

# High-power ultrasound for dental practice and laboratory




Thorough and gentle cleaning of instruments and dentures





## Content

BANDELIN – The Company profile.....	2
Ultrasonic baths for cleaning of dental instruments .....	3
Digital or analogue? Your choice! .....	4
Our favorite! <b>SONOREX DIGITEC</b> DT 102 H .....	4
<b>SONOREX DIGITEC</b>	
Ultrasonic baths with digital operation and rapid degassing.....	5
<b>SONOREX SUPER</b>	
Ultrasonic baths with easy-to-operate turning knobs .....	6
Cleaning in cassettes.....	7
<b>SONOREX</b> Accessories .....	8 – 9
Recommendations for use.....	10
Cleaning and disinfection agents.....	11
The Foil test – Function testing of an ultrasonic bath.....	12
Dosing of agents .....	12
The complement to hygiene plan .....	12



# BANDELIN – Ultraschall seit 1955

## Company profile

We are a family-owned company located in Berlin and meanwhile run in the third generation, specialised in development, manufacturing and sales of ultrasonic devices, the corresponding accessories and application-specific disinfectants and cleaning agents.

A wide vertical range of manufacture, modern production lines and a motivated staff guarantee a high quality of the products. Our devices contribute to the success of our customers in the laboratory, medical, dental, pharmaceutical, industrial, craft as well as service.

As early as 1955, our company began developing and manufacturing high-performance ultrasonic devices. The constant expansion of the product range and a sharp rise in sales led to an expansion of the production area in 1985. In 1992, ultrasonic homogenisers and controllable, power-constant ultrasonic generators were introduced to the market.

The period from 1996 to 2004 was characterised by the development and production of innovative ultrasonic baths and immersible transducers as well as tube reactors for industrial applications. In the following years, BANDELIN's product range was expanded by new laboratory ultrasonic devices.

After the introduction of the ultrasonic bath for simultaneous cleaning and rinsing of MIC instruments, a further development was launched in 2016 for robotic instruments.

Today, the reputation of our brands SONOREX, SONOPULS, SONOMIC and TRISON stand for the high quality awareness of our employees and is equated in expert circles with ultrasound.

The most important product groups include:

SONOREX	– ultrasonic baths and reactors
SONOPULS	– ultrasonic homogenisers
SONOMIC	– ultrasonic baths for rinsable MIC and standard instruments
TRISON	– ultrasonic baths for robotic-, rinsable MIS and standard instruments
TICKOPUR	– cleaning agents
STAMMOPUR	– disinfectants and cleaning agents

We are innovation leaders in the development of ultrasonic devices and new areas of application. In the past we have registered 79 patents / utility models as well as 68 trade brands. Our participation in various committees in the development of new standards and guidelines serve to ensure the highest standards for ultrasonic applications.

As the only complete supplier of ultrasonic devices, accessories, disinfectants and cleaning agents with approvals and certifications according to ISO 9001 and ISO 13485, BANDELIN is the market leader.

Over one million units have already been delivered to our customers.



More information about our company you will find in this Company history for download:  
[bandelin.com/prospekte/Company\\_history\\_GB.pdf](http://bandelin.com/prospekte/Company_history_GB.pdf)

# Ultrasonic baths for cleaning of dental instruments



## Fast cleaning results with ultrasound



Start



3 seconds



5 seconds



8 seconds



10 seconds

Sonication of a dental forceps contaminated with blood residues, in an ultrasonic bath SONOREX DIGITEC DT 102 H with intensive cleaner STAMMOPUR R. The contamination is detached from the instrument after few seconds.

## Advantages of ultrasound to the cleaning

- Rapid cleaning of places difficult to reach such as cavities, holes etc. without mechanical damage.
- gentle intensive cleaning
- fast instrument circulation
- Reduction of chemical disinfection (time) by catalytic effect when using suitable preparations (e.g. STAMMOPUR DR 8).
- Economical use of resources as water, chemicals and electricity.

## Recommended liquids

- Only water with appropriate additives do clean or disinfect properly. Ultrasound alone will not disinfect.
- The STAMMOPUR concentrates have been especially developed for cleaning and disinfection in ultrasonic baths.

## When is a heater recommended

### Ultrasonic baths without heater:

- For cleaning after dry deposit as the protein starts to coagulate at a temperature of 40 °C (104 °F).
- Disinfection solutions may not be warmed up.

### Ultrasonic baths with heater:

- For cleaning after wet deposit or for basic cleaning.
- Contaminations like fats and waxes are removed faster.

## What kind of accessories should be used

- Parts to be cleaned must not be placed on the tank bottom.
- Instruments are not to be stapled and baskets are not to be overloaded.
- Instruments like forceps and scissors must be opened completely or detached, if necessary.
- Instruments must be covered completely with liquid.



# Digital or analogue? Your Choice!

High-power ultrasonic baths  
with digital operation



High-power ultrasonic baths  
with easy-to-operate turning knobs



	SONOREX DIGITEC DT	SONOREX SUPER RK
Capacity [l]	0.9 – 5.5	0.9 – 5.5
Sweep (SweepTec)	✓	✓
Rapid degassing DEGAS	✓	–
Timer [min]	1, 2, 3, 4, 5, 10, 15, 30, ∞	1 – 15, ∞
Safety shut-down	after 12 hours	–
Heating	optional, version "H"	optional, version "H"
Degree of protection	IP 33 – splash-proof	IP 32 – drip-proof



## SONOREX DIGITEC DT 102 H The most powerful 3-litres ultrasonic bath

▪ 50 % more ultrasound ▪ hard chromium plated oscillating tank ▪ 3 years long-term warranty ▪

### hygienic

– the flat front allows optimal disinfection and cleaning of the surface – no space for hidden germ accumulation

### easy to clean

splash-proof  
stainless steel housing

### strong cleaning power

by 50 % more ultrasound

### ON / OFF function

### temperature display

with excess temperature signal



fill level mark  
for safe filling

hard chromium plated  
oscillating tank  
especially durable

drain  
one-piece drain,  
welded with ball valve

DEGAS function  
+ ON / OFF ultrasound

programming  
– saves the last setting time  
after switching off

# SONOREX DIGITEC

## Ultrasonic baths with digital operation and rapid degassing



Front to rear: DT 31 H, DT 100 H, DT 102 H and DT 255 H

### Product features:

- stainless steel oscillating tank with high-performance oscillating systems, ultrasonic frequency 35 kHz
- **digital timer** for 1, 2, 3, 4, 5, 10, 15, 30 min and continuous operation
- rapid degassing DEGAS
- fill level mark for safe filling
- compact, easy to clean stainless steel housing
- rubber feet for safe positioning
- as of type DT 102 H, outlet with ball valve for easy emptying of bath liquid
- depending on type, comes with heating and handles

Type	Internal tank dimensions l × w × d [mm]	Capacity [l]	Code No.	External dimensions l × w × h [mm]	Ultrasonic peak output [W]	Ultrasonic nominal output [W]	Heating power [W]	Features
DT 31	190 × 85 × 60	0.9	3200	205 × 100 × 180	160	40	–	–
DT 31 H	190 × 85 × 60	0.9	3220	205 × 100 × 180	160	40	70	heating
DT 100	240 × 140 × 100	3.0	3210	260 × 160 × 250	320	80	–	–
DT 100 H	240 × 140 × 100	3.0	3230	260 × 160 × 250	320	80	140	heating
DT 102 H	240 × 140 × 100	3.0	3235	260 × 160 × 250	480	120	140	heating, drain with ball valve G ½, handles
DT 255	300 × 150 × 150	5.5	3215	325 × 175 × 295	640	160	–	drain with ball valve G ½, handles
DT 255 H	300 × 150 × 150	5.5	3240	325 × 175 × 295	640	160	280	heating, drain with ball valve G ½, handles

# SONOREX SUPER

## Ultrasonic baths with easy-to-operate turning knobs



Front to rear: RK 31 H, RK 100 H, RK 102 H and RK 255 H

### Product features:

- stainless steel oscillating tank with high-performance oscillating systems, ultrasonic frequency 35 kHz
- **analogue timer** for 1 – 15 min and continuous operation
- fill level mark for safe filling
- compact, easy to clean stainless steel housing
- rubber feet for safe positioning
- as of type RK 102 H, drain outlet with ball valve for easy discharge of bath liquid
- depending on type, comes with heating and handles

Type	Internal tank dimensions l × w × d [mm]	Capacity [l]	Code No.	External dimensions l × w × h [mm]	Ultrasonic peak output [W]	Ultrasonic nominal output [W]	Heating power [W]	Features
RK 31	190 × 85 × 60	0.9	329	205 × 100 × 180	160	40	–	–
RK 31 H	190 × 85 × 60	0.9	044	205 × 100 × 180	160	40	70	heating 65 °C fixed setting
RK 100	240 × 140 × 100	3.0	301	260 × 160 × 250	320	80	–	–
RK 100 H	240 × 140 × 100	3.0	312	260 × 160 × 250	320	80	140	heating
RK 102 H	240 × 140 × 100	3.0	303	260 × 160 × 250	480	120	140	heating, drain with ball valve G ½, handles
RK 255	300 × 150 × 150	5.5	3066	325 × 175 × 295	640	160	–	drain with ball valve G ½, handles
RK 255 H	300 × 150 × 150	5.5	316	325 × 175 × 295	640	160	280	heating, drain with ball valve G ½, handles



# SONOREX

## Cleaning in cassettes

Or another application? Everything is possible!

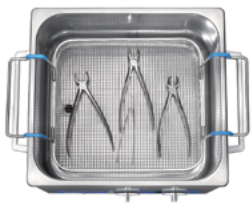


DT 514 H (left) and RK 514 H (right)



Cleaning of instruments, loaded in cassettes, in the cassette holder KAH 14.1 and using TICKOMED 1

- up to 2 × 1/1 DIN cassettes, for surgery.
- up to 4 × 1/2 DIN cassettes, for prophylaxis.
- up to 8 × 1/4 DIN cassettes, for diagnostics and prophylaxis.



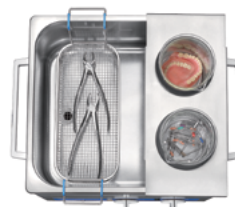
Cleaning and chemical disinfection of instruments placed in the insert basket K 14 with STAMMOPUR DR 8.



Cleaning and chemical disinfection of burs in insert beaker SD 06 to be placed into positioning lid DE 255 with STAMMOPUR DB and cement removal of dental prosthetics with STAMMOPUR Z.



Cleaning and chemical disinfection of instruments in two insert baskets K 5 C with STAMMOPUR DR 8, in TICKOMED 1 or STAMMOPUR RD 5.



Treatment of instruments, burs and prosthetics in the basket and with the support of a positioning lid in two insert beakers:

- Cleaning and chemical disinfection of instruments in the K 5 C basket with STAMMOPUR DR 8.
- Removing of cement residues from prosthetics in insert beaker SD 06 with STAMMOPUR Z.
- Cleaning and chemical disinfection of burs in a second SD 06 insert beaker in the KD 0 basket in STAMMOPUR DB.

Type	DT 514 H	RK 514 H
Internal tank dimensions l × w × d [mm]	325 × 300 × 150	
Capacity [l]	13.5	
Code No.	3211	207
External dimensions l × w × h [mm]	355 × 325 × 305	
Ultrasonic peak output [W]	860	
Ultrasonic nominal output [W]	215	
Heating power [W]	600	
Features	with heating, drain with ball valve G ½, handles	

# SONOREX

## Accessories

Appropriate accessories facilitate ultrasonic application and simultaneously protect oscillating tank and parts to be cleaned.

**Objects to be cleaned or vessels must not be placed on the bottom of the ultrasonic tank!**

Accessories	Material	Function
Lid D	stainless steel	To cover the oscillating tank. Protects the bath fluid from external contamination. Condensation water is discharged into the tank. Recommended for TRBA 250.
Insert basket K	stainless steel	For direct cleaning of instruments (probes, pressers, syringes) in the oscillating tank. Optimum permeability of ultrasound.
Insert basket K	plastic	For cleaning of sensitive surfaces. The basket is perforated.
Insert tub KW	plastic	For cleaning in aggressive liquids. Tank with lid, temperature resistant up to 60 °C.
Cassette holder KAH	stainless steel	For simultaneous sonication of up to 2 cassettes (1/1 DIN).
Rack for cleaning of impression trays LT	stainless steel	With silicone spacer for safe fixing of up to 8 impression trays.
Frame for foil test FT	stainless steel	The foil test is a simple procedure to demonstrate the intensity and distribution of cavitation in an ultrasonic bath (see also page 12).

### Accessories for indirect cleaning

Positioning lid DE	stainless steel	For fixing the insert beakers.
Insert beakers EB, PD, SD	stainless steel (EB) plastic (PD) glass (SD)	Indirect cleaning of small parts in aggressive liquids or solvents.
Inset baskets KD, PD	stainless steel (KD) plastic (PD)	For insertion in the insert beakers of very small parts, e.g. burs and very sensitive surfaces.



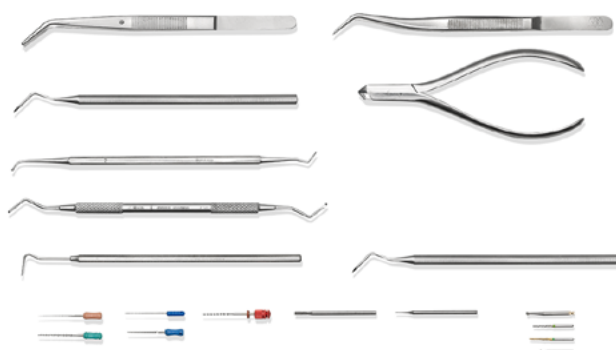
	RK 31 / H DT 31 / H	RK 100 / H DT 100 / H RK 102 H DT 102 H	RK 255 / H DT 255 / H	RK 514 / H DT 514 / H	
Lid Code No.	D 08 218	D 100 3003	D 255 3007	D 514 3010	
Insert basket l × w × d [mm] Code No.	K 08 170 × 65 × 50 209	K 3 C 200 × 110 × 40 3025	K 5 C 260 × 110 × 40 3027	K 14 275 × 245 × 50 354	K 5 C (2 pcs.) 260 × 110 × 40 302
Insert basket l × w × d [mm] Code No.	–	PK 2 C 187 × 90 × 56 3082	–	–	
Insert tub l × w × d [mm] Code No.	–	KW 3 195 × 115 × 88 715	KW 5 254 × 96 × 130 240	KW 14 280 × 215 × 145 613	
Cassette holder l × w [mm] Code No.	–	–	–	KAH 14.1 305 × 208 × 52 7501	
Rack for cleaning of impression trays Code No.	–	LT 102 371	–	–	
Foil test frame Code No.	FT 1 3190	FT 4 3074	FT 4 3074	FT 14 3084	

	DE 08 278			DE 100 3017			DE 255 3028			DE 255 (2 pcs.) 3028			DE 514 3039
Insert beakers Capacity (ml) Code No.	SD 04 400 168	KB 04 400 3000	SD 05 600 575	SD 06 600 330	PD 06 600 299	EB 05 600 340	SD 06 600 330	PD 06 600 299	EB 05 600 340	SD 06 600 330	PD 06 600 299	EB 05 600 340	
Inset baskets Code No.	PD 4 126			KD 0 370		PD 4 126	KD 0 370		PD 4 126	KD 0 370		PD 4 126	

## Recommendations for use

BANDELIN ultrasonic baths enable a fast and thorough cleaning of dental instruments, if using the right accessories and agents made especially for use with ultrasonic baths.

Ultrasound removes impurities from the deepest pores. Even hard-to-access spots, surfaces, corners and openings can be reached by ultrasound ("electronic brushing"). It is important to consider that all cleaning objects must be thoroughly rinsed under running water after use in the ultrasonic bath.



Objective	Objects to be cleaned	Agent	Instructions for use
Cleaning and chemical disinfection	metal instruments e.g. forceps, matrices, cofferdam clamps, root canal instruments (with anodised handle), syringes, glass parts e.g. dappen dishes with/without lid, petri dishes, prostheses dishes, bur boxes	STAMMOPUR DR 8	Place in the stainless steel or plastic insert basket, hang the basket in the oscillating tank.
	rotating instruments e.g. burs and cutters, root canal instruments (with plastic handle)	STAMMOPUR DB	Place in the inset basket and set the basket in the insert beaker. Place the positioning lid on top of the oscillating tank, hang the insert beaker into the positioning lid.
Cleaning	instruments made of stainless steel, syringes, glass parts, prostheses (new manufacture) e.g. abutments, crowns, bars and bridges	STAMMOPUR RD 5	Place in the stainless steel or plastic insert basket, hang the basket in the oscillating tank.
	instruments made of stainless steel in cassettes	STAMMOPUR RD 5	Cleaning is only possible in the SONOREX DIGITEC DT 514 H or SONOREX SUPER RK 514 H ultrasonic bath. Hang a maximum of two cassettes in the oscillating tank using the stainless steel KAH 14.1 cassette holder.
	instruments made of light metals e.g. model analogs, root canal instruments	TICKOMED 1	Place in the stainless steel or plastic insert basket, hang the basket in the oscillating tank.
Removal of cement residues and tartar from dental prostheses	instruments made of stainless steel, glass parts e.g. mixing glass plates and cement spatulas, prostheses (tartar) e.g. metal denture, orthodontic appliances and retainers	STAMMOPUR Z	Place objects in the plastic insert tub with the polluted side downwards and hang the tub in the oscillating tank, or place the positioning lid on top of the oscillating tank and hang the insert beaker in the positioning lid.
Removal of alginate deposits			Place instruments in the insert basket, hang the basket in the oscillating tank. Some alginates swell during sonication and form a gelatin-like mass that absorbs the ultrasound. They are pre-soaked by the sonication and can be removed with a strong water jet.
	instruments made of stainless steel, glass parts	STAMMOPUR AG	
	impression trays	STAMMOPUR AG	Slide them over the impression tray holder and hang in the oscillating tank. Some alginates swell during sonication and form a gelatin-like mass that absorbs the ultrasound. They are pre-soaked by the sonication and can be removed with a strong water jet.
Removal of dental plaster	instruments made of stainless steel, glass parts, prostheses (new manufacture)	STAMMOPUR AG	Place in the stainless steel and hang the basket in the oscillating tank.

# Cleaning and disinfection agents

Optimum cleaning results require the application of appropriate cleaning and disinfection agents. Many cleaning and disinfection agents contain substances that can attack the stainless steel oscillating tank.

STAMMOPUR and TICKOMED have been especially developed for ultrasonic application. All agents are environmentally friendly and biodegradable.



Agents	Description	Application with ultrasound Concentration, Duration	Litres	Code No.
<b>STAMMOPUR DR 8 – VAH-certified –</b>  Instrument disinfection and intensive cleaning CE 0483	Manual, chemical disinfection and disinfecting, non-fixing intensive cleaning of general, surgical, invasive and non-invasive medical instruments and accessories in an ultrasonic bath as well as in an immersion bath process. High blood dissolution, for instruments heavily contaminated with incrustations of blood and secretions. Short irradiation time. Solution applicable under strain for 3 sequent days. Very high material compatibility. <b>Concentrate</b> . Non-odiferous. Without aldehydes, chlorine, phenols. Bactericidal, yeasticidal, limited virucidal, additionally active against H5N1, SV40, Adeno. Mildly alkaline pH 9.4 at 1 %. Labelling in accordance with CLP. Signal word: Danger, GHS05-GHS07-GHS08-GHS09	2 %, 5 min		
		SV40 with high protein burden: 2 %, 10 min Adeno with high protein burden: 3 %, 15 min		
		application without ultrasound: 1 %, 60 min: bactericidal, levurocidal; 2% – 30 min or 3 % – 15 min: bactericidal, levurocidal, limited virucidal incl. H5N1 and additionally against SV40	2 5 10	972 974 6028
<b>STAMMOPUR RD 5</b>  Intensive cleaner for instruments CE	Removes obstinate, encrusted contaminations like blood, secretions, sputum, grinding and polishing residues, fat, wax, tissue residues, filling materials from instruments, devices, dentures, crowns. <b>Concentrate</b> . High material compatibility, with corrosion protection. Not for light metals. Alkaline, pH 10.9 bei 1 %. Labelling in accordance with CLP. Signal word: Danger, GHS05		2 5 10	827 901 6034
		3 %, 2 – 10 min		
<b>TICKOMED 1</b>  Universal cleaner for instruments CE	Removes blood, secretions, sputum, grinding and polishing paste, fat, wax, tissue residues, filling materials, dentinal splinters from instruments, devices, dentures, burs. <b>Concentrate</b> . Very high material compatibility, with corrosion protection. Also for use on light metals. Applicable as contact liquid. Mildly alkaline, pH 9.0 at 1 %. Labelling in accordance with CLP. Signal word: Danger, GHS05		2 5 10	904 949 6035
		3 %, 2 – 10 min		
<b>STAMMOPUR Z</b>  Cement remover and denture cleaner CE	Removes dental cements (except some glasionomer cements), tartar, provisional filling materials, embedding materials, oxides and fluxes from instruments and dentures. <b>Concentrate</b> . For stainless steel, precious metals, plastics, ceramics. Not for use on light metals. Caution with damaged chrome-plated material. Application only in insert beakers (indirect sonication, contact liquid STAMMOPUR DR 8 or TICKOMED 1). Acid, pH 1.9 at 1 %. Labelling in accordance with CLP. Signal word: Danger, GHS05		2 5 10	822 928 6036
		5 %, 2 – 10 min		
<b>STAMMOPUR AG</b>  Plaster and alginat remover CE	Removes plasters, alginates, impressing and embedding materials from impression trays, dental tools and accessories. <b>Ready for use</b> . Very high material compatibility. For all materials, also for light metals. Also applicable without ultrasound e.g.: plaster traps, vacuum mixing devices undiluted for 15–120 min. Mildly alkaline, pH 8.0 Labelling in accordance with CLP. Signal word: Danger, GHS05		2 5 10	825 906 6032
		undiluted, 3 – 10 min		
<b>STAMMOPUR DB – VAH-certified –</b>  Bur disinfection and intensive cleaning CE 0483	Manual bur disinfection and intensive cleaning in an ultrasonic bath for dental, rotating and non-rotating small and precision instruments as well as small endodontic instruments. Can also be used for disinfection without ultrasound in small bur containers (immersion bath method). <b>Ready for use</b> . With corrosion protection. High material compatibility. Not for alkali- and alcohol-sensitive materials. Application only in insert beakers (indirect sonication, contact liquid STAMMOPUR DR 8 or TICKOMED 1). Bactericidal, fungicidal, tuberculocidal, mycobactericidal, virucidal in each case under high burden. Alkaline, pH 13.0. Labelling in accordance with CLP. Signal word: Warning, GHS02-GHS07		2 5 10	821 984 6033
		undiluted, 5 min		

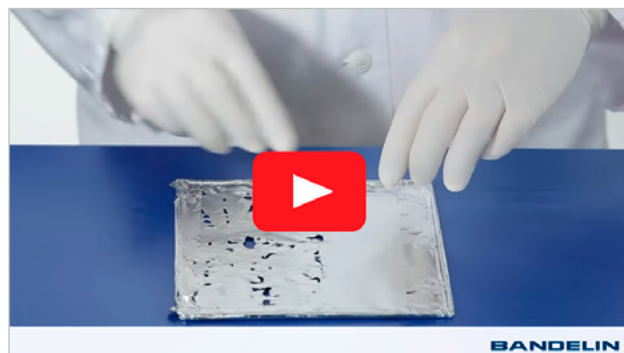


## The Foil test – Function testing of an ultrasonic bath

A foil test is recommended for testing ultrasonic baths. This should be conducted upon initial startup and at regular intervals thereafter (e.g. every 3 months). The frequency of testing is the responsibility of the user. The foil test is a simple procedure for demonstrating the intensity and distribution of cavitation in an ultrasonic bath. It involves stretching aluminium foil over a foil testing frame, which will be perforated or destroyed to a certain degree by cavitation, depending on sonication time.

For purposes of reproducibility, it is important that the test conditions remain constant:

- Filling the oscillation tank to the filling level mark
- Temperature of the sonication fluid
- Degassing time
- Positioning of frame
- Foil type (brand, thickness)
- Sonication time
- Type and concentration of ultrasonic agent



[https://bandelin.com/foil\\_test/](https://bandelin.com/foil_test/)

Foils can be archived in a suitable way (scanning, photos, etc.) This allows the foils to be compared at any time. The perforated areas of all foils should have approx. the same dimensions and distribution – the results are never identical.

A process validation, e.g. for the treatment of medical products, can only be achieved by conducting regular foil tests.

To execute the foil test, different foil test frames can be ordered from the manufacturer BANDELIN. The foil test frames are suitable for a wide range of tank dimensions.

Aluminium household foil is also required to conduct the test and is not included in the delivery.

## Dosing of agents

Dosing table for ultrasonic cleaners

Unit	Operating volume (l)	1 %	2 %	3 %	5 %	10 %
NE 2016, 2017, 2018	100	300 ml	600 ml	900 ml	1500 ml	3000 ml
NE 2019, 2020	12	3.6 l	7.2 l	10.8 l	18 l	36 l
NE 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 2682, 2683, 2684, 2685, 2686, 2687, 2688, 2689, 2690, 2691, 2692, 2693, 2694, 2695, 2696, 2697, 2698, 2699, 2700, 2701, 2702, 2703, 2704, 2705, 2706, 2707, 2708, 2709, 2710, 2711, 2712, 2713, 2714, 2715, 2716, 2717, 2718, 2719, 2720, 2721, 2722, 2723, 2724, 2725, 2726, 2727, 2728, 2729, 2730, 2731, 2732, 2733, 2734, 2735, 2736, 2737, 2738, 2739, 2740, 2741, 2742, 2743, 2744, 2745, 2746, 2747, 2748, 2749, 2750, 2751, 2752, 2753, 2754, 2755, 2756, 2757, 2758, 2759, 2760, 2761, 2762, 2763, 2764, 2765, 2766, 2767, 2768, 2769, 2770, 2771, 2772, 2773, 2774, 2775, 2776, 2777, 2778, 2779, 2780, 2781, 2782, 2783, 2784, 2785, 2786, 2787, 2788, 2789, 2790, 2791, 2792, 2793, 2794, 2795, 2796, 2797, 2798, 2799, 2800, 2801, 2802, 2803, 2804, 2805, 2806, 2807, 2808, 2809, 2810, 2811, 2812, 2813, 2814, 2815, 2816, 2817, 2818, 2819, 2820, 2821, 2822, 2823, 2824, 2825, 2826, 2827, 2828, 2829, 2830, 2831, 2832, 2833, 2834, 2835, 2836, 2837, 2838, 2839, 2840, 2841, 2842, 2843, 2844, 2845, 2846, 2847, 2848, 2849, 2850, 2851, 2852, 2853, 2854, 2855, 2856, 2857, 2858, 2859, 2860, 2861, 2862, 2863, 2864, 2865, 2866, 2867, 2868, 2869, 2870, 2871, 2872, 2873, 2874, 2875, 2876, 2877, 2878, 2879, 2880, 2881, 2882, 2883, 2884, 2885, 2886, 2887, 2888, 2889, 2890, 2891, 2892, 2893, 2894, 2895, 2896, 2897, 2898, 2899, 2900, 2901, 2902, 2903, 2904, 2905, 2906, 2907, 2908, 2909, 2910, 2911, 2912, 2913, 2914, 2915, 2916, 2917, 2918, 2919, 2920, 2921, 2922, 2923, 2924, 2925, 2926, 2927, 2928, 2929, 2930, 2931, 2932, 2933, 2934, 2935, 2936, 2937, 2938, 2939, 2940, 2941, 2942, 2943, 2944, 2945, 2946, 2947, 2948, 2949, 2950, 2951, 2952, 2953, 2954, 2955, 2956, 2957, 2958, 2959, 2960, 2961, 2962, 2963, 2964, 2965, 2966, 2967, 2968, 2969, 2970, 2971, 2972, 2973, 2974, 2975, 2976, 2977, 2978, 2979, 2980, 2981, 2982, 2983, 2984, 2985, 2986, 2987, 2988, 2989, 2990, 2991, 2992, 2993, 2994, 2995, 2996, 2997, 2998, 2999, 3000, 3001, 3002, 3003, 3004, 3005, 3006, 3007, 3008, 3009, 3010, 3011, 3012, 3013, 3014, 3015, 3016, 3017, 3018, 3019, 3020, 3021, 3022, 3023, 3024, 3025, 3026, 3027, 3028, 3029, 3030, 3031, 3032, 3033, 3034, 3035, 3036, 3037, 3038, 3039, 3040, 3041, 3042, 3043, 3044, 3045, 3046, 3047, 3048, 3049, 3050, 3051, 3052, 3053, 3054, 3055, 3056, 3057, 3058, 3059, 3060, 3061, 3062, 3063, 3064, 3065, 3066, 3067, 3068, 3069, 3070, 3071, 3072, 3073, 3074, 3075, 3076, 3077, 3078, 3079, 3080, 3081, 3082, 3083, 3084, 3085, 3086, 3087, 3088, 3089, 3090, 3091, 3092, 3093, 3094, 3095, 3096, 3097, 3098, 3099, 3100, 3101, 3102, 3103, 3104, 3105, 3106, 3107, 3108, 3109, 3110, 3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 3119, 3120, 3121, 3122, 3123, 3124, 3125, 3126, 3127, 3128, 3129, 3130, 3131, 3132, 3133, 3134, 3135, 3136, 3137, 3138, 3139, 3140, 3141, 3142, 3143, 3144, 3145, 3146, 3147, 3148, 3149, 3150, 3151, 3152, 3153, 3154, 3155, 3156, 3157, 3158, 3159, 3160, 3161, 3162, 3163, 3164, 3165, 3166, 3167, 3168, 3169, 3170, 3171, 3172, 3173, 3174, 3175, 3176, 3177, 3178, 3179, 3180, 3181, 3182, 3183, 3184, 3185, 3186, 3187, 3188, 3189, 3190, 3191, 3192, 3193, 3194, 3195, 3196, 3197, 3198, 3199, 3200, 3201, 3202, 3203, 3204, 3205, 3206, 3207, 3208, 3209, 3210, 3211, 3212, 3213, 3214, 3215, 3216, 3217, 3218, 3219, 3220, 3221, 3222, 3223, 3224, 3225, 3226, 3227, 3228, 3229, 3230, 3231, 3232, 3233, 3234, 3235, 3236, 3237, 3238, 3239, 3240, 3241, 3242, 3243, 3244, 3245, 3246, 3247, 3248, 3249, 3250, 3251, 3252, 3253, 3254, 3255, 3256, 3257, 3258, 3259, 3260, 3261, 3262, 3263, 3264, 3265, 3266, 3267, 3268, 3269, 3270, 3271, 3272, 3273, 3274, 3275, 3276, 3277, 3278, 3279, 3280, 3281, 3282, 3283, 3284, 3285, 3286, 3287, 3288, 3289, 3290, 3291, 3292, 3293, 3294, 3295, 3296, 3297, 3298, 3299, 3300, 3301, 3302, 3303, 3304, 3305, 3306, 3307, 3308, 3309, 3310, 3311, 3312, 3313, 3314, 3315, 3316, 3317, 3318, 3319, 3320, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333, 3334, 3335, 3336, 3337, 3338, 3339, 3340, 3341, 3342, 3343, 3344, 3345, 3346, 3347, 3348, 3349, 3350, 3351, 3352, 3353, 3354, 3355, 3356, 3357, 3358, 3359, 3360, 3361, 3362, 3363, 3364, 3365, 3366, 3367, 3368, 3369, 3370, 3371, 3372, 3373, 3374, 3375, 3376, 3377, 3378, 3379, 3380, 3381, 3382, 3383, 3384, 3385, 3386, 3387, 3388, 3389, 3390, 3391, 3392, 3393, 3394, 3395, 3396, 3397, 3398, 3399, 3400, 3401, 3402, 3403, 3404, 3405, 3406, 3407, 3408, 3409, 3410, 3411, 3412, 3413, 3414, 3415, 3416, 3417, 3418, 3419, 3420, 3421, 3422, 3423, 3424, 3425, 3426, 3427, 3428, 3429, 3430, 3431, 3432, 3433, 3434, 3435, 3436, 3437, 3438, 3439, 3440, 3441, 3442, 3443, 3444, 3445, 3446, 3447, 3448, 3449, 3450, 3451, 3452, 3453, 3454, 3455, 3456, 3457, 3458, 3459, 3460, 3461, 3462, 3463, 3464, 3465, 3466, 3467, 3468, 3469, 3470, 3471, 3472, 3473, 3474, 3475, 3476, 3477, 3478, 3479, 3480, 3481, 3482, 3483, 3484, 3485, 3486, 3487, 3488, 3489, 3490, 3491, 3492, 3493, 3494, 3495, 3496, 3497, 3498, 3499, 3500, 3501, 3502, 3503, 3504, 3505, 3506, 3507, 3508, 3509, 3510, 3511, 3512, 3513, 3514, 3515, 3516, 3517, 3518, 3519, 3520, 3521, 3522, 3523, 3524, 3525, 3526, 3527, 3528, 3529, 3530, 3531, 3532, 3533, 3534, 3535, 3536, 3537, 3538, 3539, 3540, 3541, 3542, 3543, 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556, 3557, 3558, 3559, 3560, 3561, 3562, 3563, 3564, 3565, 3566, 3567, 3568, 3569, 3570, 3571, 3572, 3573, 3574, 3575, 3576, 3577, 3578, 3579, 3580, 3581, 3582, 3583, 3584, 3585, 3586, 3587, 3588, 3589, 3590, 3591, 3592, 3593, 3594, 3595, 3596, 3597, 3598, 3599, 3600, 3601, 3602, 3603, 3604, 3605, 3606, 3607, 3608, 3609, 3610, 3611, 3612, 3613, 3614, 3615, 3616, 3617, 3618, 3619, 3620, 3621, 3622, 3623, 3624, 3625, 3626, 3627, 3628, 3629, 3630, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640, 3641, 3642, 3643, 3644, 3645, 3646, 3647, 3648, 3649, 3650, 3651, 3652, 3653, 3654, 3655, 3656, 3657, 3658, 3659, 3660, 3661, 3662, 3663, 3664, 3665, 3666, 3667, 3668, 3669, 3670, 3671, 3672, 3673, 3674, 3675, 3676, 3677, 3678, 3679, 3680, 3681, 3682, 3683, 3684, 3685, 3686, 3687, 3688, 3689, 3690, 3691, 3692, 3693, 3694, 3695, 3696, 3697, 3698, 3699, 3700, 3701, 3702, 3703, 3704, 3705, 3706, 3707, 3708, 3709, 3710, 3711, 3712, 3713, 3714, 3715, 3716, 3717, 3718, 3719, 3720, 3721, 3722, 3723, 3724, 3725, 3726, 3727, 3728, 3729, 3730, 3731, 3732, 3733, 3734, 3735, 3736, 3737, 3738, 3739, 3740, 3741, 3742, 3743, 3744, 3745, 3746, 3747, 3748, 3749, 3750, 3751, 3752, 3753, 3754, 3755, 3756, 3757, 3758, 3759, 3760, 3761, 3762, 3763, 3764, 3765, 3766, 3767, 3768, 3769, 3770, 3771, 3772, 3773, 3774, 3775, 3776, 3777, 3778, 3779, 3780, 3781, 3782, 3783, 3784, 3785, 3786, 3787, 3788, 3789, 3790, 3791, 3792, 3793, 3794, 3795, 3796, 3797, 3798, 3799, 3800, 3801, 3802, 3803, 3804, 3805, 3806, 3807, 3808, 3809, 3810, 3811, 3812, 3813, 3814, 3815, 3816, 3817, 3818, 3819, 3820, 3821, 3822, 3823, 3824, 3825, 3826, 3827, 3828, 3829, 3830, 3831, 3832, 3833, 3834, 3835, 3836, 3837, 3838, 3839, 3840, 3841, 3842, 3843, 3844, 3845, 3846, 3847, 3848, 3849, 3850, 3851, 3852, 3853, 3854, 3855, 3856, 3857, 3858, 3859, 3860, 3861, 3862, 3863, 3864, 3865, 3866, 3867, 3868, 3869, 3870, 3871, 3872, 3873, 3874, 3875, 3876, 3877, 3878, 3879, 3880, 3881, 3882, 3883, 3884, 3885, 3886, 3887, 3888, 3889, 3890, 3891, 3892, 3893, 3894, 3895, 3896, 3897, 3898, 3899, 3900, 3901, 3902, 3903, 3904, 3905, 3906, 3907, 3908, 3909, 3910, 3911, 3912, 3913, 3914, 3915, 3916, 3917, 3918, 3919, 3920, 3921, 3922, 3923, 3924, 3925, 3926, 3927, 3928, 3929, 3930, 3931, 3932, 3933, 3934, 3935, 3936, 3937, 3938, 3939, 3940, 3941, 3942, 3943, 3944, 3945, 3946, 3947, 3948, 3949, 3950, 3951, 3952, 3953, 3954, 3955, 3956, 3957, 3958, 3959, 3960, 3961, 3962, 3963, 3964, 3965, 3966, 3967, 3968, 3969, 3970, 3971, 3972, 3973, 3974, 3975, 3976, 3977, 3978, 3979, 3980, 3981, 3982, 3983, 3984, 3985, 3986, 3987, 3988, 3989, 3990, 3991, 3992, 3993, 3994, 3995, 3996, 3997, 3998, 3999, 4000, 4001, 4002, 4003, 4004, 4005, 4006, 4007, 4008, 4009, 4010, 4011, 4012, 4013, 4014, 4015, 4016, 4017, 4018, 4019, 4020, 4021, 4022, 4023, 4024, 4025, 4026, 4027, 4028, 4029, 4030, 4031, 4032, 4033, 4034, 4035, 403						



Made in Germany

BANDELIN electronic  
GmbH & Co. KG  
Heinrichstraße 3 – 4  
12207 Berlin  
DEUTSCHLAND  
☎ +49 30 76880-0  
📠 +49 30 7734699  
info@bandelin.com

Certified in accordance with  
ISO 9001 and ISO 13485



We advice you personally!  
Feel free to consult our experts:

**+49 30 76880-0**

**www.bandelin.com**



7642-001 EN/2021-09

Subject to technical alterations without notice.

Dimensions subject to manufacturing tolerances.

All images are provided as examples and are not true to size.

Decorative elements are not included in the scope of delivery.

The general terms and conditions apply.