

# Operation manual



## RFC Battery extinguishing system

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 **rosenbauer**

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## ORIGINAL OPERATION MANUAL

# 1 Legal notice

## 1.1 Copyright

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Information from this manual may not be passed on to or made accessible to third persons, in particular competitors.

## 1.2 Manufacturer and customer service address

### 1.2.1 Manufacturer address



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## **2 Declaration of conformity**

### **2.0.1 Declaration of conformity**

**According to EC Machinery Directive 2006/42/EC, Annex II, part 1A**

Herewith declares

**Rosenbauer International AG**

**Fire fighting technology**

Austria, 4060 Leonding, Paschinger Str. 90

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that the

**extinguishing system for battery fires**

Type

**extinguishing system for battery fires**

Serial number

**PC481**

**complies with the following regulations:**

- 1) 2006/42/EC - EC Machinery Directive
- 2) 2014/68/EU - Directive on the harmonisation of the laws of pressure equipment on the market

## 3 Introduction

### 3.1 Preface

This manual is to be read through carefully and all regulations and advice observed before commissioning the product.

Also observe the documents of the corresponding manufacturers supplied in addition to this manual.

All persons who are involved in the operation and maintenance of this product must be properly qualified and must read and carefully follow this manual (see training and qualifications).

The operation manual is to be stored carefully (for later reference).

### 3.2 Liability and injury

Due to the information in this manual Rosenbauer fundamentally accepts no liability for direct damage or consequential damage, which arise from incorrect operation or maintenance, as well as by unauthorised changes of components or this manual.

The product may only be operated by persons who are familiar with the manual, the product as well as the national laws, guidelines and regulations pertaining to work, safety and accident prevention.

Rosenbauer assumes no responsibility for injury to persons or material damage, which are caused by untrained personnel, also through non-compliance with the regulations regarding work, safety and accident prevention.

If this manual contains a technical error or a typographical error, Rosenbauer reserves the right to make change at any time and without notice.

This manual may contains figures and descriptions, that are not built into the delivered product.

No claims may be made for products that have already been delivered from the information, figures and descriptions in this manual.

For your own safety only use spare parts and accessory products from Rosenbauer. Rosenbauer accepts no liability for the use of other products and the resulting damage!

Check the delivery immediately for transport damage and completeness.

- Faults and damages must be documented in writing immediately.
- Photograph damaged components.
- Send written damage report to the manufacturer - see chapter "Manufacturer and customer service address".

### 3.3 Identification

Identifying the serial number is important when making enquires to the manufacturer in regards to part and technical issues.

The serial number of the extinguishing system is located on the type plate on the rear of the operator module.

P	C	4	8	1	L					
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- ▶ Enter the serial number of the extinguishing system in the table.

# Introduction

---

Use of the operation manual

## 3.4 Use of the operation manual

### 3.4.1 Validity

This manual contains information needed for the operation of the product. This manual contains descriptions of special equipment as well as some abstractions and exemplary illustrations. The actual equipping of your product may therefore differ in part from the descriptions and illustrations.

### 3.4.2 Key to the symbols

To ensure readability and clarity, various paragraphs and information are structured with symbols.

Meaning of the symbols:

- ▶ Operating instructions. Execute the operating instructions one after the other in the order described.
- ✓ Results of an action.
- Enumerations.
- ⇒ Further information on this topic.



Supplementary information.

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Follow the supplementary documentation or supplier's documentation.

---

#### Key figures

Texts are illustrated with additional drawings, if required. An image legend is provided below the illustration.

The reference from the text to a position in the illustration is established by a set position number (e.g. S1).



## 3.4.3 Warnings

The safety information warns the user of risks and informs them how these risks can be avoided.

Safety information stands at the beginning of a chapter before handling instructions from which a dangerous situation can occur. Further safety information is found at the start of this manual.

Safety instructions that must be followed without fail are highlighted as follows:

### **DANGER!**

This symbol warns of an extremely dangerous situation, in which non-observation of the danger warning will lead to death or serious irreversible injury.

---

### **WARNING!**

This symbol warns of a dangerous situation, in which non-observation of the danger warning can lead to death or serious irreversible injury.

---

### **CAUTION!**

This symbol warns of a dangerous situation, in which non-observation of the danger warning can lead to slight reversible injury.

---

### **NOTICE**

This symbol warns of situations, in which non-observation of the warning can lead to material damage.

---

Additionally, the information in the manual, the technical data and the safety information in the supplier's documentation supplied must be observed.

# Safety

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Intended use

## 4 Safety

### 4.1 Intended use

Improper use of the product can result in personal injury. Additionally, the product or other material assets of value may be damaged.

Rosenbauer can warrant the safety, reliability and performance of its product only if the product is used in accordance with the stipulations in this manual.

Unauthorised changes, unauthorised conversions or improper operation can detract from the intended use and result in personal injury or property damage.

Firefighting products may be used only in a flawless technical condition by qualified personnel for the following purposes:

- For extinguishing electrical storage systems on lithium-ion basis below 1000 V which are used in motor vehicles of any kind (cars, trucks,...)
- Operation only under supervision of the product

Only manufacturer-authorised persons may perform modifications, conversions and repairs. Unauthorised changes, conversions or improper use will nullify all manufacturer liability for resulting damages.

### 4.2 Markings and warning signs

Safe use is only possible, if all necessary information for a safety operation are observed. These informations are especially including safety- and warning instructions.

In addition to the instructions in this operating manual read and observe all the safety- and warning signs affixed to the product.

### 4.3 Other regulations

This product has been manufactured in accordance with the applicable regulations and the state of the art.

In addition to this manual the relevant national legislation, regulations and directives in the latest version are to be observed (e.g. guidelines for personal protective equipment, road traffic regulations, country-specific training regulations for the fire department, accident prevention guidelines, fire department duty regulations, occupational medicine and technical environmental rules, country legislation for fire and disaster protection).

## 4.4 Training and qualifications

Operator errors caused by inadequate qualifications can cause serious accidents or endanger the success of the operation. Safe operations can be assured only when operation and consistent maintenance of the product is performed exclusively by specially trained personnel.

Only qualified training by experienced firefighting experts and continuous practice of operating procedures ensure safe operations.

One-time instruction is not sufficient!

The product may only be operated by persons who have successfully completed appropriate firefighting training.

The operator is responsible for defining responsibilities and supervision of personnel as well as for adequate instruction and training according to applicable regulations.

Even during operation, make sure that persons without technical knowledge never operate the product.

Personnel must exhibit physical and mental aptitude. Minors and persons without firefighting training may not operate the product.

Modifications and conversions to the product may be performed only with written authorization from Rosenbauer and must be performed by a manufacturer-authorized person.

### 4.5 General safety instructions

The following instructions give an overview of how the product is used safely. This general overview will be supplemented by the safety instructions in the individual chapters.

In general, observe the potential for danger associated with handling pressurized equipment.

Use the prescribed personal protective equipment.

Make sure that the product corresponds to the respective valid safety regulations and the local fire departments guidelines and is always ready for use.

In case of contact with hazardous chemicals, always observe the material safety data sheets and information provided by the manufacturer.

Foam compounds may be an environmental hazard.

- ▶ Do not dispose of foam compounds in bodies of water or in the sewage system.

Foam compounds cause elevated corrosion.

- ▶ Carefully clean the product of extinguishing agent residue after every operation.

Observe the operation and maintenance manuals of additional products.

If you cannot rectify faults yourself or repairs cannot be performed by specially trained workshop personnel, Rosenbauer or the nearest Rosenbauer service partner must be contacted immediately.

## 4.6 List of the safety symbols used

### 4.6.1 Meaning of the warning signs





	Danger from electricity.
	Impending risk of explosion.
	Risk from oxidising materials.
	Risk of harmful or irritating materials.
	Impending acid burn risk.
	Impending hearing damage.
	Risk of inhalation of toxic vapours.
	Risk from hot fluids and vapours.
	Risk from hot surfaces.
	Impending crushing risk.
	Danger from high pressure.

# Safety

## List of the safety symbols used

	Threat of environmental contamination.
	Impending shearing risk.
	Threat of shearing.
	Impending risk of tripping.
	Impending risk of hand injury.

## 4.6.2 Meaning of the prohibitory signs

	No smoking!
	Handling fire and naked flames forbidden!
	Do not touch or reach in!
	Do not remain in the danger area!

# Safety

List of the safety symbols used

## 4.6.3 Meaning of the caution signs

	Use hearing protection.
	Wear safety goggles or a safety mask.
	Use safety goggles and hearing protection.
	Wear a protective helmet.
	Wear protective gloves.
	Wear safety boots.
	Wear a protective suit.
	Maintain distance. Special caution.
	Observe environmental protection.



## 4.7 Warnings



### **DANGER!**

**Danger of explosion if the permissible internal pressure of the high-voltage battery is exceeded!**

Flammable gas can escape during vehicle fires and ignite.

- ▶ If there is an unusual smell, smoke or burn marks, stop the charging process immediately.
- ▶ Immediately leave the danger area and ensure sufficient distance.
- ▶ Prepare for the fire fighting operation.



### **Risk of mortal danger or severe injury from impalement!**

The extinguishing lance can lead to mortally dangerous injuries for the service personnel or passers-by during maintenance and servicing work.

Risk of injury from uncontrolled shooting out of the extinguishing lance from incorrect handling.

- ▶ Dismantle compressed air bottles during maintenance and servicing work.
- ▶ Only open the cylinder valves when the extinguishing lance is to extend.
- ▶ Maintain a safe distance from the danger area.
- ▶ Do not remain in the danger area.



### **WARNING!**

#### **Accidental movement!**

The vehicle to be extinguished must be secured against accidental movement before attaching the extinguishing module.

- ▶ Secure the vehicle with suitable securing material, e.g. wheel chocks.
- ▶ When using technical aids (hydr. rescue cylinders, stabilising props, etc.) make sure that they have the appropriate load-bearing capacity of approx. 6 tonnes.
- ▶ Do not remain in the danger area.

# Safety

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## Warnings



### **WARNING!**

#### **Stay at a safe distance!**

Penetration of the extinguishing lance into the battery housing will destroy the battery. If no coolant is supplied, a thermal reaction may occur and a fire may result.

- ▶ Fully roll out the hose stack.
  - ▶ Main the largest possible safety distance of 8 m.
  - ▶ Do not remain in the danger area.
  - ▶ Wear complete and suitable protective equipment on operations.
- 



### **WARNING!**

#### **Crushing risk when raising and lowering the extinguishing device!**

When lifting and lowering the extinguishing device, there is a risk of crushing for people under or next to the extinguishing device.

- ▶ Crushing especially of feet or hands due to mishandling during parking and operation.
  - ▶ Watch the danger zone when lifting and lowering.
  - ▶ When parking, ensure that the extinguishing device is stable.
  - ▶ Do not remain in the danger area.
- 



### **WARNING!**

#### **Crushing risk due to loss of stability!**

If the stability is lost there is a risk of crushing for people under or next to the extinguishing device.

- ▶ When parking, ensure that the extinguishing device is stable.
  - ▶ Crushing due to the extinguisher falling over (parking on uneven ground, parking on a ramp).
  - ▶ When using the extinguisher with technical aids (hydr. rescue cylinders, stabilising props, etc.) make sure that they have the appropriate load-bearing capacity of approx. 6 tonnes.
  - ▶ Secure the vehicle with suitable securing material, e.g. wheel chocks.
  - ▶ Do not remain in the danger area.
-



### **WARNING!**

#### **Crushing hazard for body parts from moving parts!**

When attaching the extinguishing system, no body parts may be between the extinguishing module and the object to be extinguished.

- ▶ Use the push and pull device to manoeuvre the extinguishing module.
- ▶ Do not touch moving parts.
- ▶ Use protective equipment.
- ▶ Maintain a safe distance from the danger area.

#### **Danger of injury and accidents!**

Danger of injury and accidents due to malfunctioning or improper used safety devices!

- ▶ Do not override safety and protective devices.
- ▶ Do not manipulate or render safety and protective devices.
- ▶ Check safety and protective devices for proper function.



#### **Personal injuries and damage to property can occur due to a restricted view of movable machine parts.**

- ▶ Do not linger in the danger zone.
- ▶ Follow the training and operation manual.

#### **Mortal danger or serious injuries can occur through failure to use protective equipment.**

- ▶ Wear protective equipment.



#### **Danger of shearing in the area of the extinguishing equipment!**

Body parts can be cut off.

- ▶ Do not linger in the danger zone.



#### **Danger of crushing and shearing of limbs due to moving or rotating parts!**

- ▶ Do not reach into or grasp moving or rotating parts.
- ▶ Observe a safety distance to the danger zone.
- ▶ Use protective equipment.

 **CAUTION!**

**Injury risk!**

When transporting the extinguishing system, ensure that the upper body is upright and straight.

- ▶ Always lift the extinguishing system with the knees to reduce the risk of back injuries.
  - ▶ Avoid jerky movements when transporting.
  - ▶ Carrying over long distances can lead to excessive strain. It is recommended to transport the extinguishing system with 2 people.
- 



**Risk of falling and injury!**

When transporting the extinguishing system, be aware of existing trip hazards.

- ▶ If the field of vision is limited, illuminate the transport route.
  - ▶ Identify and avoid existing trip hazards.
  - ▶ When moving, pay attention to the surface.
- 

**Risk of falling and injury!**

There is a risk of slipping and tripping in the immediate area of action.

- ▶ Increased attention in the immediate area of action.
  - ▶ When moving, pay attention to the surface.
- 

**Pressure increase due to direct solar radiation or other sources of radiant heat!**

- ▶ Protect the storage site from direct exposure to radiant heat (sunlight, hot surfaces).
  - ▶ Depressurise the extinguisher after each extinguishing operation.
- 

**Bursting of the extinguishing cylinder if the operating pressure is too high!**

- ▶ The extinguishing device, in particular the cylinder, falls into DRGL 2014/68/EU category I. Due to this classification, no special test intervals are stipulated. If a component is damaged, it may only be inspected and replaced by a qualified person.
  - ▶ A visual check must be carried out before and after using the extinguisher.
  - ▶ Only original spare parts may be used.
- 

**Danger of injury for the operator due to performing action in wrong order!**

- ▶ Individual operating instructions must be done in the prescribed order.
-



### **Danger of crushing!**

Danger of crushing due to pneumatic cylinders and drives.

- ▶ Do not grasp moving parts.
  - ▶ Do not reach into the danger zone.
- 

### **Injury to persons and damage to property in critical operational conditions!**

A delayed reaction to critical operating conditions can cause serious injury and property damage. To immediately be able to respond, the operator must fulfil the following conditions:

- ▶ Always stay within easy reach of the controls.
  - ▶ Control instruments must always remain in the line of vision.
- 

### **Personal injury and material damage due to incompletely engaged connection couplings!**

- ▶ Before start-up, check all connection couplings for tight fit.
- 

### **Danger to health due to extinguishing agents!**

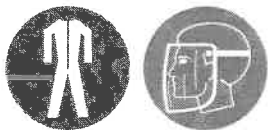
- ▶ Observe the safety data sheets of the extinguishing agent manufacturer.
- 



### **Danger to health due to extinguishing agents!**

The contamination with extinguishing agents can cause health problems.

- ▶ Observe wind direction, to avoid a inhalation or contamination by extinguishing agent.
  - ▶ Wear protective gear.
  - ▶ Wear safety goggles.
  - ▶ Avoid direct contact with extinguishing agent.
  - ▶ If necessary, take first aid measures.
- 



# Safety

---

## Warnings

### **NOTICE**

#### **Danger due to residual pressure in the bottle!**

- ▶ Only dispose of completely empty compressed air bottles. For proper disposal, observe national and/or regional regulations!
- 

#### **Material damage due to the non-observance of optical or acoustic warning signals!**

- ▶ Monitor all optical and acoustic warning signals, measured value indicators and pilot lamps.
  - ▶ Follow all training and the operating manual.
- 

#### **Danger due to water over flow!**

Some materials expand and/or increase their weight when saturated with water. Certain materials must not come into contact with water due to the danger of chemical reactions.

- ▶ In case of danger, immediately stop operation with water.
-

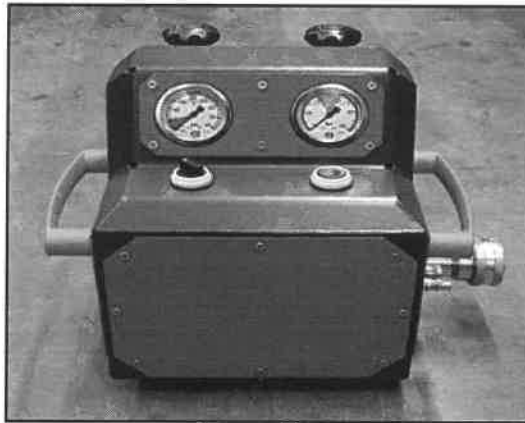
## 5 Product description

### 5.1 Battery extinguishing system

The extinguishing system consists of a control unit that is connected to the extinguishing cylinder via pressure hoses. Compressed air penetrates the extinguishing lance into the lithium-ion-based storage system below 1000 V and is then cooled by an extinguishing agent. For ease of reading, the lithium-ion-based electrical storage system below 1000 V is referred to as a battery.

### 5.2 Operating module

The operating module contains all the monitoring and control elements for the extinguishing system.

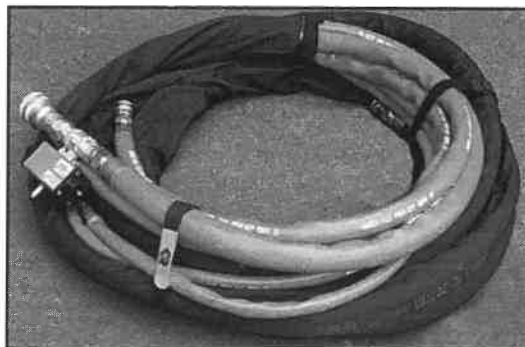


*Operating module*

### 5.3 Hose lines

Use the hose line to make a connection between the operating module and the extinguishing module. At the end of the compressed air line there is a pneumatically-actuated shut-off device.

The end of the two hose lines at the extinguishing module is protected by a fire-retardant protective hose.

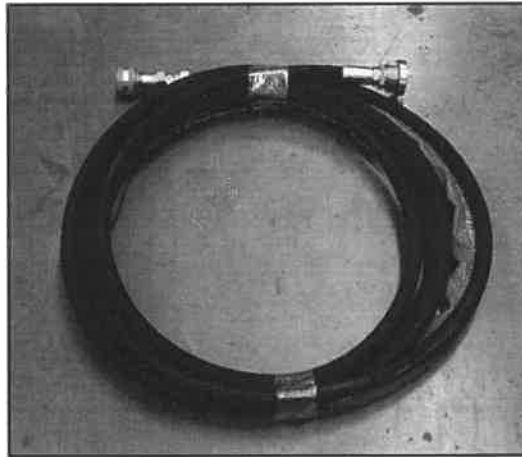


*Compressed air hose line*

## Product description

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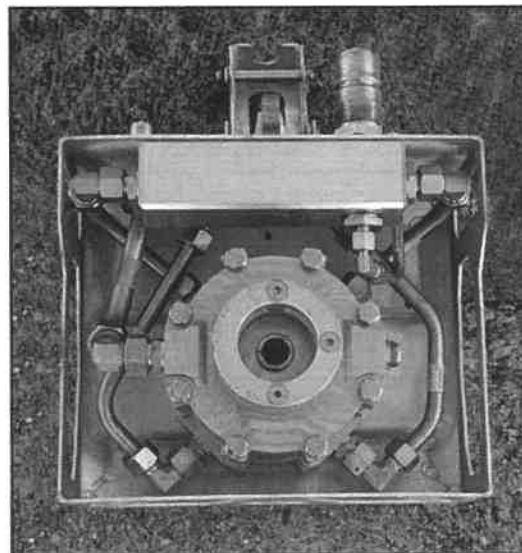
### Extinguishing module



*Water supply hose line*

### 5.4 Extinguishing module

The extinguishing module contains the actual extinguishing system. The punch in the centre of the system is driven pneumatically. The fire fighting water is released through the holes in the punch.

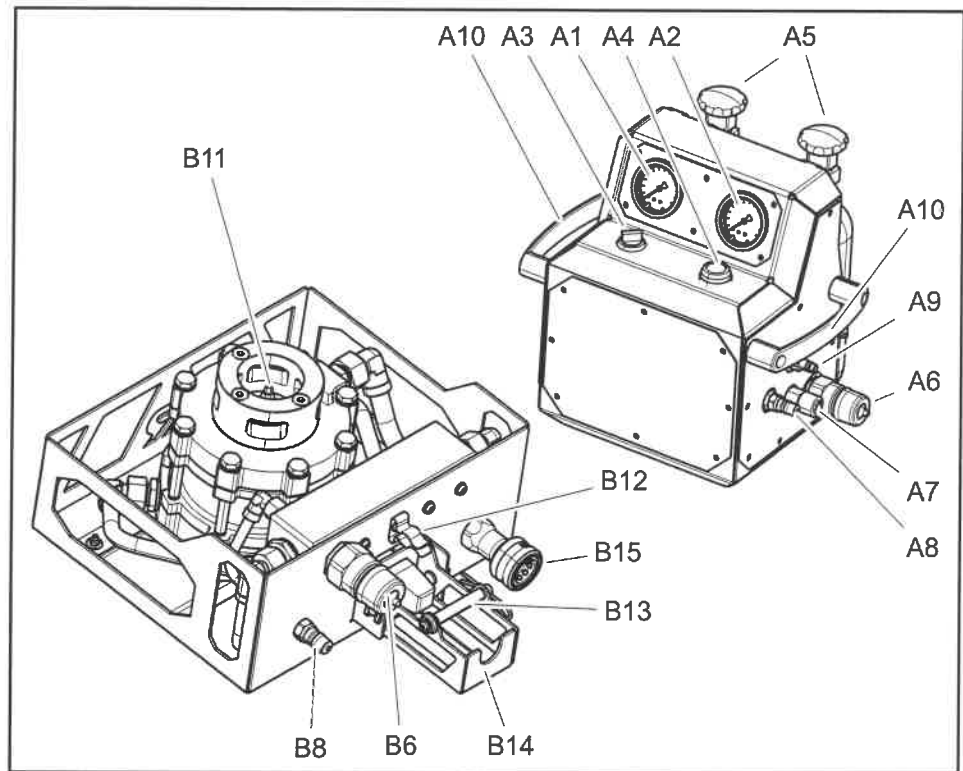


*Extinguishing module*



## 6 Technical description

### 6.1 Components



*Battery extinguishing system components*

A1	Bottle pressure pressure gauge
A2	Piercing pressure pressure gauge
A3	Switch - piercing
A4	Button - relief
A5	Compressed air bottles
A6	Connection - piercing
A7	Compressed air supply ball valve connection
A8	Air connection - relief
A9	Compressed air supply ball valve connection
A10	Carrying handle
B6	Connection - piercing
B8	Air connection - relief
B11	Extinguishing lance
B12	Clamp hydrant wrench
B13	Locking bolts hydrant wrench
B14	Holder hydrant wrench
B15	Water connection - extinguishing

## 7 Operation

### 7.1 General

#### Protective equipment



Suitable and complete personal protective equipment must be worn when handling the device.

The following Rosenbauer products meet this requirement:

- HEROS Titan helmet
- HEROS H30 helmet
- FIRE MAX 3 protective clothing
- FIRE FLEX protective clothing

In addition, it is recommended that the helmet provides protection from an arc fault in accordance with GS-ET-29 (Principles for the Testing and Certification of Electricians' Face Protection) and the protective clothing in accordance with IEC 61842:2018.

#### Compressed air bottles

- ▶ The extinguishing system may only be operated with compressed air bottles that do not have flow protection installed in the bottle valve.
  - ⇒ Cylinder valves without flow protection are identified by a black handle. Cylinder valves with flow protection are identified by a blue handle. They may not be used!



*Cylinder valve without flow protection*

## Use of the extinguishing system

- ▶ The extinguishing system may only be used if there is a "thermal runaway" of the battery cells. Prophylactic flooding of the battery housing is prohibited.
  - ⇒ Whether a "thermal runaway" is present must be assessed on the basis of the conditions. A thermal imaging camera to observe the temperature of the battery can be helpful for this.
- ▶ Before using the extinguishing system, extinguish the fire of the vehicle with conventional extinguishing methods.
  - ⇒ The gases escaping from the battery housing lead to a class C fire. It may not be possible to extinguish it completely.
- ▶ The vehicle's high-voltage system must be deactivated in accordance with the manufacturer's information.
- ▶ If the vehicle is connected to a charging station, the vehicle must be disconnected from the charging station in accordance with the manufacturer's instructions.
- ▶ Protect the extinguishing system from direct flame.

### 7.2 Startup



#### **WARNING!**

##### **Crushing hazard for body parts from moving parts!**

When attaching the extinguishing system, no body parts may be between the extinguishing module and the object to be extinguished.

- ▶ Use the push and pull device to manoeuvre the extinguishing module.
- ▶ Do not touch moving parts.
- ▶ Use protective equipment.
- ▶ Maintain a safe distance from the danger area.



##### **Mortal danger or serious injuries can arise through failure to use protective equipment.**

- ▶ Wear protective equipment.



#### **CAUTION!**

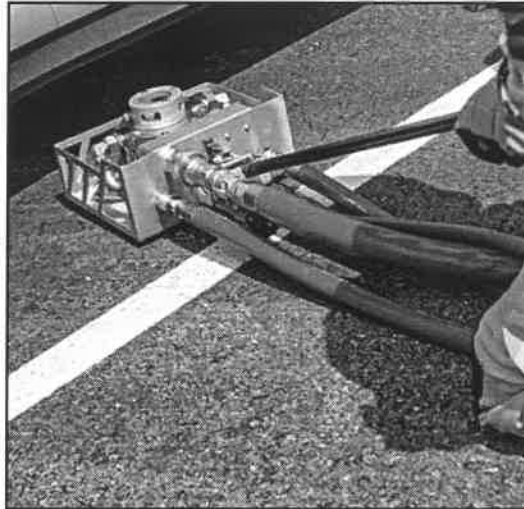
##### **Personal injury and material damage due to incompletely engaged connection couplings!**

- ▶ Before start-up, check all connection couplings for tight fit.

The extinguishing system consists of three main components. Before use, these must be connected to each other.

- ▶ Use the hose stack to make a connection between the control module and the extinguishing module.
  - ▶ Connect the compressed air hose to the extinguishing unit (B6) and to the control module (A6).
  - ▶ Connect the water hose to the extinguishing unit (B15) and to a water supply.
  - ▶ Connect the compressed air supply ball valve to control module (9) and (11).
    - ⇒ All couplings must be fully engaged.
- ▶ Connect 2 compressed air bottles of technical air 11/300 bar with one cylinder valve each.
  - ⇒ Larger compressed air bottles (41/200 bar or 61/300 bar) can also be connected via an optionally available extension hose. 2 compressed air bottles must always be used.
  - ⇒ Only open the cylinder valves just before the extinguishing process.
- ▶ Establish a water supply via a hydrant, a portable fire pump or a built-in pump in the fire fighting vehicle.
  - ⇒ A litre flow of at least 50 l/min at 10 bar pressure must be available on the control unit.
  - ⇒ Due to the low flow rate, the operator on the portable fire pump or on the fire fighting vehicle must ensure that the pump does not overheat.

- ▶ To be able to position the extinguishing module safely under a vehicle, a push-pull rod must be used. For this purpose, it is intended to attach a standard underfloor hydrant wrench to the module.
  - ▶ Loosen the bolts for the holder (B13).
  - ▶ Insert the hydrant wrench in the holder (B14).
  - ▶ Fasten the bolts for the holder (B13) again.
- ✓ Hydrant wrench is fastened.



*Fastened hydrant wrench*



Permanently monitor the extinguishing system during operation. If a fault occurs take the appropriate countermeasures.

## 7.3 Operation



### **DANGER!**

**Danger of explosion if the permissible internal pressure of the high-voltage battery is exceeded!**

Flammable gas can escape during vehicle fires and ignite.

- ▶ If there is an unusual smell, smoke or burn marks, stop the charging process immediately.
  - ▶ Immediately leave the danger area and ensure sufficient distance.
  - ▶ Prepare for the fire fighting operation.
- 



### **WARNING!**

**Crushing risk due to loss of stability!**

If the stability is lost there is a risk of crushing for people under or next to the extinguishing device.

- ▶ When parking, ensure that the extinguishing device is stable.
  - ▶ Crushing due to the extinguisher falling over (parking on uneven ground, parking on a ramp).
  - ▶ When using the extinguisher with technical aids (hydr. rescue cylinders, stabilising props, etc.) make sure that they have the appropriate load-bearing capacity of approx. 6 tonnes.
  - ▶ Secure the vehicle with suitable securing material, e.g. wheel chocks.
  - ▶ Do not remain in the danger area.
- 



### **WARNING!**

**Stay at a safe distance!**

Penetration of the extinguishing lance into the battery housing will destroy the battery. If no coolant is supplied, a thermal reaction may occur and a fire may result.

- ▶ Fully roll out the hose stack.
  - ▶ Main the largest possible safety distance of 8 m.
  - ▶ Do not remain in the danger area.
  - ▶ Wear complete and suitable protective equipment on operations.
-



**WARNING!**

**Crushing hazard for body parts from moving parts!**

When attaching the extinguishing system, no body parts may be between the extinguishing module and the object to be extinguished.

- ▶ Use the push and pull device to manoeuvre the extinguishing module.
- ▶ Do not touch moving parts.
- ▶ Use protective equipment.
- ▶ Maintain a safe distance from the danger area.

**WARNING!**

**Crushing risk when raising and lowering the extinguishing device!**

When lifting and lowering the extinguishing device, there is a risk of crushing for people under or next to the extinguishing device.

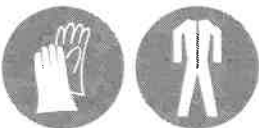
- ▶ Crushing especially of feet or hands due to mishandling during parking and operation.
- ▶ Watch the danger zone when lifting and lowering.
- ▶ When parking, ensure that the extinguishing device is stable.
- ▶ Do not remain in the danger area.

**WARNING!**

**Accidental movement!**

The vehicle to be extinguished must be secured against accidental movement before attaching the extinguishing module.

- ▶ Secure the vehicle with suitable securing material, e.g. wheel chocks.
- ▶ When using technical aids (hydr. rescue cylinders, stabilising props, etc.) make sure that they have the appropriate load-bearing capacity of approx. 6 tonnes.
- ▶ Do not remain in the danger area.



**WARNING!**

**Mortal danger or serious injuries can arise through failure to use protective equipment.**

- ▶ Wear protective equipment.

# Operation

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## Operation

### CAUTION!

#### **Injury risk!**

When transporting the extinguishing system, ensure that the upper body is upright and straight.

- ▶ Always lift the extinguishing system with the knees to reduce the risk of back injuries.
  - ▶ Avoid jerky movements when transporting.
  - ▶ Carrying over long distances can lead to excessive strain. It is recommended to transport the extinguishing system with 2 people.
- 



#### **Risk of falling and injury!**

When transporting the extinguishing system, be aware of existing trip hazards.

- ▶ If the field of vision is limited, illuminate the transport route.
  - ▶ Identify and avoid existing trip hazards.
  - ▶ When moving, pay attention to the surface.
-



## 7.3.1 Positioning the extinguishing module

Depending on the location of the battery, the condition of the burning vehicle and the spread of the fire, the correct location for the extinguishing module must be determined first.

- ▶ When attaching the extinguishing module with technical aids (hydr. rescue cylinders, stabilising props, etc.) make sure that they have the appropriate load-bearing capacity of max. 6000 kg (approx. 59 kN).
  - ⇒ The load bearing capacity data depends on the thickness of the material to be penetrated and the support angle.
  - ⇒ The specifications refer to a vertical angle of entry.



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Observe the operation manuals of the individual items of equipment and devices!

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The extinguishing module must be firmly attached to the vehicle before activating the piercing function. Otherwise, there is a risk of the system slipping uncontrollably.

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No guarantee can be given for safe penetration into every battery housing, as safe penetration depends not only on the material but also on the construction of the battery housing e.g. local overlapping of materials may prevent penetration.

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# Operation

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## Operation

### 7.3.2 Under the vehicle

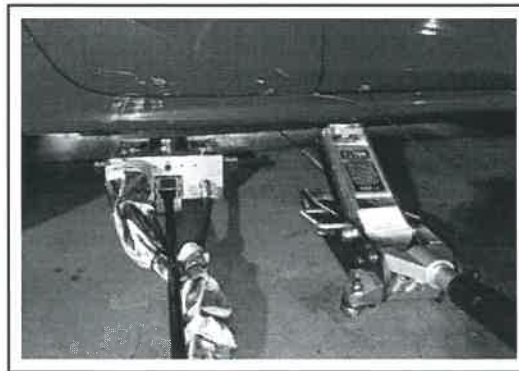
The preferred position of the extinguishing module is under the vehicle. The mass of the vehicle makes it easier to penetrate the battery housing.

- ▶ The required ground clearance is 195 mm (7.7 in) (= height of the extinguishing module). If necessary, lift the vehicle with suitable tools. If the ground clearance is increased, the extinguishing module can also be brought to the necessary height with appropriate underlay material.



The extinguishing module must be positioned under the battery housing. The extinguishing lance of the extinguishing module must be able to penetrate the battery housing unhindered. Any screw connections or material overlaps must be avoided during positioning.

---



*Positioned extinguishing module*

## 7.3.3 In the passenger compartment

The battery housing can also be reached via the passenger compartment in most vehicle models. The footwell on the passenger side or the rear bench seat is used for this. However, the vehicle data must be used to check exactly where the battery housing is located.

- ▶ Remove additional floor mats in the footwell or the rear bench seat in order to safely reach the battery housing with the available stroke of the extinguishing lance.
- ▶ Place the extinguishing module in the interior with suitable support to be able to penetrate the battery housing.
  - ⇒ The support material must be able to absorb the static compressive force of max. 6000 kg (approx. 59 kN) of the extinguishing lance. The specifications refer to a vertical angle of entry.
  - ⇒ The load bearing capacity data depends on the thickness of the material to be penetrated and the support angle.

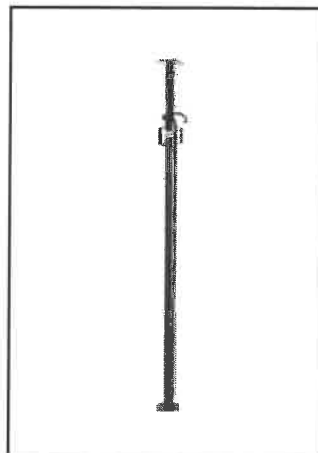


Observe the operation manuals of the individual items of equipment and devices!

- Support options:



*Telescopic cylinder*

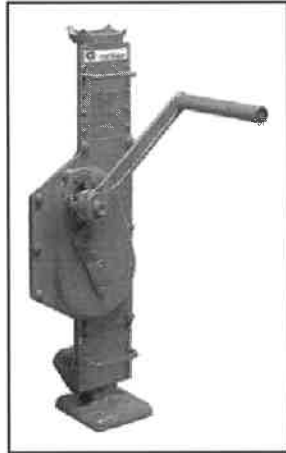


*Adjustable ceiling support*

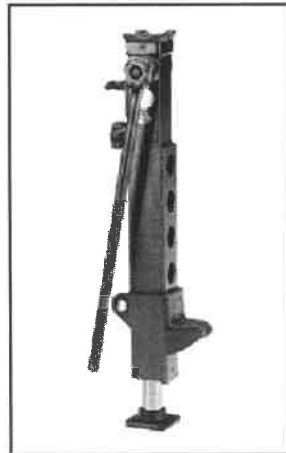
# Operation

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## Operation



*Crank winch*



*Hydraulic jack*

### 7.3.4 Vehicle lying on its side

If access under the vehicle or in the interior is not possible, the extinguishing module can also be attached to the vehicle from the outside.

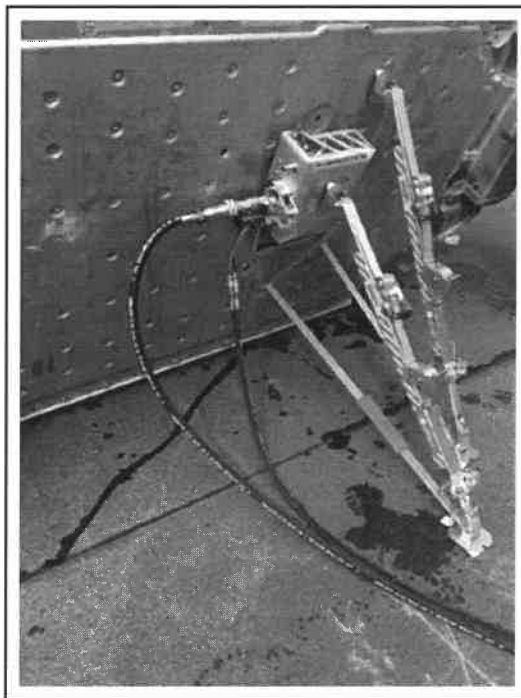
- ▶ First stabilise the vehicle against movement in all directions.
- ▶ Attach the extinguishing module with suitable support to be able to penetrate the battery housing.
  - ⇒ The support material must be able to absorb the static compressive force of max. 6000 kg (approx. 59 kN) of the extinguishing lance. The specifications refer to a vertical angle of entry.
  - ⇒ The load bearing capacity data depends on the thickness of the material to be penetrated and the support angle.



Observe the operation manuals of the individual items of equipment and devices!



Check that the extinguishing module is firmly attached to the battery housing. If the attachment is not adequate, the extinguishing module may lift off undesirably during penetration. This can cause the extinguishing module to detach from the support system.



*Side jacking system*

## Operation

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### Operation

#### 7.3.5 Vehicle lying on its roof

If the vehicle is lying on its roof, the extinguishing module can be mounted in the interior. If this is not possible, the extinguishing module can also be attached to the battery housing from above (floor plate).

- ▶ The extinguishing module can be attached to the vehicle by means of a load beam. This must be attached to the bodywork with chains or tension belts (10 tonnes).
- ▶ Attach the extinguishing module with suitable support to be able to penetrate the battery housing.
  - ⇒ The support material must be able to absorb the static compressive force of max. 6000 kg (approx. 59 kN) of the extinguishing lance. The specifications refer to a vertical angle of entry.
  - ⇒ The load bearing capacity data depends on the thickness of the material to be penetrated and the support angle.



It is not possible to attach the extinguishing module with a circumferential tension belt alone. Due to the change in length of the tension belt under tensile force, the extinguishing module can lift off the battery housing.

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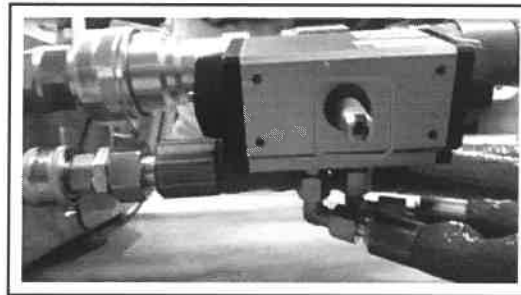
## 7.3.6 Use of the extinguishing system

### Establish water supply

- ▶ Before activating the extinguishing lance, establish a water supply to the extinguishing module.

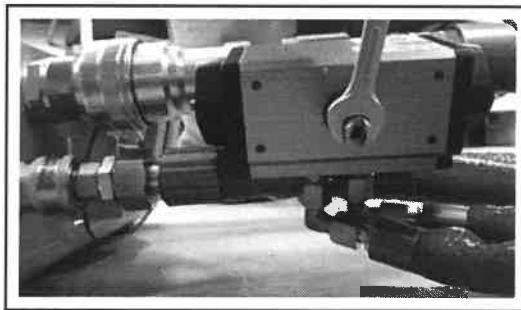
### Extend extinguishing lance

- ▶ Before opening the cylinder valves, be sure to check that the ball valve for the working air is closed.
  - ⇒ When the ball valve is closed, the slot of the rotary actuator is transverse to the direction of flow.



*Closed ball valve*

- ▶ If the ball valve for the working air is open, it must be closed manually with a suitable tool, e.g. a open-end wrench (wrench size 10).



*Manual closing process ball valve*

- ▶ Slowly turn both valves of the compressed air bottles anti-clockwise as far as they will go.
  - ✓ A filling noise will be audible until the working pressure is reached.
  - ⇒ The pressure on the piercing pressure gauge must be at least 40 bar after opening.
  - ⇒ Only open the cylinder valves just before the extinguishing process.
- ▶ Activate piercing switch (A3).
  - ▶ Visual check of whether the extinguishing lance extension was successful.



The extinguishing lance extends in a time of approx. 10 milliseconds.

# Operation

## Operation

### Check water flow

- ▶ Visual check of whether water has penetrated the battery housing.

### Cooling process

The penetrating water first completely fills the battery housing. This can lead to an increase in flammable gas being pressed out of the battery housing, which then ignites in the atmosphere. These flames can be fought with conventional extinguishing methods.

- ▶ Continue the cooling process until no more heat spots can be detected on the outside of the battery housing. The highest measured temperature must be below 60°C.



No binding time can be given for the necessary cooling time. This depends on many factors. Various tests have shown that this can be in the order of 15-60 minutes, depending on the size of the battery.

### Water flow

The water flow through the extinguishing system depends on the water pressure. When starting to extinguish, fill the battery housing as quickly as possible. A high water pressure of at least 10 bar ensures that the process is achieved quickly. The battery housing should remain filled with water during the entire cooling process.

- ▶ Depending on the condition of the battery housing (damage, holes from the fire, etc.), the water flow can be reduced by reducing the pressure as soon as larger amounts of water leak out without achieving a cooling effect.

The water flow depending on the water pressure is shown in the table:

Water pressure [bar]	Water flow [l/min]
4	24
5	28
6	30
7	32
8	34
9	36
10	39
11	41
12	43
13	45
14	47
15	49



### End cooling process

- ▶ Disconnect the water supply to end the cooling process.
  - ▶ Close the pressure outlet on the water supply and disconnect the pressure hose.



The battery housing must be checked further using a thermal imaging camera after the cooling process has been completed. If the temperature rises again or smoke forms, the extinguishing module must be re-activated immediately.

The extinguishing module can also remain in the battery housing during the removal of the vehicle. If necessary, it may be advisable to secure the extinguisher with a tension belt to prevent it from falling out.

### Extend extinguishing lance out of the battery housing

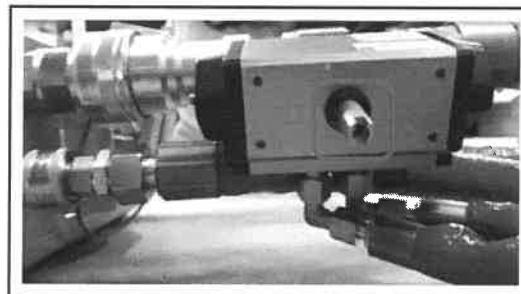
- ▶ Close both cylinder valves.
- ▶ Activate the relief button (A4).
  - ⇒ Do not deactivate the piercing button (A3).



During the relief process, there may be an increased noise level due to escaping compressed air. Manual resetting of the extinguishing lance is only possible by pressing the relief button (A4).

### Decommissioning - restoring operational readiness

- ▶ Activate the relief button (A4).
- ▶ Deactivate piercing button.
  - ⇒ Check whether the ball valve is closed on the hose stack.
  - ⇒ If the ball valve for the working air is open, it must be closed manually with a suitable tool, e.g. a open-end wrench (wrench size 10).



*Closed ball valve*

- ▶ Uncouple and take care of hoses.
- ▶ Check the battery extinguishing system for damage.
- ▶ Dismantle both compressed air bottles with the cylinder valve closed.

# 8 Service and cleaning

### **Rosenbauer Original Service**

- ▶ In order to guarantee safe operation and to extend the service life of the product all prescribed service intervals should be kept.
  - ⇒ Only technology which is regularly maintained by specialists can meet the high demands.

Rosenbauer service partners will gladly provide you with comprehensive advice about inspections and Service PLUS, as well as about the exact scope and costs of testing and maintenance work.

- ⇒ Further information is also available on the homepage, [www.rosenbauer.com](http://www.rosenbauer.com).

## 8.1 Maintenance work

Maintenance work involves tasks that can be performed by properly trained fire department personnel.

This work must be carried out regularly, especially after each use, to ensure optimum condition of the product.

- ▶ Keep the safety and warning signs clean and legible.
- ▶ Replace missing or damaged signs.

## 8.2 Testing and inspection work



### **DANGER!**

#### **Risk of mortal danger or severe injury from impalement!**

The extinguishing lance can lead to mortally dangerous injuries for the service personnel or passers-by during maintenance and servicing work.

Risk of injury from uncontrolled shooting out of the extinguishing lance from incorrect handling.

- ▶ Dismantle compressed air bottles during maintenance and servicing work.
- ▶ Only open the cylinder valves when the extinguishing lance is to extend.
- ▶ Maintain a safe distance from the danger area.
- ▶ Do not remain in the danger area.



### **CAUTION!**

#### **Bursting of the extinguishing cylinder if the operating pressure is too high!**

- ▶ The extinguishing device, in particular the cylinder, falls into DRGL 2014/68/EU category I. Due to this classification, no special test intervals are stipulated. If a component is damaged, it may only be inspected and replaced by a qualified person.
- ▶ A visual check must be carried out before and after using the extinguisher.
- ▶ Only original spare parts may be used.



### **WARNING!**

#### **Risk of accident and injury!**

Damage to the product can cause serious accidents or jeopardise the success of the operation.

- ▶ Any damage which occurs must be repaired before reuse.
- ▶ Before maintenance work, the compressed air bottles must be dismantled to prevent unintentional activation.
- ▶ Maintenance work may only be carried out in a depressurised state.
- ▶ Depressurise the device after each extinguishing operation.
- ▶ Do not leave the extinguisher permanently pressurised.

Assessment and inspection work may only be carried out by correspondingly trained fire-fighting personnel, who are familiar with the product.

The work must be carried out regularly, especially after each use, to ensure optimum operational safety of the product.

All components, locks and fittings of holding and storage systems have to be checked if they are in a good condition and verify safe storage. Any deviation, damage or defect must be corrected immediately or repaired.



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Follow the operating instructions of the individual subcomponents!

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### 8.2.1 Hose lines

All hose lines are to be checked at least once a year, and before each operation, for obvious defects in the course of a visual check.

Note the following criteria when checking hose lines:

- ▶ Check whether there is damage to the hose lines external layer like chafing, cuts, or cracks.
- ▶ Check brittleness of the outer layer or cracks in the hose material.
- ▶ Check hose lines for deformation, e.g. layers separating, bubbles, signs of crushing, kinks.
  - ▶ Check hose lines in depressurised and pressurised condition.
- ▶ Check the hose lines for leaks.

Should there be a defect, or the suspicion of a defect, the affected line is to be replaced immediately.

- ⇒ The above service activities must be performed at regular intervals. Starting from the date of manufacture of the RFC battery extinguishing system, the hose lines must be replaced every 10 years by an authorised specialist (Rosenbauer Service).

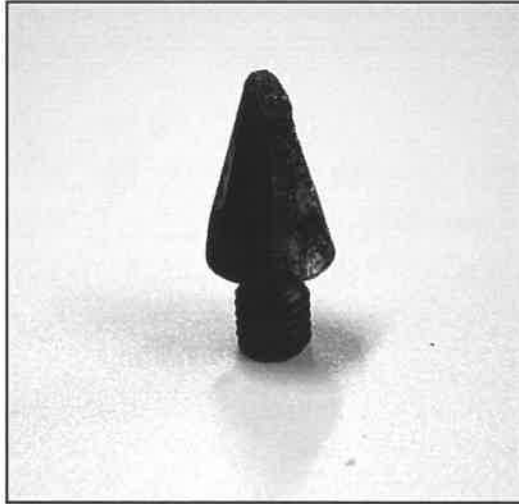
## Service and cleaning

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### Testing and inspection work

#### 8.2.2 Extinguishing lance

The extinguishing lance must be checked after each operation. If wear or damage is found it must be replaced.



*Worn extinguishing lance*

#### 8.2.3 Safety valve

Regular checks of the working pressure.

- ⇒ If the pressure regulator is set too high, the safety valve may respond intermittently. This produces loud whistling noises. Startle hazard.
- ▶ If the safety valve responds permanently, the valves of the compressed air bottles must be closed.

#### 8.2.4 Compressed air bottle

Compressed air bottles may only be serviced and refilled by certified bodies.

- ⇒ Keep compressed air bottle valves clean.

### 8.3 Service work

Service work is work that may only be carried out by specially authorised expert personnel.

This work is to be carried out or allowed to be carried out in accordance with the manufacturer's regulations.



Maintain service intervals, as well as officially prescribed testing schedules and create written records for them.



Observe the operation manuals of the individual items of equipment and devices!

#### **NOTICE**

Neglecting these recommendations will result in loss of warranty.

### 8.4 Storage and transport

The battery extinguishing system and its associated material must be stored and transported in the packaging. It must be handled carefully and cautiously.

The battery extinguishing system and its associated material may be removed from the packaging only shortly before set up.

## Troubleshooting

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Failure

# 9 Troubleshooting

## 9.1 Failure



If problems or repairs can not be clearly identified or solved please contact the customer service department or your Rosenbauer representative.

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## 10 Disposal

Dispose of all materials and old parts that are produced through the handling and repair of this unit in an environmentally-friendly way.

### **Disposal of foam compound**

Toxic foam compound is hazardous to health!

- ▶ Observe the material safety data sheets of the manufacturer of the foam compound.
- ▶ Do not dispose of foam compounds in bodies of water or in the sewage systems.
- ▶ Observe the manufacturer's disposal information.

### **Disposal of metal, rubber, and plastic parts**

Improper disposal of metal, rubber and plastic parts will contaminate the environment.

- ▶ Observe local regulations.

### **Disposal of compressed air bottles**

Only dispose of completely empty compressed air bottles.

- ▶ Observe locally valid regulations.

## Technical data

Failure

### 11 Technical data

#### RFC battery extinguishing system

Manufacturer	Rosenbauer International AG
Flow	30 l/min at 7 bar
Flow range	from 25 l/min at 4 bar to 50 l/min at 15 bar
Water supply connection	Storz C
Compressed air supply	2 x 1l 300 bar
Operating module dimensions	
Length	approx. 390 mm (15.35 in)
Width	approx. 310 mm (12.2 in)
Height	approx. 355 mm (14 in)
Weight with compressed air bottles	approx. 22 kg (48.5 lbs)
Weight without compressed air bottles	approx. 19 kg (41.9 lbs)
Extinguishing module dimensions	
Length	approx. 350 mm (13.7 in)
Width	approx. 390 mm (15.3 in)
Height	approx. 195 mm (7.7 in)
Weight	approx. 21 kg (46.3 lbs)
Extinguishing module material	Stainless steel and aluminium
Extinguishing lance material	Hardened steel
Stroke of the extinguishing lance	65 mm (2.6 in)
Hose stack dimensions	
Compressed air	
Length	8 m (315 in) as standard
Weight	approx. 19 kg (41.9 lbs)
Hose stack dimensions	
Water supply	
Length	8 m (315 in) as standard
Weight	approx. 5 kg (11 lbs)

## 12 Documentation

Calling up the QR code (QR = Quick Response) provides access to the available documents for the battery extinguishing system. The online spare parts catalogue can also be called up.

RFC battery extinguishing system (PC481)



<https://my.rosenbauer.com/productinfo/?id=7c58099a-925d-ec11-8f8f-000d3a269fb2>

### 13 Index of abbreviations

#### General abbreviations

i.n.	if necessary
e. g.	for example
approx.	approximately
Etc.	Et cetera
incl.	inclusive
resp.	respectively
acc. to	according to

#### Abbreviations for units

m	Meter
mm	Millimetres
in	Inch
"	Inch
ft	Feet
min	Minute
s	Second
h	hour
kg	Kilogram
lbs, lb	Pound
l	Litres
gal	gallons
bar	Pressure unit
psi	Pounds per square inch
V	Volt
VDC	DC voltage
A	Ampere
kVA	Kilo volt-ampere
W	Watts
kW	Kilowatts

### Abbreviations for units

Hz	Hertz
kN	Kilonewtons
cSt	Centistokes
DN	Diameter nominal
dB	Decibel
°C	Degrees Celsius
°F	Degrees Fahrenheit
l/min	Litres per minute
GPM	Gallons per minute
kg/s	Kilogram per second
lbs/s	Pounds per second
km/h	Kilometres per hour
m/s <sup>2</sup>	Metres per second squared
min <sup>-1</sup> , rpm	Revolutions per minute

