BUCHI
SWITZERLAND

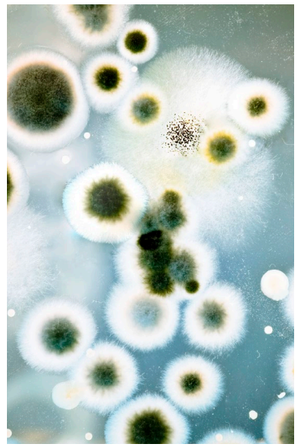
Mini Spray Dryer S-300

The next generation Spray Dryer

Spray Drying and Microencapsulation
Unmatched flexibility for a full range of applications

For more than 40 years BUCHI has been developing market leading solutions for laboratory spray drying and encapsulation. For decades, our motivation has been to understand and meet your personal demands for particle formation technologies in the lab. Our reliable and tailored solutions for various industries include cutting-edge products, innovative systems and a highly professional application support.

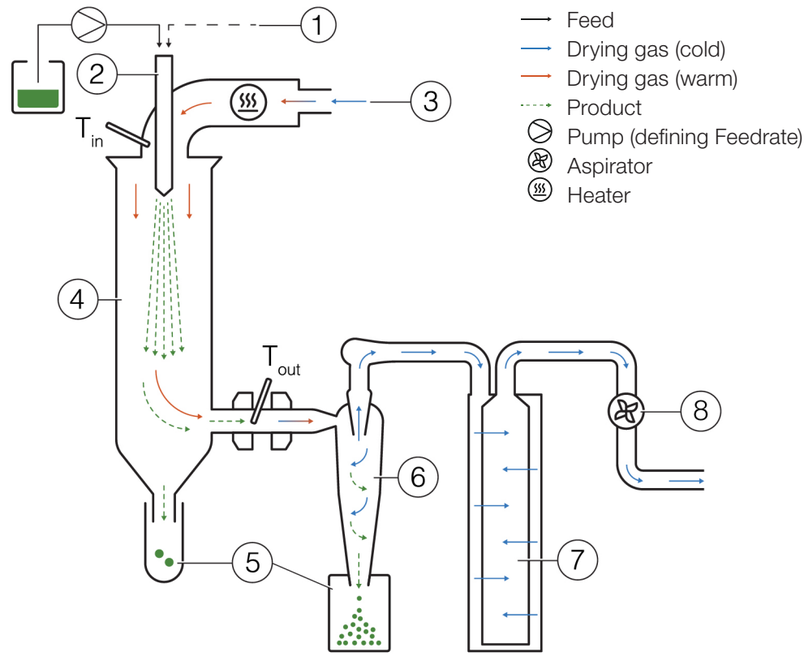
	Pharma	Chemicals / Materials	Batteries
			
Applications	Active pharmaceutical ingredients, drug delivery, vaccines, inhalable drugs, taste masking	Nanotechnology, ceramics, UV absorbers, pigments & coatings	Fuel cells, batteries, accumulators
Methods	Drying, Amorphous solid dispersions, encapsulation of liquids, Encapsulation of solids	Drying, Micronization, Agglomeration & Granulation	Drying, Micronization, Agglomeration & Granulation
Instruments used	Mini Spray Dryer S-300 Nano Spray Dryer B-90 HP Encapsulator B-390 / B-395 Lyovapor™ L-200 / L-300	Mini Spray Dryer S-300 Nano Spray Dryer B-90 HP Lyovapor™ L-200 / L-300	Mini Spray Dryer S-300 Nano Spray Dryer B-90 HP Lyovapor™ L-200 / L-300

	Food	Biotech	Cosmetics
			
Applications	Encapsulation of additives, controlled release, nutraceuticals, functional foods, flavors, vitamins, proteins, probiotic bacteria, juice concentrate, milk powder	Cells, bacteria and protein encapsulation, cell transplantation, biotransformation	Cosmetics, fragrances
Methods	Drying, encapsulation of liquids, Encapsulation of solids, Micronization,	Drying, encapsulation of liquids, Encapsulation of solids, Micronization, Cell encapsulation	Drying, encapsulation of liquids, Encapsulation of solids, Micronization,
Instruments used	Mini Spray Dryer S-300 Encapsulator B-390 / B-395 Lyovapor™ L-200 / L-300	Mini Spray Dryer S-300 Nano Spray Dryer B-90 HP Encapsulator B-390 / B-395 Lyovapor™ L-200 / L-300	Mini Spray Dryer S-300 Encapsulator B-390 / B-395 Lyovapor™ L-200 / L-300

What is Spray Drying?
Insights from the global market leader in spray drying

Since the 1940s, spray drying has been a robust and widely used manufacturing process with applications in all major industries.

Spray drying is accomplished by dissolving, emulsifying or dispersing the core substance in a solvent or in a solution of carrier material. The material is then atomized and sprayed into the drying chamber where a hot stream of drying gas helps evaporate the solvent to produce dry solid particles. These particles are further separated from the gas stream and collected using centrifugal forces with a cyclone.

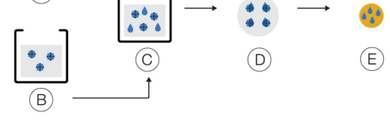


① + ② Droplet formation: Two-fluid nozzle for the S-300
③ Heating: Heat the inlet air to the desired temperature (max. 250 °C)
④ Drying chamber: Conductive heat exchange between drying gas and sample droplets.
⑤ Particle collection in two possible places
⑥ Particle collection: Cyclone technology
⑦ Outlet filter: Collection of finest particles to protect the user and the environment.
⑧ Drying gas: Delivered by aspirator

One instrument, endless possibilities
Easily make particles tailored to your needs

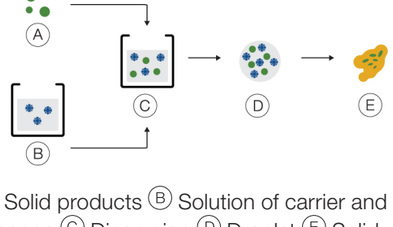
Spray drying remains one of the most common technologies used to obtain granulated substances due to its single step process, its mild process conditions, and its scalability. Generally, spray drying applications can be divided into distinct areas, such as drying, structural change, encapsulation and amorphous solid dispersion, as shown below.

Drying



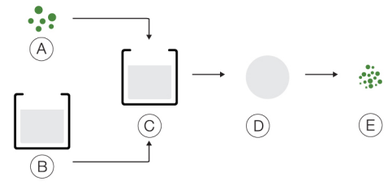
Ⓐ Liquid product Ⓑ Droplets Ⓒ Solid particles

Amorphous solid dispension



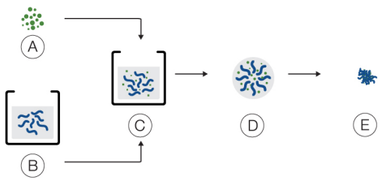
Ⓐ Polymer Ⓑ Drug Ⓒ Solvent Ⓓ Solution of drug and polymer in solvent C Ⓔ Droplets Ⓕ Molecular mixture of API and polymer(s)

Micronization



Ⓐ Solid product Ⓑ Solvent Ⓒ Solution of the solid product dissolved in the solvent Ⓓ Droplets Ⓔ Solid particles

Agglomeration & Granulation



Ⓐ Solid products Ⓑ Binder dissolved in solvent Ⓒ Suspension of solid particles in binder solution Ⓓ Droplet Ⓔ Agglomerate of solid particles

Encapsulation of liquids

Ⓐ Liquid product Ⓑ Solution of carrier and filmogen Ⓒ Emulsion Ⓓ Droplets Ⓔ Solid particles

Encapsulation of solids

Ⓐ Solid products Ⓑ Solution of carrier and filmogen Ⓒ Dispersion Ⓓ Droplet Ⓔ Solid particles

Mini Spray Dryer S-300
From expertise to master piece

With the Mini Spray Dryer S-300, BUCHI solidifies its position as a global market leader in spray drying, a stance the company has held for more than 40 years. The newest spray drying solution combines combines outstanding product design with unique instrument capabilities to offer a superior user experience.

Highest level of automation and flexibility
Spray drying with convenience and efficiency

With the Mini Spray Dryer S-300 you can benefit from the highest possible automation levels to improve your process efficiency and free more time for your formulations.

- Safe handling of organic solvents
- Substantial time savings with auto mode
- Higher process regulation and reproducibility
- Maximal flexibility with remote control possibilities
- User friendly operation with method programming

Improved spray drying performance
Maximize reproducibility and product yield

The Mini Spray Dryer S-300 allows you to achieve highly reproducible results, speed up the optimization of your formulation and simplify upscaling applications.

- Comprehensive reporting with a push of a button
- Improved sample protection
- Improved reproducibility through system design
- Full compatibility with previous spray dryers

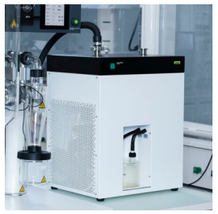
Clever features that make a difference
Optimal performance and simple system operation

BUCHI focuses on perfecting every detail so you can easily handle the Mini Spray Dryer S-300 and improve your spray drying performance.

- Easy maintenance with new cyclone mounting
- Coated cyclone for increased yields
- More stability with ruby stone in the nozzle
- Higher flexibility thanks to second sample pump
- Vast expertise in Application Database

Highest level of automation and flexibility
Spray drying with convenience and efficiency

With the Mini Spray Dryer S-300 you can benefit from the highest possible automation levels to improve your process efficiency and free more time for your formulations.



Safe handling of organic solvents
In combination with the Inert Loop S-395, the Mini Spray Dryer S-300 allows for the safe handling of samples with organic solvents. The nitrogen drying gas is circulated and the solvent is collected as condensate. For your safety, the oxygen level and gas flow in the system are continuously monitored.

Substantial time savings with Auto Mode
The Auto Mode allows you to program your Mini Spray Dryer S-300 Advanced and run your method automatically. The instrument will heat up, condition the outlet temperature, spray pure solvent, spray your sample, spray pure solvent again and shut down after the sample is processed. The auto mode improves the time efficiency of your process, especially during repetitive tasks.

Higher process regulation and reproducibility
All parameters in the Mini Spray Dryer S-300, such as spraying gas, drying gas and pump speed, are provided in SI values and are automatically regulated by the system. These features maximize the reproducibility of your process.

Maximal flexibility with remote control possibilities
Control or monitor the Mini Spray Dryer S-300 from anywhere at any time. The app on any mobile device or computer grants you full access to the entire user interphase of the system. With remote control options, you gain flexible time management and fast reaction times to process alterations.

User-friendly operation with method programming
Save time and hassle by saving your runs as methods and repeating them later. You can also program a sample queue to run one sample after another on your Mini Spray Dryer S-300 for added convenience.

Improved spray drying performance
Maximize reproducibility and product yield

The Mini Spray Dryer S-300 allows you to achieve highly reproducible results, speed up the optimization of your formulation and simplify upscaling applications.

Comprehensive reporting with a push of a button
All the runs you perform on the Mini Spray Dryer S-300 are recorded and saved on the instrument. With the push of a button, you can easily generate a PDF report or a .csv file with your process data.

Improved sample protection
To give you more information about the thermal influences on your sample, the Mini Spray Dryer S-300 allows you to monitor both the outlet temperature and the final product temperature. This information can help you better protect your samples, especially when spray drying heat sensitive samples.

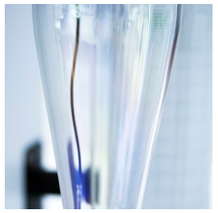
Improved reproducibility through system design
Achieve high data reproducibility thanks to an instrument made of highest quality material combined with decade-long expertise in spray drying instruments. The Mini Spray Dryer S-300 is made of the most precise and stable glass and contains the most durable nozzle made of stainless steel with a ruby stone strengthening.

Full compatibility with previous spray dryers
With the Mini Spray Dryer S-300, you can reproduce the results that you achieved with older models of the BUCHI Mini Spray Dryer. You will not lose any of your valuable work for a quick, seamless transfer to the new instrument.

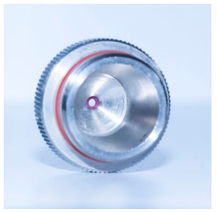
Clever features that make all the difference
Optimal performance and simple system operation

BUCHI focuses on perfecting every detail so you can easily handle the Mini Spray Dryer S-300 and improve your spray drying performance.

Easy maintenance with new cyclone mounting
The cyclone is often the most difficult part to be cleaned in a Mini Spray Dryer. With the Mini Spray Dryer S-300, you can take the cyclone apart, clean it quickly and efficiently while minimizing the risk of cross contamination.



Coated cyclone for increased yields
Reduce sample loss during lab spray drying thanks to a cyclone with a conductive coating that reduces the ability of your sample to stick to the walls.



More stability with ruby stone in the nozzle
The nozzle of the Mini Spray Dryer S-300 is the most stable of its kind. The nozzle, made of stainless steel, has been strengthened with a ruby stone in critical places, resulting in a more reproducible spray drying performance.

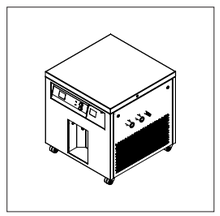
Higher flexibility thanks to second sample pump
Add a second peristaltic pump to the Mini Spray Dryer S-300 and feed two samples into the three fluid nozzle independently or feed your cooling or heating media to the nozzle.

Vast expertise in Application Database
With more than 40 years of experience in laboratory scale spray drying, BUCHI has accumulated vast application know-how. Find one of the thousands of publications with BUCHI spray dryers in scientific libraries or explore our online Spray Drying application database to find applications that match your needs.

Technical data
MiniSprayDryer S-300

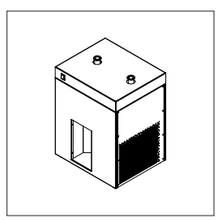
	Mini Spray Dryer S-300	Mini Spray Dryer S-300 Advanced	Mini Spray Dryer S-300 Corrosive
Organic solvent samples	-	Yes	Yes
Acidic and basic sample	-	-	Yes
Auto mode	-	Yes (optional)	Yes (optional)
Method mode	-	Yes	Yes
Outlet filter included	Yes	Yes	Yes
Maximum sample throughput		1 L / h	
Particle size range		1 - 60 µm	
Yield		Up to 70%	
Viscosity of the sample		Up to 300 cps	
Dimensions (W x D x H)	620 mm x 640 mm x 1052 mm	620 mm x 640 mm x 1052 mm	620 mm x 640 mm x 1052 mm
Weight (with glass assembly)	62.5 kg	62.5 kg	62.5 kg
Connection voltage	220 - 240 ± 10% VAC	220 - 240 ± 10% VAC	220 - 240 ± 10% VAC
Power consumption	max. 2300 W	max. 2300 W	max. 2300 W
Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Minimum clearance on all sides	100 mm	100 mm	100 mm
Spray drying gas	Nitrogen Compressed air	Nitrogen Compressed air	Nitrogen Compressed air
Max. temperature	220 / 250 °C	220 / 250 °C	220 / 250 °C
Drying Gas Max. flow rate	35 m³ / h	35 m³ / h	35 m³ / h
Spray gas range	80 - 1800 L / min	80 - 1800 L / min	80 - 1800 L / min
Max. pressure spray gas	7 bar	7 bar	7 bar
Sample feed	0.1 - 30 mL / min	0.1 - 30 mL / min	0.1 - 30 mL / min

Accessories



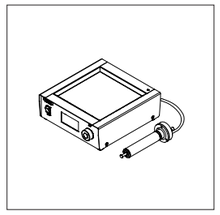
Inert Loop S-395

The safe way to spray dry organic solvents is to use the Inert Loop S-395 as the ideal accessory for your Mini Spray Dryer S-300. Its innovative design makes spray drying of organic solvents more environmentally friendly, cost-efficient and safe.



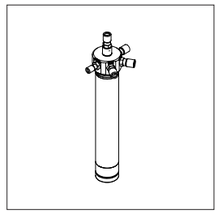
Dehumidifier S-396

The Dehumidifier S-396 is designed to provide dry air or to enable continuous work with water and organic solvent mixtures. The accessory improves your spray drying performance, while providing stable spray drying conditions.



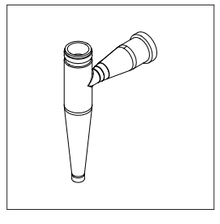
Ultrasonic Package

The Ultrasonic package allows the Mini Spray Dryer S-300 to produce particles in the size range from 10 – 60 µm. It is compatible with all Mini Spray Dryer models.



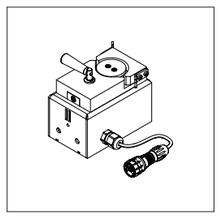
Three fluid nozzle

For the independent feeding of two liquids, such as immiscible systems or reactants to nozzle tip, in the Mini Spray Dryer S-300.



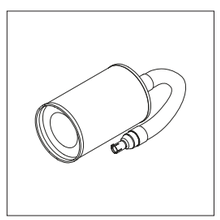
High performance cyclone

The high performance cyclone is especially optimized to collect small particles in high yields from the Mini Spray Dryer.



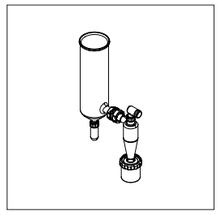
Second peristaltic pump

Feed two samples into the three fluid nozzle independently or feed your cooling or heating media into the nozzle.



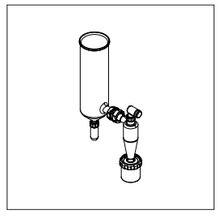
Inlet Filter

Filter the inlet air into the Mini Spray Dryer S-300 to minimize contamination.



Amber glass set

The amber glass set reduces the UV light impact on your sample when working with light sensitive material.



Additional set of glass ware

An additional set of glassware will increase the productivity of your system and will reduce the downtime in case of glass breakage.

The complete formulation portfolio
Overview

Mini Spray Dryer S-300

Nano Spray Dryer B-90

Encapsulator
B-390 / B-395 Pro

Lyovapor™
L-200 / L-300

Description	The Mini Spray Dryer S-300 is designed according to the spray dryers used in the industrial process.	The Nano Spray Dryer B-90 is designed for research purposes and allows the handling of very small samples with highest yields	The Encapsulator B-390 / B-395 is a versatile system for encapsulation of active ingredients and materials for R&D purposes.	The BUCHI Layovapors are the flexible solutions for laboratory scale freeze drying.
Methods				
Classical Spray Drying	•	•		
Encapsulation Spray Drying	•	•		
Capsuls wet			•	
Beads wet			•	
Capsules dry			•	
Beads dry			•	
Freeze dryed formualtions				•
Characteristics				
Maximum sample throughput	1 L / h	150 mL / h	0.5 – 200 mL / min	6 – 12 L / 24 h
Minimal Sample	5 g	200 mg	1 g	No limitation
Particle size range	1 – 60 µm	200 nm – 5 µm	80 – 2000 µm	No particles formed
Particle size distribution	medium	narrow	Uniform	No particles formed
Yield	Up to 70%	Up to 90%	Around 100%	Around 100%
Viscosity of the sample	300 cps	10 cps	1000 cps	No limitations
Physical state of the sample	Liquid	Liquid	Liquid	Liquid or solid

Service & Training
BUCHI Service packages

BUCHI START – The highest efficiency from the very beginning
From a professional installation to a carefree agreement that will leave you with full cost predictability and the highest possible system efficiency. www.buchi.com/start

«Install»
· Product installation and testing
· Hands-on training from a certified technician
· Evaluation of the immediate surroundings of your new product
· Best integration of your new product into the existing infrastructure
«IQ / OQ»
· Product or system installation
· Installation and Operational Qualification

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Receive comprehensive qualifications with all of your BUCHI products. We perform qualification services on a level that can only be achieved by the manufacturer. www.buchi.com/exact

«OQ»
· Our one-time OQ service will provide you with all the necessary documents and certificates.
· The service team will remind you about the option for a follow-up OQ before the certificates expire.
«OQ Circle»
Buying an OQ package will grant you an additional discount on the documents and offer you priority service with automated visit scheduling.

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Maintaining a heavily used device requires different parts and inspection frequencies than units that are operated occasionally. Our approach takes factors like these into consideration to provide you with an optimal yet cost-efficient solution. www.buchi.com/care

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Expert know-how is provided by the application chemists in our competence centers in Flawil, Beijing and Mumbai and the locally available experts at our market organizations. Our scientific support offers pre-sales feasibility studies, tailored solution offers, after sales onsite support, regular basic to advanced courses and on demand customized training. www.buchi.com/academy

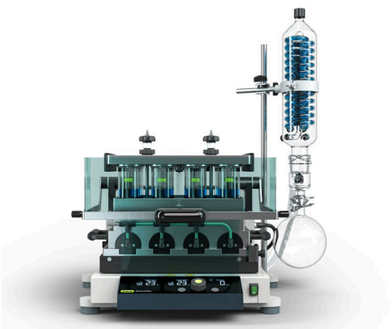
Pharma & Chemistry
R&D Discovery

Synthesis, Extraction | Concentration | Separation | Drying | Analysis

Cold Extraction / Soxhlet | **Evaporation** | **Flash Chromatography Prep HPLC** | **Freeze Drying** | **Melting Point**

Rotavapor®

Rotavapor®



SyncorePlus

Pure Instruments & Consumables

Lyovapor™

Melting Point

Application

The search for active pharmaceutical ingredients (APIs) and chemical compounds typically begins with a synthesis or an extraction step. Reflux synthesis and Soxhlet extraction can be performed via a rotary evaporator.	Since both synthesis and extraction require large amounts of solvent, a concentration step is required prior to downstream processing. Here, rotary evaporation is used to remove the solvent and concentrate the compound of interest. The use of parallel evaporation can speed up the concentration of multiple samples. Many samples are evaporated simultaneously, which increases sample throughput.		Flash and preparative highpressure liquid chromatography (prep HPLC) are commonly used to purify target compounds: flash is used as a pre-purification step, whereas prep HPLC increases the purity of the target compound to the maximum.	Following the separation process, molecules of interest are highly diluted and must be concentrated before proceeding with the next steps. Freeze drying can be used to remove solvent from heatsensitive products with minimal damage.	Melting point analysis can be used to perform quality control on the compound of interest. Determination of the novel compound's melting point serves as a useful indicator of the material's purity.

Features

- Reflux condenser for reflux synthesis
- Soxhlet accessory for Soxhlet extraction
- One instrument fits several application

- Evaporation of a single sample with evaporating flask size of 50 to 5000 mL
- Fully communicating system to avoid downtime: solvent library, dynamic distillation, drying mode, leak test, foam sensor
- Dewar accessory for freeze drying sample preparation

- Multiple samples in the range of 0.5 – 500 mL can be concentrated or dried simultaneously
- Flushback module to achieve highest analyte recovery and most reliable results
- Interchangeable racks and volume versatility

- Flash and prep HPLC in one system (optionally)
- Integrated UV and ELS detection (optionally)
- Compatible with a wide range of flash cartridges, prep HPLC columns and glass columns
- Leak, pressure, solvent level sensors and RFID technology on cartridges and racks for superior sample safety

- Two BUCHI platforms available:
  - L-200: high-quality traditional freeze drying of samples (-55 °C, 6 kg)
  - L-300: continuous sublimation with two alternately working and automatically cleansed condensers at -105 °C (Infinite-Technology™)
- Easy way of controlling and monitoring of the freeze drying process

- Automatic determination of melting and boiling points
- Compliant with Pharmacopeia methods (European, USP, Japanese)
- Observation and replay of the phase transition using color display and video recording
- Parallel measurement of up to 3 samples

Core messages to our customers
BUCHI creates added value

“Quality in your hands” is the guiding principle that shapes our philosophy and our actions. It challenges us to provide outstanding services that are precisely tailored to your needs. This means that we must stay in close contact with our customers. That is why we keep in touch and continue to work very hard to understand you and your business even better.

We help you by providing high-quality products, systems, solutions, applications and services that offer you added value. This allows you to focus entirely on your processes and your work.

Competent
We have the technological expertise and decades of experience needed to provide competent support and work with you to continually improve our services.

Reliable
We guarantee the quality and functionality of our equipment and will continue to help you quickly and efficiently whenever something does not operate to your satisfaction.

Safe
By collaborating closely with you, we do everything in our power to make our products, systems, solutions, applications and services as safe as possible for people and the environment.

Cost-effective
We strive to create a high level of economic benefit and maximum added value for you.

Global
As an international family-owned business with own subsidiaries and qualified distributors, we have a presence wherever you are located.

Easy
We support you by providing carefully designed solutions as well as instruments and systems that are easy to operate.

Sustainable
We support environmentally friendly processes and manufacture products that have a long service life. We utilize advanced technologies to leave the smallest environmental footprint possible.

We are represented by more than 100 distribution partners worldwide.
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Quality in your hands
