ToothLock® Ear Clamp

293

Recommended for Air Intake Systems

Benefits

- Outstanding clamping performance
- Reliable assembly
- Strong sealing qualities
- Worker-friendly installation

360° StepLess® Technology: uniform 360° compression and uniform surface pressure

ToothLock® Technology: very high and permanent compression rates, outstanding expansion resistance

Enlarged ear width (17 mm): enhanced clearance for easy assembly, extended diameter range

Security hook: prevents unintended opening during transport

Closed interlock: smooth outer contour supports injury-free installation

Burr-free strip edges: reduced risk of damage to parts being clamped
FEATURES

- Ear dimple
- Interlock
- Security hook

ToothLock® Technology

- Teardrop dimple
- Tongue-in-groove-design
- Ear width (s)
- Tongue with teeth

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TECHNICAL DATA OVERVIEW

Target applications
Air Intake Systems
Other applications upon verification by Oetiker.

Material
Stainless steel, material no. 1.4301/UNS S30400

Corrosion resistance according to DIN EN ISO 9227
≥ 1000 hours

Series

<table>
<thead>
<tr>
<th>Size range</th>
<th>Width x thickness</th>
<th>Ear width</th>
</tr>
</thead>
<tbody>
<tr>
<td>40.0 – 120.5 mm</td>
<td>10.0 x 1.0 mm</td>
<td>17 mm</td>
</tr>
</tbody>
</table>

Sizes

- Diameter graduation 0.5 mm
- Some sizes are only available if an appropriate minimum quantity is ordered.

ToothLock®

Interlocked with its teeth, the distinctive “ToothLock®” feature offers extremely high and permanent compression rates and outstanding expansion resistance – strong enough for the toughest connections. It also supports shock and vibration resistance and helps the clamp to withstand thermal stress. The ToothLock® is designed as a self-locking mechanism and increases the performance due to the low spring back rate. With its multiple tooth-locking positions, it compensates component tolerances.

Security hook
The security hook securely holds the clamp geometry together during transportation.

Clamp ear (closing element)
Using tools designed by Oetiker, the clamp is closed by drawing together the lower radii of the “ear”. The maximum diameter reduction is proportional to the open “ear” width (s). The theoretical maximum reduction in diameter is given by the formula:

Max. diameter reduction = \( \frac{\text{Ear width (s)}}{\pi} \) = \( \frac{17 \text{ mm}}{\pi} \) = 5.4 mm
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Clamp ear (closing element)

The above sketch shows the appearance of a closed “ear” (s'); it does not necessarily indicate an effective closed assembly.

**Approach**

To determine the correct clamp diameter, push the hose onto the attaching material, (e.g. the nipple), and then measure the outer diameter of the hose. Select a clamp whose average value of the size range is slightly greater than the hose’s outer diameter. To ensure full ToothLock® engagement and a sufficient closure of the clamp the nominal diameter has to be reduced by at least 2.2 mm (> 40% of the original ear width) and the correct closing force has to be applied during assembly.

**Assembly**

**Recommendations**

The clamp’s ear should be closed at a uniform rate not exceeding the recommended maximum closing force. This will ensure clamp tension remains constant without overloading individual components of the assembly being joined, and of the clamps. Oetiker calls this installation method “force priority”. Force priority ensures that tolerance compensating of the clamp remains functional for every installation. This insures the resulting radial force remain approximately the same for every assembly, independent of any component’s dimensional fluctuation. If Oetiker’s ELK electronically controlled pneumatic pincers are used in force priority mode, installations can be monitored to ensure repeatable installations are achieved at the proper force.

**Instructions**

For proper assembly, position the pincer jaws onto “ear” of the clamp. Close the pincer jaws to compress the ear of the clamp. This reduces the diameter of the ToothLock® Ear Clamp. The tool can be removed once the pincer jaws open after the ear is clamped.

To ensure full ToothLock® engagement and a sufficient closure of the clamp, the nominal diameter has to be reduced by at least 2.2 mm (minimum diameter reduction) and the correct closing force has to be applied during assembly.

**Closing force**

As a matter of principle, the closing force selection is closely related to the desired compression or surface pressure of the material to be assembled. The resistance against the clamp corresponds to the applied force, so that the defined closing force is significantly reduced if soft materials are compressed. The maximum closing force is displayed in the table below, it specifically refers to thermoplastics.

**Block closure**

Block closure is when the installation force fully closes the ear, resulting in both ear legs touching (vertical members between the ear dimple and clamp radius). When this occurs the installation force is absorbed by compressing the legs rather than transferring the installation forces to the parts being clamped. If installation forces are going to be measured, a block closure must be avoided.

**Rotation diameter**

The rotation diameter (RD) of an assembled clamp can be critical design information for applications which require a rotation within a limited open space. It changes, depending on the resulting ear gap. Maximum rotation diameter must be determined with application specific tests.

\[
RD = \text{closed diameter} + 19.6 \text{ mm}
\]

Important

- The ear height is a natural result of ear deformation. Do not influence the ear height, neither by changing the ear gap nor with built-in hold-down devices in installation tools.
- Single tool stroke closure only, do not apply secondary crimping force.
ASSEMBLY TOOLS

Manual
- Clamping tool 293 Item no. 14100379
- Torque wrench Item no. 14100098

Mechanical or electronically controlled
- HO 7000 ME w/o pincer head Item no. 13900230
- Pincer head HO-10.5-21.2 ME Item no. 13900851
- HO 7000 ELT w/o pincer head Item no. 13900341
- Pincer head HO-10.5-21.2 EL Item no. 13900879
- HO 10000 ELT w/o pincer head Item no. 13900879
- Pincer head HO-10.5-21.2 EL HO-10000 Item no. 13900854
- Jaw replacement kit Item no. 13900853

This closing force is intended as a guide, which may vary depending on the type and tolerances of parts being clamped. To ensure optimum clamp selection, we recommend conducting functional tests with several assemblies.

Cordless Clamp Pincer Oetiker CP 20
- Closing force range: 3500 N-10000 N*
- External dimensions: 425 x 82 x 124 mm
- Weight: 3100 g**
- Closing time: 3-4 seconds

* Adjustable closing force range, depending upon pincer head used. Closing force can be determined by:
- CAL 01
- SKM 02 (limited usability - up to max. 7500 N)
** incl. 1 x 2 Ah battery and standard pincer head

Installation data

<table>
<thead>
<tr>
<th>Material dimension</th>
<th>Size range</th>
<th>Ear width</th>
<th>Maximum closing force</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 x 1.0 mm</td>
<td>40.0 – 120.5 mm</td>
<td>17 mm</td>
<td>7500 N*</td>
</tr>
</tbody>
</table>

* For closing forces ≥ 7000 N, with the HO 7000 pneumatic pincer, an inlet pressure of > 6.6 bar is required.

Selection of pincer heads

<table>
<thead>
<tr>
<th>Pincer heads</th>
<th>CP 20</th>
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</thead>
<tbody>
<tr>
<td>Jaw width</td>
<td>10.5 mm</td>
</tr>
<tr>
<td>Opening gap</td>
<td>21.2 mm</td>
</tr>
<tr>
<td>For ear width*</td>
<td>17 mm</td>
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<tr>
<td>Item no.</td>
<td>13900994</td>
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</tbody>
</table>

* measured on the inside

Selection of pincer types

<table>
<thead>
<tr>
<th>CP 20 version</th>
<th>CP 20 sets with pincer heads*</th>
<th>CP sets without pincer head*</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP 20 (AUS)</td>
<td>13900971</td>
<td>13901315</td>
</tr>
<tr>
<td>CP 20 (EU)</td>
<td>13900969</td>
<td>13901313</td>
</tr>
<tr>
<td>CP 20 (UK)</td>
<td>13900972</td>
<td>13901316</td>
</tr>
<tr>
<td>CP 20 (US)</td>
<td>13900970</td>
<td>13901314</td>
</tr>
</tbody>
</table>

Replacement jaws

| Jaw replacement kit | 13900853 |

* to suit regional power plug