



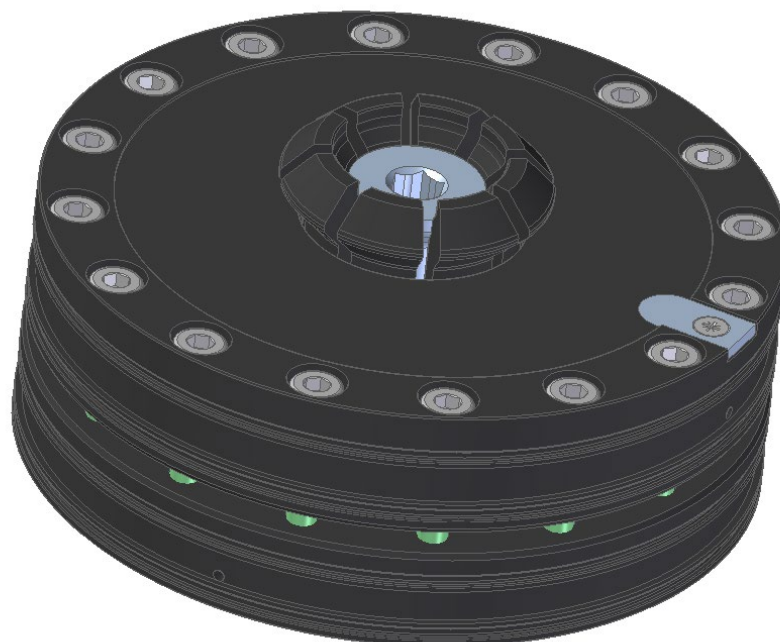
ZERO CLAMP®

Experience precision

**Original**

**Installation and operating  
instructions**

**Safety unit – 16569**



Copyright

ZERO CLAMP® safety unit 16569 installation instructions.

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83052 Bruckmühl, Germany

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Issue: 11/15/2018

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## **1. General matters**

### **1.1. Use of the installation and operating instructions**

Dear customer,

Many thanks for deciding to purchase our products. These installation and operating instructions contain useful information allowing you to familiarize yourself with your clamping system before starting to use it for its intended purpose under the specified operating conditions. They contain important instructions to ensure functionally correct and cost-effective installation and operation.

The operating instructions have been created for use by installation, operating and maintenance staff, and must always be kept to hand at the place of use of the clamping system.

You have chosen a high-quality clamping system which operates with extremely high precision.

In the interests of product improvement, we reserve the right to make changes in respect of versions, dimensions and materials.

Of course, we remain available to you at all times for after-sales service.

Please contact us using the information set out below.

#### **1.1 Customer Service contact information**

ZeroClamp GmbH  
Albert-Mayer-Straße 13  
83052 Bruckmühl

Tel. +49 8062 72948-0  
info@zeroclamp.com

#### **1.2 Spare parts and wearing parts**

Using spare wearing parts from third-party manufacturers can lead to hazards. Use only original parts from the manufacturer or parts approved by them.

#### **1.3 Warranty**

The warranty is 12 months from the date of delivery from the works, provided the system is used for its intended purpose in 1-shift operation.

These operating instructions supersede all previous versions. The current operating instructions are available for download at [www.zeroclamp.com](http://www.zeroclamp.com)

## 1.4 Scope of supply

The scope of supply includes:

- Safety unit with accessories

## 1.5 Declaration of conformity

The manufacturer:                      ZeroClamp GmbH  
Albert-Mayer-Straße 13  
83052 Bruckmühl

hereby declares that the following products:

Product designation:                      Safety unit  
Type designation:                              Safety unit 120

Build year:    2013

comply with the following essential requirements of the **Machinery Directive (2006/42/EC)**:

The following standards were applied:

DIN EN ISO 4414	Pneumatic fluid power – General rules and safety requirements for pneumatic systems and their components
DIN EN ISO 12100	Safety of machinery – General principles for design, risk assessment and risk reduction
ISO 16156	Safety Machine tools safety – Safety requirements for the design and construction of work holding chucks
ISO 19719	Machine tools — Work holding chucks — Vocabulary

The incomplete machine may not be brought into use until it has been incorporated into a machine and the machine into which it has been incorporated satisfies the provisions of the Machinery Directive (2006/42/EC).

The manufacturer undertakes on request to communicate by electronic means the special documents relating to the incomplete machine.

The special technical documents relating to the machine were created in accordance with Appendix VII Part B.

Name of the authorized person for documentation: Klaus Hofmann

Address of the authorized person for documentation: see manufacturer's address





Icking,  
May 2, 2013  
Date


\_\_\_\_\_  
Klaus Hofmann, Managing Director  
Signatory and details of signatory                      Signature


  
Unterschrift


## 2. Safety

### 2.1 General safety instructions

	<p><i>Warning!</i></p> <p>In both a clamped and non-clamped state, the safety unit can fill up with liquids (cooling lubricants) if it is not operated for a prolonged period of time.</p> <p>Ensure that the safety unit cannot fill up with liquids when it is not in use!</p> <p>Free the safety unit of fluids once a week by siphoning these off!</p>
	<p><i>Warning!</i></p> <p>Spray the exposed mechanical parts on the safety unit once to twice a week with fine oil (for approved products, refer to 7.1 Cleaning and care) while actuating these mechanical parts several times in order to distribute the oil!</p> <p>This preserves the mechanical parts and ensures that they run smoothly and remain viable.</p>
	<p><i>Warning!</i></p> <p>Do not overload the safety unit!</p> <p>Calculate the anticipated forces! (both static and dynamic). Use a sufficient number of safety units: min. 2 units are generally recommended.</p>
	<p><i>Warning!</i></p> <p>When the safety unit is operated, the skin of the fingers may be crushed.</p> <p>Do not reach into the clamping elements! Supply the safety unit with compressed air before inserting components and/or equipment.</p>

	<p><b>Warning!</b></p> <p>Accidental actuation of the zero point clamping system and safety unit may lead to the unintentional release of the clamping.</p> <p>Disconnect the zero point clamping system and the safety unit from the compressed air supply before you undertake installation, adjustment, maintenance or set-up work!</p> <p>Whilst the zero point clamping system and safety unit are in operation, secure them against unintentional releasing by fitting suitable safety devices for the compressed air supply!</p> <p>We recommend operating the zero point clamping system and the safety unit on separate channels.</p>
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	<p><b>Warning!</b></p> <p>Your clamping system/adapter plate can be very heavy.</p> <p>When you build your own clamping systems, make sure that they can be fastened in a suitable way in order to be lifted with handling devices or cranes.</p> <p>Give particular attention to this point if the clamping systems weigh 20 kg or more.</p>
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	<p><b>Warning!</b></p> <p>Before operation, perform a full function test that includes all special functions.</p>
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## 2.2 Use for the intended purpose

The safety unit features a self-locking system. This safety device is therefore required for turning and milling applications in combination with the ZERO CLAMP® zero point clamping system.

It is not permissible to use it on its own, as no clamping forces originate from the safety unit.

Two safety units should always be used. If installed centrally, one single unit can also be used if the anticipated load permits this.

Any use that is not within these conditions ranks as improper use. The manufacturer accepts no responsibility for damage resulting from improper use.

## 2.3 Structural modifications

For reasons of safety, unauthorized changes and modifications to the safety unit are prohibited! When exchanging defective parts, use only original parts or standard parts that are approved by the manufacturer.

## 2.4 Training the operators

The operators must have received instruction on the following topics:

- Function and operation of the safety unit
- Functionality and operation of the zero point clamping system
- Calculation of the maximum clamping forces
- Maintenance and cleaning work

All persons responsible for the installation, commissioning and maintenance of the machine must have read and understood the complete operating instructions, especially Section 1 "Safety". We recommend that the operating company obtains signatures to this effect.

Installation, removal, connection and commissioning may only be performed by authorized personnel. Do not employ operating techniques which adversely affect the functionality and operational safety of the zero point clamping system and the safety unit.

## 3. Technical data

### 3.1 Pneumatic data

Minimum air pressure	5.5 bar
Maximum air pressure	8 bar
Opening time	max. 4 seconds (if the air pressure is fully applied to the housing)

### 3.2 Operating temperature

Minimum	15 °C
Maximum	40 °C

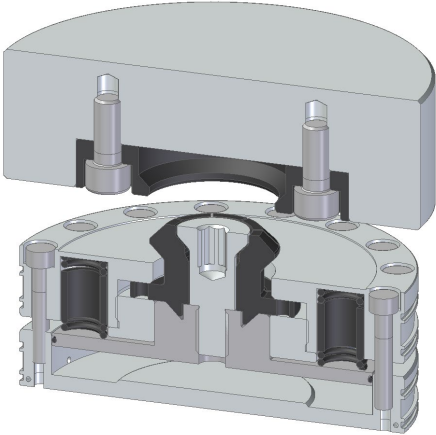
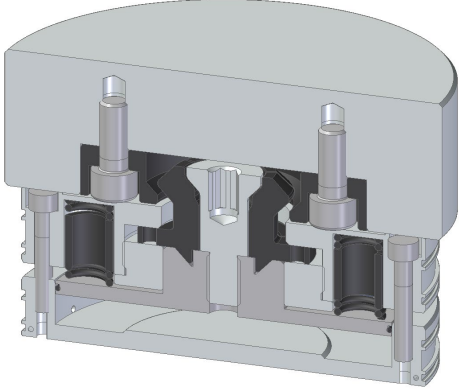
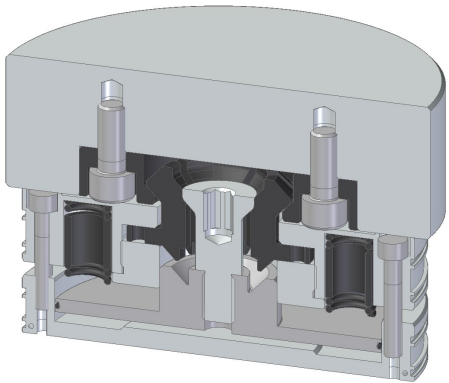
### 3.3 Operational environment

The safety unit is not suitable for the following operational environments:

- Abrasive dusts
- Caustic or aggressive liquids and vapors



## 4. Functionality

	<p>The pallet is placed onto the opened safety unit.</p>
	<p>The locking unit is kept open by the applied air pressure.</p>
	<p>If the system is vented, the safety unit closes.</p>



**Warning!**

The safety unit serves exclusively as a safety device. No clamping forces occur!

Only use this system in combination with the ZERO CLAMP® zero point clamping system.

## 5. Accessories

A counterpart component is required to use the safety unit: the so-called retaining ring with appropriate fastening material for your adapter plate or clamping fixture.

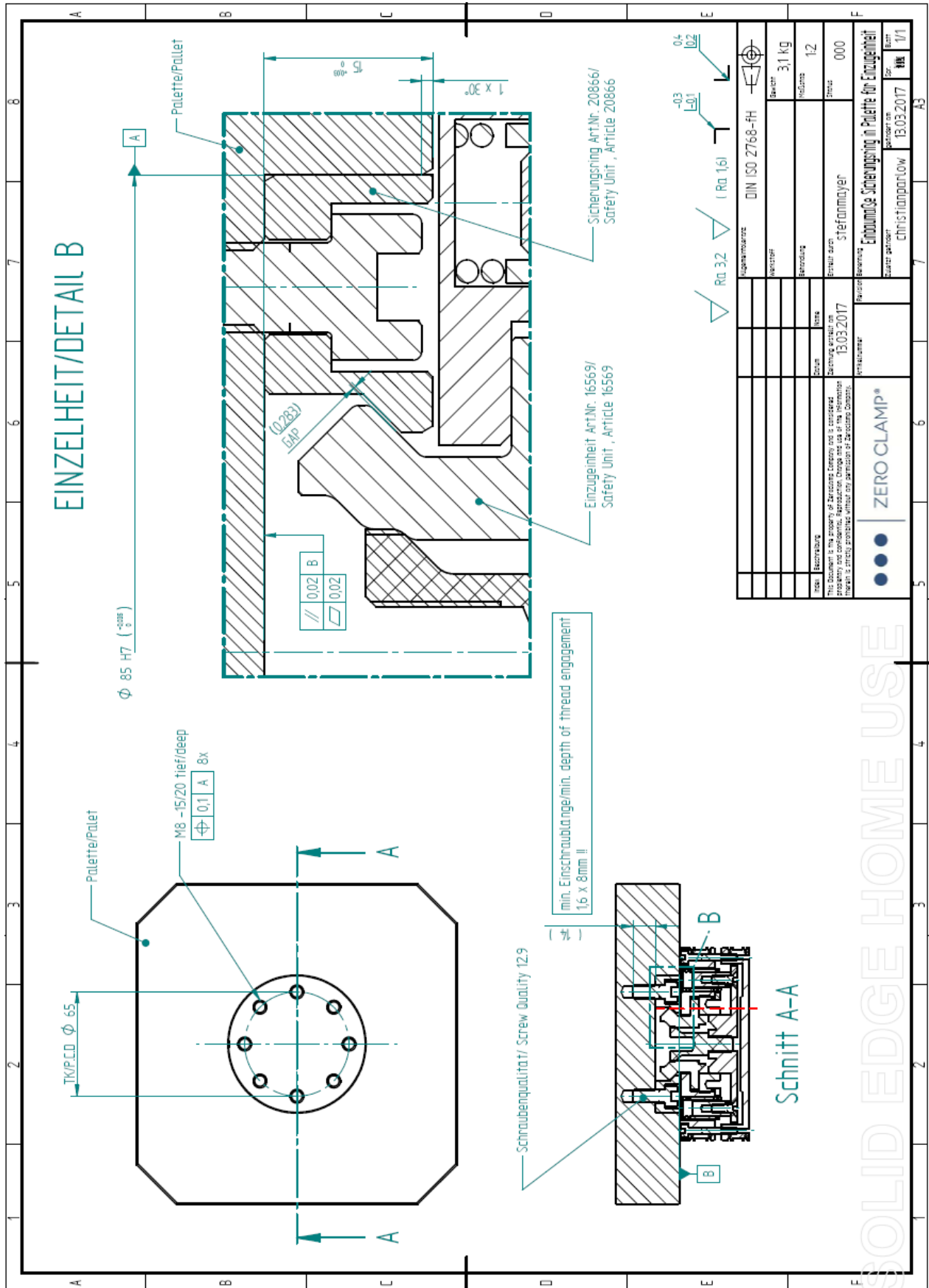


Article no. 20866






*Note:*

Only use the permitted fastening material!



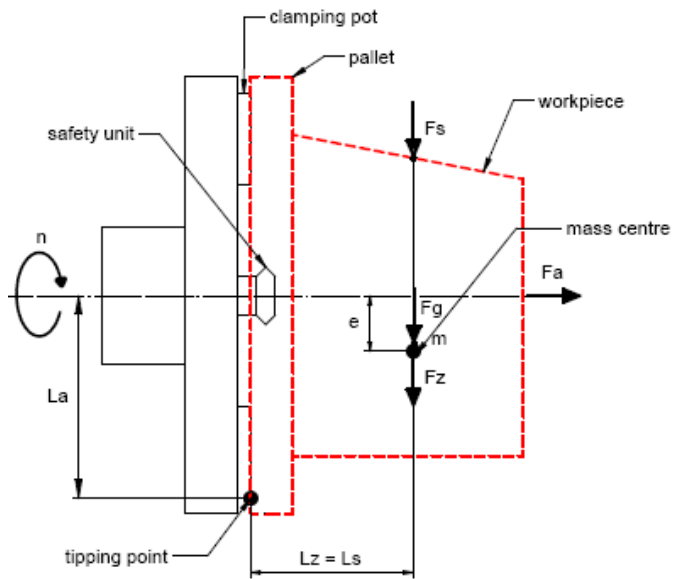
## 6. Operation

	<p><i>Warning!</i></p> <p>During installation and operation, the skin of the fingers or the fingers themselves may be crushed.</p> <p>Do not reach into the mechanical parts.</p>
	<p><i>Warning!</i></p> <p>Only use the approved retaining ring 20866 and at least two safety units. When positioned centrally, it is also permissible to use one single safety unit.</p> <p>Always calculate the anticipated forces!</p>
	<p><i>Warning!</i></p> <p>Before operation, perform a full function test that includes all special functions.</p>

### 6.1 Calculating forces

#### **Redundant safeguard:**

The safety units are equipped with positive locking and therefore offer an additional safeguard. The smallest breaking load of an individual safety unit in the axial direction is determined by the screw connection in the base plate and is  $272\text{ kN}$ . The smallest radial breaking load is over  $500\text{ kN}$  and is not examined in the following. The actual occurring axial forces are explained based on the following drawing.



### Parameters:

Revolutions	=	n [rpm]
Lever arm a	=	$L_a$ [m]
Lever arm z	=	$L_z$ [m]
Eccentricity	=	e [m]
Mass	=	m [kg]
Centrifugal force	=	$F_z$ [N]
Cutting force	=	$F_s$ [N]
Weight force	=	$F_g$ [N]
Axial force	=	$F_a$ [N]
Axial breaking load	=	$F_{azul}$ [N]
Safety	=	S
Gravitational acceleration	=	g [m/s <sup>2</sup> ]

An axial component arises as a result of the centrifugal force and weight force in the center of mass via the lever ratios. This is calculated as follows:

$$F_a = \frac{L_z}{L_a} \cdot (F_z + F_g)$$

The centrifugal force and weight force are calculated from the following values:

$$F_z = \left(\frac{\pi \cdot n}{30}\right)^2 \cdot m \cdot e$$

$$F_g = m \cdot g$$

### Imbalance and balance quality:

The permissible unbalance  $U_{zul}$  [g·mm] is the result of the values for the rotational speed  $n$  [rpm], the permissible balance quality  $Q_{zul}$  [mm/s] and the mass  $m$  [kg]. A balance quality of Q 6.3 therefore means that  $Q_{zul} = 6.3 \text{ mm/s}$ .

$$U = \frac{9,550 \cdot m [g] \cdot Q}{n} = m [g] \cdot e [mm]$$

$$Q = \frac{U \cdot \pi \cdot n}{m \cdot 30} = e [mm] \cdot \frac{\pi \cdot n}{30}$$

**Example 1:**

m	=	400 kg
n	=	1600 rpm
e	=	$5 \cdot 10^{-3}$ m
L <sub>z</sub>	=	0.250 m
L <sub>a</sub>	=	0.360 m
F <sub>azul</sub>	=	272 kN

$$F_z = \left( \frac{\pi \cdot 1600 \text{ min}^{-1}}{30} \right)^2 \cdot 400 \text{ kg} \cdot 5 \cdot 10^{-3} \text{ m} = 56,5 \text{ kN}$$

$$F_g = 400 \text{ kg} \cdot 9,81 \frac{\text{m}}{\text{s}^2} = 3,92 \text{ kN}$$

$$F_a = \frac{0,250 \text{ m}}{0,360 \text{ m}} \cdot (56,5 \text{ kN} + 3,92 \text{ kN}) = 42,0 \text{ kN}$$

$$U = 400 \cdot 10^3 \text{ g} \cdot 5 \text{ mm} = 2.000.000 \text{ g} \cdot \text{mm}$$

$$Q = \frac{2.000.000 \text{ g} \cdot \text{mm} \cdot \pi \cdot 1600 \text{ min}^{-1}}{400 \cdot 10^3 \text{ g} \cdot 30} = 838 \frac{\text{mm}}{\text{s}}$$

$$S = \frac{F_{azul}}{F_a} = \frac{272 \text{ kN}}{42,0 \text{ kN}} \sim 6,5$$

With a theoretical balance quality of  $Q = 838 \text{ mm/s}$ , a safety of  $S \sim 6.5$  would still be present if one safety unit were in use.

**The operator is responsible for choosing the safety factors, the setup of the equipment and the risk potential in particular must be taken into account here.**

**Example 2:**

m	=	400 kg
n	=	1600 rpm
L <sub>z</sub>	=	0.250 m
L <sub>a</sub>	=	0.360 m
F <sub>s</sub>	=	5 kN
Q	=	6.3 mm/s
F <sub>g</sub>	=	3.92 kN

$$U = \frac{9,550 \cdot 400 \cdot 10^3 g \cdot 6,3 \frac{mm}{s}}{1600 \text{ min}^{-1}} = 15041 \text{ g} \cdot \text{mm}$$

$$e = \frac{15041 \text{ g} \cdot \text{mm}}{400 \cdot 10^3 g} = 0,038 \text{ mm}$$

$$F_z = \left( \frac{\pi \cdot 1600 \text{ min}^{-1}}{30} \right)^2 \cdot 400 \text{ kg} \cdot 0,038 \cdot 10^{-3} \text{ m} = 0,427 \text{ kN}$$

As the cutting force, weight force and centrifugal force take effect on the same level, these can be added together.


$$F_a = \frac{0,250 \text{ m}}{0,360 \text{ m}} \cdot (0,427 \text{ kN} + 3,92 \text{ kN} + 5,00 \text{ kN}) = 6,49 \text{ kN}$$


$$S = \frac{F_{azul}}{F_a} = \frac{272 \text{ kN}}{6,49 \text{ kN}} \sim 42$$

**General instruction**

The safety instructions and other instructions for the zero point clamping system are also applicable.  
The installation and operating instructions of the zero point clamping system are available for download. [www.zeroclamp.com](http://www.zeroclamp.com)

## 7. Maintenance and care

	<p><b>Warning!</b></p> <p>In both a clamped and non-clamped state, the safety unit can fill up with liquids (cooling lubricants) if it is not operated for a prolonged period of time.</p> <p>Ensure that the safety unit cannot fill up with liquids when it is not in use!</p> <p>Free the safety unit of fluids once a week by siphoning these off!</p>
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	<p><b>Warning!</b></p> <p>Spray the exposed mechanical parts on the safety unit once to twice a week with fine oil (for approved products, refer to 7.1 Cleaning and care) while actuating these mechanical parts several times in order to distribute the oil!</p> <p>This preserves the mechanical parts and ensures that they run smoothly and remain viable.</p>
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### 7.1 Maintenance schedule

Activity	Weekly	Monthly	Note
Siphoning of liquids which may have accumulated in the safety unit.	x		Perform several times a week if permanently used in cooling lubricants.
Spray mechanical parts with fine oil (for approved products, refer to 7.1 Cleaning and care).	x		Perform several times a week if permanently used in cooling lubricants.
Spray mechanical parts with fine oil (hebro <sup>®</sup> multiplus) and activate the safety unit multiple times.		x	If the safety unit is not in use, but rather in storage.



## 7.2 Cleaning and care


### Approved cleaning and care products:

- hebro®multiplus (recommended)<sup>1</sup>
- WD 40
- Ballistol

### Impermissible cleaning and care products:

- Acids
- Lyes
- Aggressive media
- Non-approved cleaning and care products

## 8. Residual risks

	Description of risk	Risk reduction
	Disregarding safety instructions	Training staff about hazards

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<sup>1</sup> Procurement source: [info@hebro-chemie.de](mailto:info@hebro-chemie.de)  
ZeroClamp installation and operation instruction Safety Unit

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