

Contact supplier if guidance is required.  
 Must not be discharged to atmosphere.  
 Ensure that the emission levels from local regulations or operating permits are not exceeded.  
 Refer to the EIGA code of practice Doc.30 "Disposal of Gases", downloadable at <http://www.eiga.eu> for more guidance on suitable disposal methods.  
 Return unused product in original receptacle to supplier.

List of hazardous waste codes (from Commission Decision 2001/118/EC) : 16 05 04 \*: Gases in pressure containers (including halons) containing dangerous substances.

### 13.2. Additional information

External treatment and disposal of waste should comply with applicable local and/or national regulations.

## SECTION 14: Transport information

### 14.1. UN number

UN-No. : 1017

### 14.2. UN proper shipping name

Transport by road/rail (ADR/RID) : CHLORINE  
 Transport by air (ICAO-TI / IATA-DGR) : Chlorine  
 Transport by sea (IMDG) : CHLORINE

### 14.3. Transport hazard class(es)

Labelling :



2.3 : Toxic gases.  
 5.1 : Oxidizing substances.  
 8 : Corrosive substances.  
 Environmentally hazardous substances

#### Transport by road/rail (ADR/RID)

Class : 2  
 Classification code : 2TOC  
 Hazard identification number : 265  
 Tunnel Restriction : C/D - Tank carriage : Passage forbidden through tunnels of category C, D and E. Other carriage : Passage forbidden through tunnels of category D and E

#### Transport by sea (IMDG)

Class / Div. (Sub. risk(s)) : 2.3 (5.1, 8)  
 Emergency Schedule (EmS) - Fire : F-C  
 Emergency Schedule (EmS) - Spillage : S-U

### 14.4. Packing group

Transport by road/rail (ADR/RID) : Not applicable  
 Transport by air (ICAO-TI / IATA-DGR) : Not applicable  
 Transport by sea (IMDG) : Not applicable

### 14.5. Environmental hazards

Transport by road/rail (ADR/RID) : Environmentally hazardous substance / mixture.  
 Transport by air (ICAO-TI / IATA-DGR) : Environmentally hazardous substance / mixture.

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Transport by sea (IMDG) : Marine pollutant

### 14.6. Special precautions for user

#### Packing Instruction(s)

Transport by road/rail (ADR/RID) : P200

Transport by air (ICAO-TI / IATA-DGR)

Passenger and Cargo Aircraft : Forbidden.

Cargo Aircraft only : Forbidden.

Transport by sea (IMDG) : P200

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment.  
 Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.  
 Before transporting product containers:  
 - Ensure there is adequate ventilation.  
 - Ensure that containers are firmly secured.  
 - Ensure container valve is closed and not leaking.  
 - Ensure valve outlet cap nut or plug (where provided) is correctly fitted.  
 - Ensure valve protection device (where provided) is correctly fitted.

### 14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable.

## SECTION 15: Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

#### EU-Regulations

Restrictions on use : None.

Seveso Directive : 2012/18/EU (Seveso III) : Listed.

#### National regulations

National legislation : Ensure all national/local regulations are observed.

### 15.2. Chemical safety assessment

A CSA has been carried out.

## SECTION 16: Other information

Indication of changes : Revised safety data sheet in accordance with commission regulation (EU) No 453/2010.

Abbreviations and acronyms : ATE: Acute Toxicity Estimate  
 CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008  
 REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006  
 EINECS: European Inventory of Existing Commercial Chemical Substances  
 CAS: Chemical Abstract Service  
 PPE: Personal Protection Equipment  
 LC50 - Lethal Concentration to 50 % of a test population  
 RMM: Risk Management Measures  
 PBT - Persistent, Bioaccumulative and Toxic  
 vPvB - Very Persistent and Very Bioaccumulative  
 STOT- SE: Specific Target Organ Toxicity - Single Exposure  
 CSA: Chemical Safety Assessment  
 EN: European Standard  
 UN: United Nations  
 ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road  
 IATA - International Air Transport Association  
 IMDG code - International Maritime Dangerous Goods  
 RID - Regulations concerning the International Carriage of Dangerous Goods by Rail  
 WGK: Water Hazard Class  
 STOT - RE: Specific Target Organ Toxicity - Repeated Exposure

Training advice : Users of breathing apparatus must be trained.  
 Ensure operators understand the toxicity hazard.



## Chlorine

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### DISCLAIMER OF LIABILITY

: Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.

Details given in this document are believed to be correct at the time of going to press.

Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.