

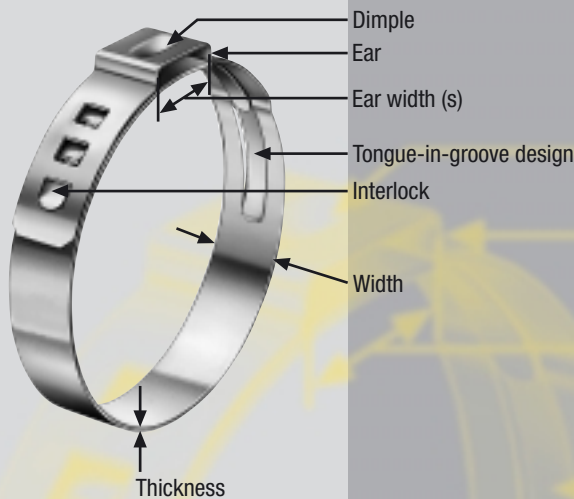
OETIKER®  
OETIKER  
Technical  
Data Sheet

# OETIKER

## Technical Data Sheet

### Stepless® Ear Clamps

Product Group **167**



Dimple

Ear

Ear width (s)

Tongue-in-groove design

Interlock

Width



Connecting Technology

Thickness

# Technical Data

## Stepless® Ear Clamps

Product Group **167**



The term "Stepless" refers to the absence of steps or gaps on the inner circumference of the clamp. The stepless® design provides uniform compression and a 360° seal.

Standard series Stepless® Ear Clamps are especially well suited to applications involving both flexible and inflexible thin-walled hoses.

The higher retained loads of the OETIKER Stepless® Heavy Duty Series Clamps, are ideal for difficult to seal applications such as moulded plastics or other less malleable materials, commonly used in the automotive industry.

### Material

- **167** Stainless Steel, Material no. 1.4301 / UNS S30400
- Alternate materials optional

### Standard Series

Size range	Width x Thickness
6.5 - 11.8 mm	5.0 x 0.5 mm
11.9 - 120.5 mm	7.0 x 0.6 mm
21.0 - 120.5 mm	9.0 x 0.6 mm

### Heavy Duty Series

Size range	Width x Thickness
24.5 - 120.5 mm	10.0 x 0.8 mm
62.0 - 120.5 mm	10.0 x 1.0 mm

### Size

See pages 3/4.

### Installation

See page 6.

The information provided in this data sheet is intended for reference purposes only and should not be considered a specification. OETIKER invites customers to submit samples with relevant application information, to determine the best suited clamp product and installation method.

### Features

- 360° stepless® design – no steps or gaps on inner circumference
- Narrow band, concentrated seal compression
- Smooth edged band steel prevents damage to hose
- Light weight
- Tamper detectable design

### Installation tools

OETIKER supplies pincers for manual closure.



OETIKER recommends pneumatic pincers with electronic gauging, to ensure repeatable assembly and uniform closure, particularly for mass production applications.



The innovative "Electronically Controlled Pneumatic Power Tool OETIKER ELK 01" guarantees reliable installation with electronic monitoring of all necessary parameters. It practically eliminates the possibility of any unnoticed defective closures.



For further information, please see the OETIKER Tool Catalogue.

# Technical Data

## Stepless® Ear Clamps

Product Group **167**

**Item No. Ref. No. Size range (mm)**

**Band width 5 mm, thickness 0.5 mm (505R)**

16702488	006.5-505R	5.3 - 6.5
16700001	007.0-505R	5.8 - 7
16700002	008.0-505R	6.8 - 8
16700003	008.7-505R	7 - 8.7
16702491	009.0-505R	7.3 - 9
16700004	009.5-505R	7.8 - 9.5
16700005	010.0-505R	8.3 - 10
16700006	010.5-505R	8.8 - 10.5
16702492	010.9-505R	9.2 - 10.9
16700007	011.3-505R	9.6 - 11.3
16700008	011.8-505R	10.1 - 11.8

**Band width 7 mm, thickness 0.6 mm (706R)**

16702951	011.9-706R	9.4 - 11.9
16700009	012.3-706R	9.8 - 12.3
16702493	012.8-706R	10.3 - 12.8
16700010	013.3-706R	10.8 - 13.3
16700011	013.8-706R	11.3 - 13.8
16700012	014.0-706R	11.5 - 14
16702864	014.2-706R	11.7 - 14.2
16700013	014.5-706R	12 - 14.5
16700014	014.8-706R	12.3 - 14.8
16700015	015.3-706R	12.8 - 15.3
16700016	015.7-706R	13.2 - 15.7
16702998	016.0-706R	13.5 - 16
16702494	016.2-706R	13.7 - 16.2
16702495	016.6-706R	14.1 - 16.6
16702496	016.8-706R	14.3 - 16.8
16700017	017.0-706R	14.5 - 17
16702497	017.5-706R	15 - 17.5
16700018	017.8-706R	14.6 - 17.8
16700019	018.0-706R	14.8 - 18
16700020	018.5-706R	15.3 - 18.5
16700110	019.2-706R	16 - 19.2
16702498	019.8-706R	16.6 - 19.8
16700024	021.0-706R	17.8 - 21
16700026	022.6-706R	19.4 - 22.6
16700028	023.5-706R	20.3 - 23.5
16700029	024.1-706R	20.9 - 24.1
16700031	025.6-706R	22.4 - 25.6
16700033	027.1-706R	23.9 - 27.1
16700035	028.6-706R	25.4 - 28.6
16702047	030.1-706R	26.9 - 30.1
16700039	030.8-706R	27.6 - 30.8
16700040	031.6-706R	28.4 - 31.6
16700042	033.1-706R	29.9 - 33.1
16700044	034.6-706R	31.4 - 34.6
16700046	036.1-706R	32.9 - 36.1
16700048	037.6-706R	34.4 - 37.6
16700050	038.1-706R	34.9 - 38.1
16700052	039.6-706R	36.4 - 39.6
16700053	041.0-706R	37.8 - 41

**Item No. Ref. No. Size range (mm)**

**Band width 7 mm, thickness 0.6 mm (706R)**

16700054	042.5-706R	39.3 - 42.5
16700055	044.0-706R	40.8 - 44
16700056	045.5-706R	42.3 - 45.5
16700057	047.0-706R	43.8 - 47
16700058	048.5-706R	45.3 - 48.5
16700059	050.0-706R	46.8 - 50
16700060	051.5-706R	48.3 - 51.5
16700061	053.0-706R	49.8 - 53
16700062	054.5-706R	51.3 - 54.5
16700063	056.0-706R	52.8 - 56
16700064	057.5-706R	54.3 - 57.5
16700065	059.0-706R	55.8 - 59
16700066	060.5-706R	57.3 - 60.5
16700067	062.0-706R	58.8 - 62
16700068	063.5-706R	60.3 - 63.5
16700069	065.0-706R	61.8 - 65
16700070	066.5-706R	63.3 - 66.5
16700071	068.0-706R	64.8 - 68
16700072	069.5-706R	66.3 - 69.5
16700073	071.0-706R	67.8 - 71
16700074	072.5-706R	69.3 - 72.5
16700075	074.0-706R	70.8 - 74
16700076	075.5-706R	72.3 - 75.5
16700077	077.0-706R	73.8 - 77
16700078	078.5-706R	75.3 - 78.5
16700079	080.0-706R	76.8 - 80
16700080	081.5-706R	78.3 - 81.5
16700081	083.0-706R	79.8 - 83
16700082	084.5-706R	81.3 - 84.5
16700083	086.0-706R	82.8 - 86
16700084	087.5-706R	84.3 - 87.5
16700085	089.0-706R	85.8 - 89
16700086	090.5-706R	87.3 - 90.5
16700087	092.0-706R	88.8 - 92
16700088	093.5-706R	90.3 - 93.5
16700089	095.0-706R	91.8 - 95
16700090	096.5-706R	93.3 - 96.5
16700091	098.0-706R	94.8 - 98
16700092	099.5-706R	96.3 - 99.5
16700093	101.0-706R	97.8 - 101
16700094	102.5-706R	99.3 - 102.5
16700095	104.0-706R	100.8 - 104
16700096	105.5-706R	102.3 - 105.5
16700097	107.0-706R	103.8 - 107
16700098	108.5-706R	105.3 - 108.5
16700099	110.0-706R	106.8 - 110
16700100	111.5-706R	108.3 - 111.5
16700101	113.0-706R	109.8 - 113
16700102	114.5-706R	111.3 - 114.5
16700103	116.0-706R	112.8 - 116
16700104	117.5-706R	114.3 - 117.5
16700105	119.0-706R	115.8 - 119
16700106	120.5-706R	117.3 - 120.5

# Technical Data Stepless® Ear Clamps

Product Group **167**



Item No.	Ref. No.	Size range (mm)
<b>Band width 9 mm, thickness 0.6 mm (906R)</b>		
16700196	021.0-906R	17.8 - 21
16700198	022.6-906R	19.4 - 22.6
16703877	023.5-906R	20.3 - 23.5
16700201	024.1-906R	20.9 - 24.1
16700203	025.6-906R	22.4 - 25.6
16700205	027.1-906R	23.9 - 27.1
16700207	028.6-906R	25.4 - 28.6
16700209	030.1-906R	26.9 - 30.1
16700211	030.8-906R	27.6 - 30.8
16700212	031.6-906R	28.4 - 31.6
16700214	033.1-906R	29.9 - 33.1
16700216	034.6-906R	31.4 - 34.6
16700218	036.1-906R	32.9 - 36.1
16700220	037.6-906R	34.4 - 37.6
16702499	038.1-906R	34.9 - 38.1
16700224	039.6-906R	36.4 - 39.6
16700225	041.0-906R	37.8 - 41
16700226	042.5-906R	39.3 - 42.5
16700227	044.0-906R	40.8 - 44
16700228	045.5-906R	42.3 - 45.5
16700229	047.0-906R	43.8 - 47
16700230	048.5-906R	45.3 - 48.5
16700231	050.0-906R	46.8 - 50
16700232	051.5-906R	48.3 - 51.5
16700233	053.0-906R	49.8 - 53
16700234	054.5-906R	51.3 - 54.5
16700235	056.0-906R	52.8 - 56
16700236	057.5-906R	54.3 - 57.5
16700237	059.0-906R	55.8 - 59
16700238	060.5-906R	57.3 - 60.5
16700239	062.0-906R	58.5 - 62
16700240	063.5-906R	60.3 - 63.5
16700241	065.0-906R	61.8 - 65
16700242	066.5-906R	63.3 - 66.5
16700243	068.0-906R	64.8 - 68
16700244	069.5-906R	66.3 - 69.5
16700245	071.0-906R	67.8 - 71
16700246	072.5-906R	69.3 - 72.5
16700247	074.0-906R	70.8 - 74
16700248	075.5-906R	72.3 - 75.5
16700249	077.0-906R	73.8 - 77
16700250	078.5-906R	75.3 - 78.5
16700251	080.0-906R	76.8 - 80
16700252	081.5-906R	78.3 - 81.5
16700981	083.0-906R	79.8 - 83
16700254	084.5-906R	81.3 - 84.5
16700255	086.0-906R	82.8 - 86
16700256	087.5-906R	84.3 - 87.5
16700257	089.0-906R	85.8 - 89
16700258	090.5-906R	87.3 - 90.5
16700259	092.0-906R	88.8 - 92
16700260	093.5-906R	90.3 - 93.5
16700261	095.0-906R	91.8 - 95

Item No.	Ref. No.	Size range (mm)
<b>Band width 9 mm, thickness 0.6 mm (906R)</b>		
16700262	096.5-906R	93.3 - 96.5
16700263	098.0-906R	94.8 - 98
16700264	099.5-906R	96.3 - 99.5
16700265	101.0-906R	97.8 - 101
16700266	102.5-906R	99.3 - 102.5
16700267	104.0-906R	100.8 - 104
16700268	105.5-906R	102.3 - 105.5
16700269	107.0-906R	103.8 - 107
16700270	108.5-906R	105.3 - 108.5
16700271	110.0-906R	106.8 - 110
16700272	111.5-906R	108.3 - 111.5
16700273	113.0-906R	109.8 - 113
16700274	114.5-906R	111.3 - 114.5
16700275	116.0-906R	112.8 - 116
16700276	117.5-906R	114.3 - 117.5
16700277	119.0-906R	115.8 - 119
16700278	120.5-906R	117.3 - 120.5

**Band width 10 mm, thickness 0.8 mm (1008R)**

In the diameter range 24.5 mm to 120.5 mm, these clamps are available in 0.5 mm steps on request.

**Band width 10 mm, thickness 1.0 mm (1010R)**

In the diameter range 62 mm to 120.5 mm, these clamps are available in 0.5 mm steps on request.

Other diameters available on request.

# Technical Data Stepless® Ear Clamps

Product Group **167**



## 1.0 Material

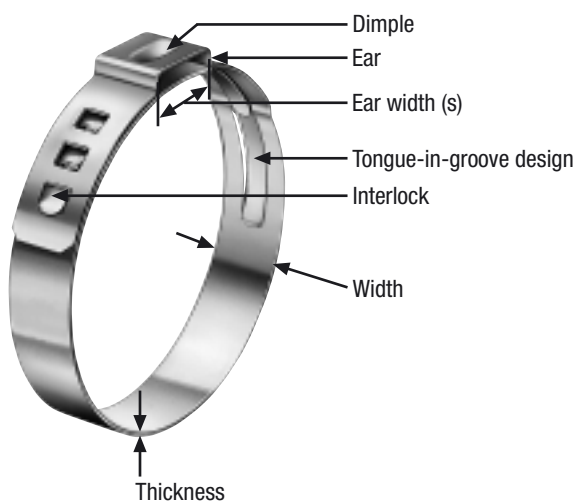
OETIKER Stepless® Ear Clamps are produced from austenitic grades of stainless steel. The primary composition being UNS S30400 / DIN 1.4301, an 18% chromium, 8% nickel alloy that is cold worked at the material processing and clamp manufacturing stages. This material exhibits exceptional properties such as toughness and ductility, providing good forming characteristics required for the clamp installation process. This chemistry provides excellent corrosion resistance to a wide variety of corrosive environments.

Alternative materials with elevated nickel contents are available for resistance to concentrated chloride or acidic exposure.

### Edge condition

Stringent controls are maintained at the OETIKER strip processing facility, conditioning the slit material and forming a machined or rolled edge radius. This process reduces the potential for damage caused by sharp or square edges when the clamp compresses adjacent material.

## 2.0 Clamp Design



### Material Thickness

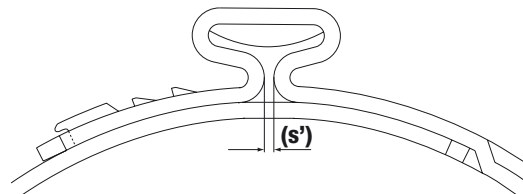
Stepless® Ear Clamps are produced from nominal widths and thickness. The selected material dimensions for a specific application are based on the stress required to obtain an adequate seal or load.

### Clamp ear (closing element)

Using tools designed or endorsed by OETIKER, the clamp is closed by drawing together the lower radii of the “ear”. The maximum diameter reduction is proportionate to the open “ear” width (s).

The theoretical maximum reduction in diameter is given by the formula:

$$\text{Max. diameter reduction} = \frac{\text{ear-width (s)}}{\pi}$$



Note: The above sketch symbolizes a closed “ear” (s’) geometry and is not necessarily indicative of an effective closed assembly.

As a rule, the clamp nominal diameter should be selected so that the outside diameter of the hose, after it has been pushed on to the component to which it is to be fastened (e.g. a hose nipple), is approximately in the middle of the diameter range of the chosen clamp (see pages 3/4).

A clamp can only be considered adequately closed when the ear width (s) has been reduced by at least 40%, and the correct closing force was used for assembly. Further information with assembly recommendations and closing force is available in Section 3.0.

### Mechanical Interlock

The interlock is a mechanically jointed design for securing the clamp in the round condition. The strength of the lock is a calculation based on the mechanical properties of the raw material and the smallest cross sectional area through the clamp. Individual interlock designs can be opened for radial installation prior to closure.

### Stepless® Design

The unique “tongue-in-groove design” was developed to assure that the inner circumference is free of steps or gaps that could be detrimental to the sealing ability of the clamp.

The groove is extruded 1x material thickness on the outer surface and is approximately 1/3 the band width, the mating tongue provides a uniform inner circumference. During the clamp closing process, the tongue engagement increases in the groove, minimizing the reduced surface area, ensuring uniform compression or surface pressure over the full 360° of the assembled parts.

### Ear Design

The integrated dimple in the ear effectively increases the clamping force and provides a spring effect when the diameter of the application contracts or expands due to thermal or mechanical influences.

# Technical Data

## Stepless® Ear Clamps

Product Group **167**

### 3.0 Assembly recommendations

The clamp “ear” is deformed with a constant tool jaw force, this practice is referred to as “force priority closure”. The assembly method assures that a uniform and repeatable stress is applied to the application in addition to a consistent tensile force on the clamp interlock. Employing this methodology when closing the 167 series clamp will compensate for any component tolerance variations, assuring that the clamp applies a constant radial force on the application. Fluctuations in component tolerances are absorbed by the changing “ear” gap (s’). Clamp installation monitoring equipment and process data collection is available by incorporating the “Electronically Controlled Pneumatic Power Tool” OETIKER ELK 01 within the assembly process.

#### Closing force

The closing force is a factor established by the preferred material compression or surface pressure and should be qualified through dimensional evaluations and experimentation. The resistance against the clamp should equal the applied force, therefore, when compressing malleable material the closing force is greatly reduced.

The table below includes the average applied closing force for the standard clamp dimensions when compressing and sealing the relatively harder synthetic material compositions.

#### Average applied closing forces

Material dimensions	Size	Closing force	Manual closure tool*	Recommended pneumatic pincer**
5 x 0.5 mm	6.5 - 11.8	1000 N	14100082, 14100083	HO 2000
7 x 0.6 mm	11.9 - 17.5	2100 N	14100082, 14100083	HO 2000 - HO 3000
	17.8 - 120.5	2400 N	14100082, 14100083	HO 3000
9 x 0.6 mm	-	2800 N	14100082, 14100083	HO 3000 - HO 4000
9 x 0.8 mm	-	4100 N	14100097, 14100098	HO 5000 - HO 7000
10 x 0.6 mm	-	2900 N	14100097, 14100098	HO 5000 - HO 7000
10 x 0.8mm	-	5000 N	14100097, 14100098	HO 5000 - HO 7000
10 x 1.0 mm	-	7000 N	14100097, 14100098	HO 7000

\* 14100082 standard pincer.

14100083 standard pincer with side jaws.

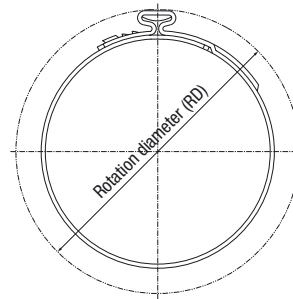
14100097 Clamping Tool

14100098 Torque wrench

\*\* With appropriate closing force setting!

### 4.0 Rotation diameter

The “rotation diameter (RD)” of an assembled clamp can be critical design information for applications that turn within close proximity of adjacent components. Many factors can influence this final assembly diameter including compression, “ear” gap “s” and material thickness. It is recommended that all variables be considered and evaluated prior to specifying a rotating dimension.



#### Important

The addition of an integrated depressor in the installation tool, for the purpose of reducing the ear height, can cause excessive stress to the ear radii and is not a recommended practice.

#### Important note!

These figures are intended as a guide, they may vary depending on type and tolerances of the products being clamped.

To ensure for best clamp selection, we recommend making functional tests with several assemblies.

